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ASSESSMENT OF AVAILABILITY AND ADEQUACY OF ELECTRICAL/ELECTRONIC WORKSHOP FACILITIES FOR PRACTICAL SKILLS ACQUISITION IN TECHNICAL COLLEGES OF KANO STATE, NIGERIA

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Abstract
The study Assessed the availability and adequacy of Electrical/Electronic workshop facilities for practical Skills Acquisition in Technical Colleges of Kano state, Nigeria. Two research question guided the study. The study used descriptive survey research design. The population of the study is 24 respondents which comprised of 18 Electrical installation and maintenance work/Electronic work trade instructors and 6 workshop attendants of technical colleges of Kano state. The instrument for data collection was Check list adopted from the National Board for Technical Education. Percentage was used as method of data analysis to answer the research questions. The findings of the study revealed that 50% of electrical installation and maintenance tools and equipment are available and 23% Electronics works tools and equipment are available. Generally, whole items found fairly available but not adequate. Maintenance programmed carried on electrical installation and maintenance/ electronic work equipment and tools was not agreed by the respondent among others. The following recommendations among others were made based on the findings of the study, the government should ensure the availability of workshop facilities as it is crucial to invest in and provide essential equipment, tools and consumable materials that is currently lacking in the electrical Installation and maintenance/Electronics workshop should be provided. The schools should establish a comprehensive maintenance program for both equipment and tools. This should include regular servicing of equipment, immediate cleaning of used tools, and daily workshop cleanup. Government should also seek for intervention from nongovernmental organization in acquiring the latest tool and equipment for practical skills acquisition

Keywords: Electrical Installation/Electronic Practical Skills Acquisition, Workshop Facilities, tools and equipment

Introduction:

Technical institution is an organized school where specialized type of education aimed at providing skills and knowledge required for employment in an occupation is conducted (Usman, Kareem, & Akinpade) According to Medugu, Zakari, and Umar (2023) pointed out that One of the major aims of technical education is the acquisition of appropriate skills by individuals to live and as well contribute meaningfully to the development of the society. These aims can only be achieved in a conducive learning environment where training facilities are available. In order to achieve this, technical institutions are expected to focus on workshop practices in addition to classroom lectures with adequate practical demonstration which is generally considered to be the key for concrete learning (Mbaga, Sambo & Aminu, 2018). Assessment according to Abdulkadir and Ma'aji (2014) is the systematic process of generating data about traits, performances, projects, activities e.t.c. for the purpose of making evaluative judgments. Therefore, assessment in the context of this study is a systematic process of generating data about Availability and effectiveness of workshop facilities for the purpose of making evaluative judgments.

Technical colleges are mainly established for the training of students to acquired practical skills, knowledge and attitude. However, the major goals of technical college education are to produced efficient and relevant craftsmen and women that will promote an industrial development in the area of maintenance, goods production and general services. The goal of technical college education is to develop saleable skills in youths in order to make them useful to themselves, society and also become labor assets in the industries (Abdulkadir & Ma'aji, 2014). According to Ebere, Dokubo, and Igharo (2024) Technical Colleges focus on learners' participation in social value. It emphasizes more on pragmatism and thus trains both the cognitive and psychomotor domains to enable individuals become productive and relevant in the society they belong to. The National Policy on Education (FRN, 2004) described technical education as education that promotes the acquisition of skills and applied scientific knowledge through hands-on experience. The extent of technological development and growth of any country is therefore, dependent on the quality and effectiveness of her Technical and vocational education. Practical Skills acquisition is the process by which individuals are expected to learn and continuously practice a particular task till they become proficient in the operation and can perform them when required. Skills are acquired when procedural instructions are matched with performance activities. For skills to be acquired, there must be opportunities for participation and practice of such skills under real life situation. Skill acquisition is very necessary at this stage of Nigeria's economic and technological development. Acquisition of skills prepares students for vocational occupation and progressive development in it. Skill acquisition remains the major goal of vocational technical education and this helps to satisfy the personal work needs of both the individual and the society. To acquire skills in vocational technical education programmed at Technical colleges, opportunities must be provided for students to practice the skills they are taught in an environment that is relevant to the job. Such opportunities that should be provided may improve practical skill acquisition of Electrical installation/Electronic works technology students include, allocation of more time for practical work, and, provision of work shop facilities (Richard, 2011). Adequacy is a state of being sufficient or satisfying requirement. Educational facilities are expected to be adequately provided to create favorable environment for the management of technical colleges (Jessa, 2017)

