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ADEQUACY AND UTILISATION OF INSTRUCTIONAL MATERIALS FOR TEACHING AND LEARNING OF 21ST CENTURY SKILLS IN SELECTED TRADES IN TECHNICAL COLLEGES IN NIGERIA.

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ABSRACT

Instructional materials are mostly physical items instructor uses to facilitate students' learning and achievement of instructional objectives. They are essential tools needed to aid teaching and learning of a given subject. They are useful in concretizing learning experiences. Therefore, in Technical Colleges in Nigeria, where the curricula involve teaching, learning and assessment of technical and vocational skills, adequate provision and utilization of instructional materials is an absolute necessity. Plumbing and Pipefitting (PP), Bricklaying, Blocklaying and Concreting (BBC) and Carpentry and Joinery (CJ) involve skills that require concrete learning compared to General Education subjects. However, there are concerns that instructional materials used for teaching and learning of the trades may not be adequate in terms of the extent of availability and utilization towards promotion and assessment of 21st century skills. This study investigated the availability and utilisation of instructional materials for the teaching and learning of 21st century skills in the selected trades. Three research questions were answered. The study adopted a mixed research design (qualitative and quantitative). The population comprised all heads of departments, teachers and students in each of the trades in all the Technical Colleges in Nigeria. Purposive sampling technique was used to select 23 Heads of department, 36 teachers and 266 students of PP, 21 Heads of department, 42 teachers and 404 students of BBC and 20 Heads of department, 32 teachers and 341 students of C&J across the country's six geopolitical zones. Three instruments were used: Questionnaire on Adequacy and Utilisation of Instructional Materials for PP, BBC and C&J with Cronbach-Alpha reliability coefficients of 0.87, 0.80 and 0.82 respectively. Data were analysed using frequencies, percentage, means and standard deviation. Findings revealed that instructional materials were not adequate and not effectively utilised for teaching and learning of the 3 trades in compliance with the 21st century skills requirements. It is therefore recommended that since assessment is an integral part of teaching and learning, schools and all relevant stakeholders should provide adequate instructional materials and ensure effective utilization of the materials for the development of 21st century skills on students of the selected trades.

KEYWORDS: *Instructional Materials, 21st Century Skills, Technical Colleges, Teaching, Learning, Assessment.*

INTRODUCTION

Instructional materials which include print and non-print items, human and non-human objects are used in teaching and learning. They are essential tools which students interact with that enable them to develop their abilities in reading, listening, speaking, writing, and solving problems. It suffice to say that the term encompasses all materials and physical means an instructor uses to implement instruction and facilitate students' achievement of instructional objectives (Wales, 2003). Several researchers have highlighted the importance of instructional materials. Ajoke (2017) stated that the advantages of instructional materials are that they can be improvised, useful in teaching large number of students, encourage learners to pay proper attention and enhance their interest. Isola (2010) and Oluwagbohunmi and Abdu-Raheem (2014) also described instructional materials as objects that assist the teachers to present their lessons logically and sequentially. Esu, Enukoha and Umoren (2004) affirmed that instructional materials facilitate learning of abstract concepts by helping to concretize ideas and stimulate learners' imagination, particularly in Technical, Vocational Education and Training (TVET) programmes.

TVET which "is used as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, the acquisition of practical skills, attitude, understanding and knowledge relating to occupations in various sectors economic and social life" (NPE, 2013: 24) is vital to technological development of any nation. Uwaifo (2010) stated that technical education can serve as change agents not only for technical systems but also for many other societal changes but lamented that students' desire to receive quality training, acquisition of practical and applied skills has been met by lots of challenges such as inadequate instructional materials.