Statement of the Problem

One of the major aims of technical education is the acquisition of appropriate skills by individuals to live and as well contribute meaningfully to the development of the society. These aims can only be achieved in a conducive learning environment where training facilities are available. According to Deebom and Puyate (2021) technical college environment should be such that it can arouse and motivate the learners' curiosity towards learning; these could be achievable if the facilities provided are utilized and maintained from time to time especially as regards to electrical installation and maintenance work/electronic work trade (EIMW/ELW), therefore without the availability and utilization of facilities teaching and learning of EIMW/ELW in Technical Colleges will be abstract, thereby making knowledge impartation and acquisition of skills a mirage. They also stress that, Over the years, both federal and state governments has been clamoring on how to promote and developed Technical Education such that teachers can impart the

necessary skills needed by the learners without much difficulty, these efforts have being crippled, abandoned and proved abortive due to lack of necessary courage on the part of the leadership to back up words with action; Technical College that are supposed to prepared students to become self-reliant are only operating using, obsolete tools, equipment, machineries and dilapidated facilities coupled with inadequate qualified teachers as a result of low level of availability and poor maintenance culture of facilities (Deebom & Puyate, 2021). For this reason, therefore, this study aimed at assessing workshop facilities for practical skills acquisition in technical collages of Kano state

Objectives of the Study

This study sought to assess the availability and adequacy of electrical/electronic workshop facilities for practical skills acquisition in technical colleges of kano state, Nigeria. Specific objectives of the study include:

1. Determine the availability of tools and equipment in Electrical Installation and Maintenance work / Electronic Work workshop for practical skills acquisition in technical colleges of kano State.
2. Determined the adequacy of EIMW/ELW workshop facilities for practical skills acquisition in technical colleges of kano state.

Research Questions

The study was guided by the following research questions:

1. What are the available of tools and equipment in EIMW/ELW workshop for practical skills acquisition in Technical colleges of Kano state, Nigeria?
2. What are the adequacy of Electrical Installation and Maintenance work / Electronic Work workshop facilities for practical skills acquisition in technical colleges of Kano state, Nigeria?

Methodology

The study adopts descriptive survey research design. The area of the study is Technical College of Kano State Nigeria. The targeted population of this study comprises of twenty-four respondents which comprises eighteen (18) Electrical Installation and Maintenance Work Trade/Electronic Work Teachers and six (6) workshop attendants of accredited Government Technical Colleges of kano state that offers electrical installation and maintenance work trade/Electronic work. Purposive sampling was adopted for selecting six schools, hence GTC kano, GTC Bagauda, GTC Tiga, GTC Ingwaggo and GTSC Mairo Tijjani. The sample comprises 24 respondents which comprise 18 teachers and 6 workshop attendants. Checklist of Electrical Installation/ Electronic Works facilities was constructed to collect data based on National Board for Technical Education (NBTE) minimum standard for Technical Colleges. To ensure face and content validity of the instrument, the instrument was subjected to validation by three experts, Lecturers from Bayero University Kano. The researcher administers the instrument to the respondents at technical colleges with the help of two trained research assistant at each school Percentage was used as method of data analysis to answer the research questions.

Results

Research Question 1: What are the available of tools and equipment in Electrical Installation and Maintenance work (EIMW)/Electronic Work (ELW) workshop for practical skills acquisition in Technical colleges Kano, Nigeria?