In TVET colleges, instructional materials are tools and equipment used in teaching and learning of construction trades including Bricklaying, Blocklaying and Concreting (BBC), Carpentry and Joinery (CJ) and Plumbing and Pipefitting (PP). Training in various trades provides an alternative route to jobs and are generally divided into the following three categories: skilled industrial trades, skilled construction trades and skilled service trades (Blackboard, 2022). This study focused on construction trades of BBC, CJ and PP. Craftsmanship programmes in these trades are offered in formal TVET colleges in Nigeria below the tertiary. The colleges are educational institutions established at par with Senior Secondary Schools (post-basic education level) for training and producing craftsmen for educational advancement in related fields (National Policy on Education [NPE], 2013). The Construction Trades are vital at every stage of construction activities. The National Business and Technical Examinations Board (NABTEB) which was established by the Federal Government of Nigeria through the Act 70 of 1993 is charged with the conduct of Technical and Business Certificate Examinations in Nigeria and award of Craftsmanship Certificates (National Business Certificate (NBC)/National Technical Certificate (NTC)) as well as the Master Craftsmanship Certificates (Advanced National Business Certificate (ANBC)/Advanced National Technical Certificate (ANTC)), among others.

According to NABTEB (2000), the general goal for the programmes leading to the award of craftsmanship certificate (NTC) in PP is to equip trainees with knowledge, skills to design, install and maintain all types of water drainages, sanitation, heating and ventilation systems. The document also stated that NTC in CJ was designed to provide the trainees with essential knowledge and skill that will enable them perform their duties effectively and efficiently in all aspects of Carpentry and Joinery activities. In a similar vein, the syllabus for NTC in BBC is

designed to provide the trainees with the essential knowledge and skill that will enable him perform competently in all aspects of BBC duties in the construction industry.

Therefore, in Nigerian TVET colleges where the teaching and learning of technical and vocational skills (trades) involve a lot of practical activities, adequate provision and utilization of instructional materials are necessary for effective teaching and learning of BBC, CJ and PP towards promotion of employability in construction industries. However, there are reports that engagements of uncertified craftsmen in the construction industries have led to incessant collapse of buildings in Nigeria. Gbonegun & Olorunlomeru (2021) reported that from 1974 to July 2021, over 461 buildings have collapsed in Nigeria with over 1,090 deaths recorded. Wordu & Kanu (2021) in their study found that the major cause of building collapse in Nigeria is the use of unskilled labour and quack craftsmen and remarked that TVET institutions should provide competent craftsmen and technician to handle construction activities.

Ugwuanyi (2013) citing Ojoawo (1990) stated that adequate instructional materials facilitate the smooth functioning of any educational programme. Mapaderun (2002) is of opinion that adequacy is a satisfactory condition of resources in an organization and added that adequacy of facilities; equipment and supplies in schools promote effective teaching and learning activities while their inadequacy affects the academic performance negatively. Adequate provision or availability of equipment and facilities and their proper utilization have been positively correlated to good performance in examinations while poor performance has been blamed on inadequacies (Maduewesi, 2010). The study of Albarico (2014) noted that inadequacy in number of instructional resources in relation to number of students make them to buy materials that are supposed to be provided by the school. Adequacy, as used in this study, implies satisfactory provision or availability in acceptable quantity of instructional materials of Plumbing and

Pipefitting, Carpentry and Joinery and Blocklaying, Bricklaying and Concreting required for the teaching and learning of the 21st century skills. A question that comes to mind in relation to adequacy of instructional materials, especially of construction trades, is whether their availability guarantees their utilisation in the teaching and learning of the 21st century skills. Although adequate instructional materials is critical in teaching and learning, utilization of available materials is fundamental in ensuring quality-learning outcomes such as the 21st century competencies (Nwafor & Eze, 2014; Makokha & Wanyonyi, 2015; Achimugu, 2017; Dhakal, 2017).