Table 1: Percentage of Respondents on Availability of Tools and Equipment in Electrical Installation and maintenance works

S/N	Items	Number Required	Average Number Obtained	Percentage	Remark
1	Manuel winding machine with accessories	1	0	0	Not AV
2	Wattmeter	1	0	0	Not AV
3	Energy meter	2	1	25	AV
4	Electric winding machine with accessories	1	0	25	AV
5	Earth loop tester	1	0	0	Not AV
6	Ringing tool	6	2	29	AV
7	Battery charger	1	3	275	AV
8	Growler	3	1	25	AV
9	Oscilloscope	1	2	150	AV
10	Tachometer	2	0	13	AV
11	Tin snips	7	3	43	AV
12	Compressing tool	6	2	33	AV
13	Bridge megger	1	1	70	AV
14	Pot and ladle	1	4	350	AV
15	Wiring board 1m x 1m for individual Work	10	6	62	AV
16	Philips (star) screw driver set	1	7	700	AV
17	Rawl plugs	10	4	40	AV
18	Hydrometer	1	3	300	AV
19	Electrical horns with accessories	1	0	0	Not AV
20	Strippers	4	5	125	AV
21	Hacksaw blade	1	4	400	AV
22	Files (flat) smooth	5	6	120	AV
23	Files (triangular) smooth	5	5	100	AV
24	Files (flat) rough	5	3	60	AV
25	Files (triangular) rough	5	2	40	AV
26	Files (square) smooth	5	3	60	AV
27	Files (square) rough	5	2	40	AV
28	Files (round) smooth	5	2	40	AV
29	Warden files	5	1	20	AV
30	Electrician's knives	4	4	100	AV
31	Centre punch	4	3	75	AV
32	Scribers	10	4	40	AV
33	Gimlet	4	3	75	AV

S/N	Items	Number Required	Average Number Obtained	Percentage	Remark
34	Screw extractors	5	1	10	AV
35	First aid box	1	0	0	Not AV
	Consumable Material:				
36	Circuit breakers	14	1	4	AV
37	Fire extinguisher	4	3	75	AV
38	Plugs – assorted	5	1	10	AV
39	Conduit pipes (galvanized steel)	1	1	70	AV
40	Adaptors – assorted	4	2	50	AV
41	Bell and battery set	6	2	33	AV
42	GBKs (Heavy duty) with Crocodile clips (for charging) As necessary	1	1	100	AV
43	Copper coils (assorted gauges)	1	4	400	AV
44	Sulphuric acid	2	1	50	AV
45	Sand bucket	2	2	100	AV
46	Water hose or bucket	1	1	100	AV
	Overall/Average	**4**	**2**	**50**	

Table 1 presents the percentage of the available tools and equipment in Electrical Installation and maintenance work workshops for practical skills acquisition in Technical Colleges of Kano State, Nigeria. The analysis showed that Electrical horns with accessories and first aid box are not available and hydrometer, hacksaw blade and files are above required number. However, the overall/ average of 50% of equipment, tools and consumable materials are available.

Table 2: Percentage of Respondents on Availability of Tools and Equipment, in Radio, Television and Electronic work workshops for practical skills acquisition in Technical Colleges of Kano State, Nigeria.

S/N	Items	Number Required	Average Number Obtained	Percentage	Availability
1	Digital multi-meter	5	4	80	AV
2	Analog multi-meter	3	4	133	AV
3	Panel ammeters	11	1	9	AV
4	Panel voltmeters	10	1	10	AV
5	Measuring tape	1	1	50	AV
6	Computer power pack (scrap)	**5**	0	0	Not AV
7	Computer circuit board	1	0	0	Not AV

S/N	Items	Number Required	Average Number Obtained	Percentage	Availability
	(scrap)				
8	Computer	**2**	1	50	AV
9	Radio receiver	2	1	50	AV
10	Television	2	4	200	AV
11	Potentiometer resistor	100	6	6	AV
12	CCTV	2	0	0	Not AV
13	Blower	1	1	100	AV
14	15v, 12v and 6v transformer	19 each	8	49	AV
15	**Tools**				
16	Soldering iron	20	6	30	AV
17	Combination pliers	7	6	86	AV
18	Screw drivers testers	16	2	13	AV
19	Wooden boards	14	0	0	Not AV
20	Hammer	4	1	25	AV
21	Computer repair kits	4	0	0	Not AV
22	**Consumable materials**				
23	Soldering lead	4	2	50	AV
24	Vero board	36	15	42	AV
25	Bread board	25	12	48	AV
26	Batteries (9v)	90	10	11	AV
27	Resistors	115	40	35	AV
28	Brushes	6	1	17	AV
29	Integrated circuit	88	26	30	AV
30	Relays	37	14	38	AV
31	Mechanical switch	11	8	73	AV
32	Switches	21	12	57	AV
33	Cut out fuses	9 sets	4	49	AV
34	Diodes	70	33	47	AV
35	Quad-2-input NAND Gate IC	40	2	5	AV
36	Dual D-flip flop	40	3	6	AV
37	555 Timer ICs	40	6	15	AV
38	NPN general type	40	10	25	AV
39	PNP general type	40	12	30	AV
40	Power diode	80	37	46	AV
41	Light dependent resistor	21	2	10	AV
42	PNP power transistor	40	10	25	AV
43	NPN power transistor	40	0	0	Not AV
44	Decade counter IC	40	1O	25	AV

S/N	Items	Number Required	Average Number Obtained	Percentage	Availability
45	LED Different colours Red, Yellow, Green	70	15	21	AV
46	Ceramic capacitors	50	10	20	AV
47	Electrolytic capacitors	55	35	64	AV
48	Header connector	100	25	25	AV
49	Microcontroller	50	0	0	Not AV
50	Liquid Crystal Display (LCD)	50	0	0	Not AV
51	7-segment display decade counter	50	1	2	AV
52	BCD to 7-segment decoder/LCD driver	50	0	0	Not AV
53	16 x 2 Alphanumeric LCD	50	0	0	Not AV
54	32 x 2 Alphanumeric LCD	50	0	0	Not AV
55	. Voltage regulator ICs	50	2	4	AV
56	Battery (12v/ 7ah, 12v/200ah)	4	0	0	Not AV
57	Arduino IDE	50	0	0	Not AV
58	Extension cables	3	2	67	AV
59	Tool box	2	1	50	AV
	Overall/Average	**31**	**7**	**23**	

Key: AV - Available

Table 2 presents the percentage of the available of tools and equipment in Radio, Television and Electronic work workshops for practical skills acquisition in Technical Colleges of Kano State, Nigeria. The analysis showed that Computer power pack (scrap), Computer circuit board (scrap), CCTV, Wooden boards, Computer repair kits, NPN power transistor, Microcontroller, Liquid Crystal Display (LCD), BCD to 7-segment decoder/LCD driver,16 x 2 Alphanumeric LCD,32 x 2 Alphanumeric LCD. Battery (12v/ 7ah, 12v/200ah) and, Arduino IDE are not available while Blower, Analog-multimeter and Television set are above the require number However, the overall/ average of 23% of tools and equipment are available.

Research Question 2: What are the adequacy of Electrical Installation and maintenance works workshop facilities for practical skills acquisition in technical colleges of Kano State, Nigeria?

Table 3: Percentage of Respondents on Adequacy of Tools and Equipment, in Electrical Installation and maintenance works

S/N	Items	Adequate Number	Average Number Obtained	Percentage	Remark
1	Manuel winding machine with accessories	1	0	0	Not AD
2	Wattmeter	1	0	0	Not AD
3	Energy meter	2	1	25	Not AD
4	Electric winding machine with accessories	1	0	0	Not AD
5	Earth loop tester	1	0	0	Not AD
6	Ringing tool	6	2	29	Not AD
7	Battery charger	1	3	275	HAD
8	Growler	3	1	25	Not AD
9	Oscilloscope	1	2	150	HAD
10	Tachometer	2	0	0	Not AD
11	Tin snips	7	3	43	Not AD
12	Compressing tool	6	2	33	Not AD
13	Bridge megger	1	1	70	AD
14	Pot and ladle	1	4	350	HAD
15	Wiring board 1m x 1m for individual Work	10	6	62	AD
16	Philips (star) screw driver set	1	7	700	HAD
17	Rawl plugs	10	4	40	Not AD
18	Hydrometer	1	3	300	HAD
19	Electrical horns with accessories	1	0	0	Not AV
20	Strippers	4	5	125	HAD
21	Hacksaw blade	1	4	400	HAD
22	Files (flat) smooth	5	6	120	AD
23	Files (triangular) smooth	5	5	100	AD
24	Files (flat) rough	5	3	60	AD
25	Files (triangular) rough	5	2	40	Not AD
26	Files (square) smooth	5	3	60	AD
27	Files (square) rough	5	2	40	Not AD
28	Files (round) smooth	5	2	40	Not AD
29	Warden files	5	1	20	Not AD
30	Electrician's knives	4	4	100	AD
31	Centre punch	4	3	75	Not AD
32	Scribers	10	4	40	Not AD
33	Gimlet	4	3	75	AD