Utilisation of available instructional materials for teaching and learning is an important aspect of training programmes in TVET colleges. This implies making use of available materials and facilities for services at the teacher's disposal in order to achieve set objectives. Thus, in TVET colleges, it is important that available instructional materials are and utilized in such a way that they enable students to acquire 21st century skills. However, there is strong argument that teachers of the selected trades may possess sound knowledge of the 21st century skills and therefore will not be able to utilise available instructional materials in the teaching and learning of 21st century skills. Most of the Heads of Departments of the various trades in response to oral interview stated that their teacher did not know much about 21st century skills. Specifically, the Head of Department of Plumbing and Pipefitting, Government Technical College, Enugu, Nigeria in response to an oral interview on the level of 21st Century skills possessed by teachers in his department remarked that:

> "21st century skills is entirely a new concept which most staff in the college do have adequate knowledge of; therefore, teachers certainly will not be able to utilise instructional materials at their disposal for the teaching and learning of the skills unless they are properly trained"

The dynamic global economy is currently making demands for the teaching and learning of 21st century skills. These consist of skills, abilities and learning dispositions that are required for success in the 21st century society and work places. Consequently, Olumorin, Yusuf, Ajidagba and Jekayinfa (2010) observed that efforts must be made to utilise available instructional materials for the teaching and learning of 21st century skills in various vocational trades since the need for such skills for employment are constantly evolving,. Today, graduates of TVET programmes entering the labour market do not need only technical job skills but also a range of other competencies that will enable them to change jobs and careers throughout their working life. In addition to technical and literacy skills, there is the need to develop soft skills needed in the workplace such as team work, critical thinking, leadership skills, information and technology skills, and work ethics (Bappah & Medugu, 2013).

The rationales for recent expectations of TVET colleges to produce graduates of Plumbing and Pipefitting, Carpentry and Joinery and Blocklaying, Bricklaying and Concreting that are equipped with 21st century skills include socio-economic changes currently taking place worldwide. These, in turn, have led to rising unemployment occasioned by lack of 21century skilled workers, thus placing the issue of workforce education high on the educational reform agenda of many nations. In line with this view, Kafka (2018) observed that the massive rate of unemployment and the changing face of the economic, social, political and labour market worldwide have led to new education reforms/polices with emphasis on TVET geared towards helping the youths and adults to be self-reliant. In recognition of the changing role of TVET in the world economic order, different countries have come up with new frameworks towards repositioning their TVET programmes to include teaching and learning of the 21st century skills. Due to rapid spread of technology, increasing globalisation and shift from industrial to

information and knowledge-based social economies (Voogt & Roblin, 2010), the need for 21st century skills in contexts of rapid development cannot be overemphasised (Rolleston, 2018; Kattan, 2017, Kattan, 2017; Suarta, Suwintana, Sudhana & Hariyanti, 2017).

Despite contrasting views on the acquisition of 21st century skills, the clamour and advocacy for embracing the teaching and learning of these skills and integrating skills into TVET curricula is on the rise. From all intents and purposes, the 21st-century skills which focus on information and technology require assessment strategies that will measure performance-based activities similar to real-life tasks that students/learners will encounter in the real world of work. Assessment of 21st-century skills, therefore, must focus on measuring students' proficiency in performing real-life tasks; demonstration of what students have learned; facilitating guide for instruction; provision of feedback to students to help manage their learning, and evaluating students' competencies which implies that we must now re-think what is being assessed. On what to assess, the Gordon Commission on the Future of Assessment in Education *(*2013), and the Pearson Paper (2014) "Preparing for a Renaissance in Assessment", recommend three of the key findings which focused on the content of assessments, namely: (1) Assessment must fully represent the competencies that the complex world demands; (2) Assessments must accommodate the full range of value outcomes (and not just cognitive/academic achievement narrowly defined and narrowly measured) and (3) What we choose to assess is what will end up being the focus of instruction and by implication the instructional materials to deploy. The implication is the instructional materials must be adequate, relevant and effectively utilised for teaching, learning assessment of the 21st century skills.