S/N	Items	Adequate Number	Average Number Obtained	Percentage	Remark
34	Screw extractors	5	1	10	Not AD
35	First aid box	1	0	0	Not AD
	Consumable Material:				
36	Circuit breakers	14	1	4	Not AD
37	Fire extinguisher	4	3	75	AD
38	Plugs – assorted	5	1	10	Not AD
39	Conduit pipes (galvanized steel)	1	1	100	AD
40	Adaptors – assorted	4	2	50	Not AD
41	Bell and battery set	6	2	33	Not AD
42	GBKs (Heavy duty) with Crocodile clips (for charging) As necessary	1	1	100	AD
43	Copper coils (assorted gauges)	1	4	400	HAD
44	Sulphuric acid	2	1	50	AD
45	Sand bucket	2	2	100	AD
46	Water hose or bucket	1	1	100	AD
	Overall/Average	**4**	**2**	**50**	Not AD

Table 3 presents the percentage of the adequacy of tools and equipment in Electrical Installation and maintenance work workshops for practical skills acquisition in Technical Colleges of Kano State, Nigeria. The analysis showed that the overall/ average of 50% of equipment, tools and consumable materials are obtained which are not adequate.

Table 4: Percentage of Respondents on Adequacy of Tools and Equipment in Radio, Television and Electronic work workshops for practical skills acquisition in Technical Colleges of Kano State, Nigeria.

S/N	Items	Adequate Number Required	Average Number Obtained	Percentage	Remark
1	Digital multi-meter	5	4	80	AD
2	Analog multi-meter	3	4	133	HAD
3	Panel ammeters	11	1	9	Not AD
4	Panel voltmeters	10	1	10	Not AD
5	Measuring tape	1	1	100	AD
6	Computer power pack (scrap)	**5**	0	0	Not AD
7	Computer circuit board (scrap)	1	0	0	Not AD

S/N	Items	Adequate Number Required	Average Number Obtained	Percentage	Remark
8	Computer	**2**	1	50	Not AD
9	Radio receiver	2	1	50	Not AD
10	Television	2	4	200	HAD
11	Potentiometer resistor	100	6	6	Not AD
12	CCTV	2	0	0	Not AD
13	Blower	1	1	100	AD
14	15v, 12v and 6v transformer	19 each	8	49	Not AD
15	**Tools**				
16	Soldering iron	20	6	30	Not AD
17	Combination pliers	7	6	86	AD
18	Screw drivers testers	16	2	13	Not AD
19	Wooden boards	14	0	0	Not AV
20	Hammer	4	1	25	Not AD
21	Computer repair kits	4	0	0	Not AV
22	**Consumable materials**				
23	Soldering lead	4	2	50	Not AD
24	Vero board	36	15	42	Not AD
25	Bread board	25	12	48	Not AD
26	Batteries (9v)	90	10	11	Not AD
27	Resistors	115	40	35	Not AD
28	Brushes	6	1	17	Not AD
29	Integrated circuit	88	26	30	Not AD
30	Relays	37	14	38	Not AD
31	Mechanical switch	11	8	73	AD
32	Switches	21	12	57	AD
33	Cut out fuses	9 sets	4	49	Not AD
34	Diodes	70	33	47	Not AD
35	Quad-2-input NAND Gate IC	40	2	5	Not AD
36	Dual D-flip flop	40	3	6	Not AD
37	555 Timer ICs	40	6	15	Not AD
38	NPN general type	40	10	25	Not AD
39	PNP general type	40	12	30	Not AD
40	Power diode	80	37	46	Not AD
41	Light dependent resistor	21	2	10	Not AD
42	PNP power transistor	40	10	25	Not AD
43	NPN power transistor	40	0	0	Not AV
44	Decade counter IC	40	1O	25	Not AD
45	LED Different colours Red, Yellow, Green	70	15	21	Not AD