Adequacy and effective utilization of instructional materials for teaching and learning of 21st century skills are closely related to the assessment of the skills. It is being argued that

assessment determines the type of instructional materials an instructor deploys in teaching and learning. Assessment is an integral part of teaching and learning and when properly designed facilitates the attainment of learning goals envisioned for the 21st century students. According to Pellegrino (2014), teachers' classroom quizzes, mid-term, or final exams, nationally and internationally-administered standardized tests, which are used to ascertain students' knowledge and skills of a subject have become an integral part of the educational landscape particularly the teaching and learning process. Assessments of school learning provide information to help educators, administrators, policy makers, students, parents, and researchers judge the state of student learning and make decisions about implications and actions (Pellegrino, 2014). In a similar vein, Sadler (1989) cited in Pellegrino (2014), conjectured that three elements are required if teachers are to successfully use assessment to promote learning: (1) A clear view of the learning goals (derived from the curriculum) (2) Information about the present state of the learner (derived from assessment) and (3) Action to close the gap (taken through instruction particularly through the deployment of appropriate instructional materials). Guskey (2003) found that the best classroom assessments also serve as meaningful sources of information for teachers, helping them identify what they need to teach and the instructional materials they need for the instructions.

The challenge faced with the teaching and learning of 21st century skills is the assessment process. It has been agreed that an integral part of developing and fostering 21st century skills is assessment, which should be used to support the process of day-to-day classroom teaching and learning. Isiugo-Abanihe (2021) conjectured that educational assessment is a continuous process that facilitates learning of measurable learning outcomes; provides sufficient amount of learning opportunities to achieve the outcomes; implements a systematic way of gathering, analysing, and

interpreting evidence to determine how well student learning matches expectations; and, uses the collected information to inform improvement in student learning. Despite this, assessment of 21st century skills is still in its infancy (Care, Griffin & McGaw, 2018) and one of the weakest points in current efforts to integrate 21st century skills in the school curricula (Gordon et al., 2009). In fact, Tan, Choo, Kang, and Liem, (2017) were very categorical with the remark that there is no assessment of 21st century skills in widespread use yet, and it is one of the major challenges in the implementation of teaching and learning of these skills.

STATEMENT OF THE PROBLEM

Instructional materials are objects or devices that assist the teachers to present their lessons logically, aid explanations and make learning of subject matter understandable to students during teaching-learning process. Several studies point to the fact that effectiveness of instructional materials in promoting students' academic performance and acquisition of 21st century skills in teaching and learning is indisputable. However, there are general concerns over the extent to which the instructional materials for Plumbing and pipefitting, Blocklaying, bricklaying and concreting and Carpentry and joinery are available and utilized in the teaching, learning and assessment of the 21st century skills. The skills are increasingly recognized as important for employability of TVET college graduates. On the other hand, producing TVET graduates without 21st century skills leads to unemployment. Unfortunately, there is limited research on availability and utilization of instructional materials to facilitate teaching, learning and assessment of needed 21st century skills in the selected trades for this study. It is against this background that the study was carried out to investigate adequacy and utilization of instructional materials of the trades for the teaching, learning and assessment of 21st century skills in Nigerian TVET colleges.

Research Questions

The study was guided by the following research questions:

1. To what extent are instructional materials of Plumbing and Pipefitting available and utilised for the teaching and learning of 21st century skill?
2. To what extent are instructional materials of Bricklaying, Blocklaying and Concreting available and utilised for the teaching and learning of 21st century skill?
3. To what extent are the instructional materials of Carpentry and Joinery available and utilised for the teaching and learning of 21st century skill?

Methodology

The study adopted a mixed research design (quantitative and qualitative) and was carried out in the six geopolitical zones of the country. The population for the study comprised of all Heads of Departments (HOD), Teachers and Students of the trades in all TVET colleges in Nigeria. Purposive sampling technique was used to select 23 Heads of department, 36 teachers and 266 students totalling 325 respondents of Plumbing and pipefitting, 21 Heads of department, 42 teachers and 404 students totalling 467 respondents of Blocklaying, bricklaying and concreting and 20 Heads of department, 32 teachers and 341 students totalling 393 respondents of Carpentry and joinery. The data were collected using questionnaire on "Availability and Utilisation of Instructional Materials for Plumbing and pipefitting (QAUIMPP), Blocklaying, bricklaying and concreting (QAUIMBBC) and Carpentry and joinery" (QAUIMCJ). Each of the questionnaire consisted of five sections. Section I dealt with the respondent's Biodata, Section II categories of respondents, Section III availability of instructional materials, Section IV utilization of the instructional materials while Section V contained open ended question. These items are instructional materials necessary for the effective teaching and learning of Plumbing

and pipefitting, Blocklaying, bricklaying and concreting, and Carpentry and joinery trades as recommended by NBTE (2011) in the curriculum and course specifications for technical College programmes. In section II, respondents answered questions on a modified four-point Likert type scale of Highly Available (HA), Moderately Available (MA), Poorly Available (PA) and Not Available (NA). For questions on the utilization of Instructional materials (section III), a similar four-point Likert-type scale of Highly Utilised (HU), Utilised (U), Poorly Utilised (PU), and Not Utilised (NU) (section IV) representing values of 4, 3, 2 and 1 respectively was employed. The Cronbach Alpha reliability coefficients of the scales were 0.87 and 0.80 and 0.82 for QAUIMPP, QAUIMBBC and QAUIMCJ respectively. An instructional material was considered adequate or not adequate if the mean value of the responses is equal to or greater than 2.50 on the availability of the instructional material. Similarly, an instructional material was considered utilised or not utilised if the mean value of the responses is equal to or greater than 2.50 on the utilisation of the material.

Results

Research Question 1: To what extent are the following Instructional materials of Plumbing and Pipefitting available and utilised for teaching and learning of 21st century skills

Table 1a: Availability of Instructional Materials of Plumbing and Pipefitting for the teaching and learning of 21st century skills

S/N	Instructional Materials	HA(%)	MA(%)	PA(%)	NA(%)	Mean	SD	Decision
1	Drilling machines	59 (18.2)	95 (29.2)	95 (29.2)	76 (23.4)	2.42	1.03	Not Adequate
2	Cutting machines	52(16.0)	84(25.8)	86(26.5)	103(31.7)	2.26	1.07	Not Adequate
3	Welding equipment	23 (7.1)	60 (18.5)	192 (59.1)	50 (15.4)	2.17	.77	Not Adequate
4	Vices	10 (3.1)	56 (17.2)	197(60.6)	62 (19.1)	2.04	.69	Not Adequate
5	Pipes	10 (3.1)	40 (12.3)	202 (62.2)	73 (22.5)	1.96	.68	Not Adequate
6	Bench Shears	80 (24.6)	110 (33.8)	90 (27.7)	45 (13.8)	2.50	.99	Adequate
7	Bending machines	42 (12.9)	115 (35.4)	126 (38.8)	42 (12.9)	2.50	.87	Adequate
8	Sharing machines	64 (19.7)	70 (21.5)	158 (48.6)	33 (10.2)	2.51	.92	Adequate
9	Shilling rods	161 (49.5)	68 (20.9)	80 (24.6)	16 (4.9)	3.15	.95	Adequate
10	Measuring tools	77 (23.7)	45 (13.8)	139 (42.8)	64 (19.7)	2.42	1.05	Not Adequate
11	Trowels	14 (4.3)	73 (22.5)	179 (55.1)	59 (18.2)	2.13	.75	Not Adequate
12	Pliers.	17 (5.2)	73 (22.5)	172 (52.9)	63 (19.4)	2.14	.78	Not Adequate

Legend: Highly Available (HA), Moderately Available (MA), Poorly Available (PA) and Not Available (NA)

Table 1a shows that only four instructional materials (Bench Shears, Bending machines, Sharing machines and Shilling rods) representing 33.3% of the total material requirements were adequate using the bench mark mean of 2.50 while the remaining eight representing 66.6% of the total materials requirements were not adequate.

Table 1b: Utilization of Instructional Materials of Plumbing and Pipefitting for the teaching and learning of 21st century skills

S/N	21st Century Skills	HU (%)	MU(%)	PU (%)	NU(%)	Mean	SD	Decision
1.	Communication	13 (4.0)	33 (10.2)	190(58.5)	89(27.4)	1.91	.72	Not Utilised
2.	Leadership	11 (3.4)	46 (14.2)	128 (39.4)	140 (43.1)	1.78	.81	Not Utilised
3.	Problem solving	17 (5.2)	59 (18.2)	104 (32.0)	145 (44.6)	1.84	.90	Not Utilised