S/N	Items	Adequate Number Required	Average Number Obtained	Percentage	Remark
46	Ceramic capacitors	50	10	20	Not AD
47	Electrolytic capacitors	55	35	64	AD
48	Header connector	100	25	25	Not AD
49	Microcontroller	50	0	0	Not AD
50	Liquid Crystal Display (LCD)	50	0	0	Not AD
51	7-segment display decade counter	50	1	2	Not AD
52	BCD to 7-segment decoder/LCD driver	50	0	0	Not AD
53	16 x 2 Alphanumeric LCD	50	0	0	Not AD
54	32 x 2 Alphanumeric LCD	50	0	0	Not AD
55	. Voltage regulator ICs	50	2	4	Not AD
56	Battery (12v/ 7ah, 12v/200ah)	4	0	0	Not AD
57	Arduino IDE	50	0	0	Not AD
58	Extension cables	3	2	67	AD
59	Tool box	2	1	50	Not AD
	Overall/Average	**31**	**7**	**23**	Not AD

Key: AD- Adequate

Table 4 presents the percentage of the available of tools and equipment in Radio, Television and Electronic work workshops for practical skills acquisition in Technical Colleges of Kano State, Nigeria. The analysis showed that the overall/ average of 23% of, too and equipment are obtained which are not adequate.

Discussion of Findings

The findings of the study with regards to research question one reveals that 50% of electrical installation and maintenance tools and equipment are available and 23% Electronics works tools and equipment are available. The findings are in agreement with the findings of Ifeanyichukwu, et al. (2018) who submitted that only 11 out of 40 tools in electrical/electronic workshop are available, representing only 27% of the tools available. The finding is in support of Industrial Training Fund, (2007), which stated that a well-equipped workshop and training materials is a pre-requisite for effective skill acquisition in Technical Colleges. The findings which relates to research question two revealed that in the electrical installation and maintenance work, the result showed 50% of equipment, tools and consumable materials are adequate and 23% of tools and equipment are adequate, For the whole items the results shows are not Adequate. The finding supported by Ifunanyachukwu, et al. (2018) who reported that greater percentage of workshop facilities are not adequately provided in electrical/electronic workshop, that only ammeter found adequately provided in electrical/electronic workshop. The finding is supported and Catherine, Mfon and Williams, K. G. (2023) who find that there was inadequate supply of training equipment/facilities in both electrical and electronics section of the technical colleges. The findings have revealed that out of the twenty-eight items listed, only two were available and adequately supplied while

twenty-six items listed were inadequate. Also, they emphasized that industrial Arts education requires a workshop setting with adequate training facilities as a unique learning situation in which the learner may experiment, test, construct, assemble, repair, design, create, imagine and study. They stressed that, active workshop experiences are essential to the study of industrial arts education. The finding is in agreement with the view of Owoeye and Yara, (2011) who posited that, the Facilities and equipment constitute a strategic factor in organizational functioning and determine to a very large extent the smooth functioning of any social organization or system including education. They further stated that availability and adequacy of facilities promote effective teaching and learning activities in schools while their inadequacy may affect the academic performance of the learner negatively.

Conclusion

This study provides valuable insights into the state of technical colleges workshops in Electrical Installation and Maintenance (EIMW) and Electronic Work (ELW) workshop within the Kano State of Nigeria. The findings reveal higher percentage in facilities availability and generally both tools and equipment are not adequately provided in Electrical Installation and Maintenance (EIMW) and Electronic Work (ELW) in Technical Colleges within the Kano State of Nigeria.

Recommendations

1. Government should ensure the availability of workshop facilities as it is crucial to invest in and provide essential equipment, tools and consumable materials that are currently lacking in the EIMW workshop, and ELW workshop.
2. Adequate workshop facilities should be procured to various Technical colleges. Government should equip the workshops with a complete set of equipment, tools and consumable materials required for practical skills acquisition.
3. Government should also seek for intervention from nongovernmental organization in acquiring the latest tool and equipment for practical skills acquisition

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