S/N	21st Century Skills	HU (%)	MU(%)	PU (%)	NU(%)	Mean	SD	Decision
4.	Critical thinking	14 (4.3)	49 (15.1)	114 (35.1)	148 (45.5)	1.78	.85	Not Utilised
5.	Teamwork	14 (4.3)	71 (21.8)	100 (30.8)	140 (43.1)	1.87	.89	Not Utilised
6.	Work Ethic	16 (4.9)	60 (18.5)	188 (57.8)	61 (18.8)	2.10	.75	Not Utilised
7.	Flexibility	15 (4.6)	75 (23.1)	181 (55.7)	54 (16.6)	2.16	.74	Not Utilised
8.	Interpersonal	16 (4.9)	65 (20.0)	190 (58.5)	54 (16.6)	2.13	.74	Not Utilised
9.	Collaboration	29 (8.9)	80 (24.6)	165 (50.8)	51 (15.7)	2.27	.83	Not Utilised
10.	Creative thinking	15 (4.6)	44 (13.5)	210 (64.6)	56 (17.2)	2.06	.70	Not Utilised
11.	Analysis	19 (5.8)	82 (25.2)	178 (54.8)	46 (14.2)	2.23	.76	Not Utilised
12.	Professional attitude	24(7.4)	34 (10.5)	186 (57.2)	81 (24.9)	2.00	.80	Not Utilised
13.	Career	19 (5.8)	66 (20.3)	168 (51.7)	72 (22.2)	2.10	.80	Not Utilised
14.	Digital literacy	55 (16.9)	79 (24.3)	146 (44.9)	45 (13.8)	2.44	.93	Not Utilised
15.	Social responsibility	22 (6.8)	58 (17.8)	171 (52.6)	74 (22.8)	2.09	.81	Not Utilised

Legend: Highly Utilised (HU), Utilised (U), Poorly Utilised (PU), and Not Utilised (NU)

Table 1b shows that the instructional materials for Plumbing and Pipefitting were not utilized for the teaching and learning of the 21st century skills using the bench mark mean of 2.50.

Research Question 2: To what extent are the instructional materials of Bricklaying, Blocklaying and Concreting available and utilised for the teaching of the 21st century skills?

Table 2a: Availability of Instructional Materials of Bricklaying, Blocklaying and Concreting for the teaching and learning of 21st century skills

S/N	Instructional Materials	HA (%)	MA (%)	PA (%)	NA (%)	Mean	SD	Decision
1	Compression Testing Machine	45 (9.6)	159 (34.0)	36 (7.7)	227 (48.6)	2.0	1.1	Not Adequate
2	Cylinders	47 (10.1)	82 (17.6)	81 (17.3)	257 (55.0)	1.8	1.0	Not Adequate
3	Apparati	43 (9.2)	93 (19.9)	69 (14.8)	260 (56.1)	1.8	1.0	Not Adequate
4	Moulds	145 (31.0)	122 (26.1)	50 (10.7)	150 (32.1)	2.7	1.2	Adequate
5	Specific gravity	67 (14.3)	108 (23.1)	68 (14.6)	224 (48.0)	2.0	1.1	Not Adequate
6	Attenberg Limit	51 (10.9)	126 (27.0)	39 (8.4)	251 (53.7)	2.0	1.1	Not Adequate
7	Moisture Content	72 (15.4)	138 (29.6)	67 (14.3)	190 (40.7)	2.2	1.1	Not Adequate

8	Soil Hydrometer	85 (18.2)	100 (21.4)	38 (8.1)	244 (52.2)	2.1	1.2	Not Adequate
9	CBR Machine	70 (15.0)	89 (19.1)	92 (19.7)	216 (46.3)	2.0	1.1	Not Adequate
10	British Standard Sieves	101 (21.6)	168 (36.0)	40 (8.6)	158 (33.8)	2.5	1.2	Adequate

Legend: Highly Available (HA), Moderately Available (MA), Poorly Available (PA) and Not Available (NA)

Table 2a shows that only two instructional materials (Moulds and British Standard Sieves) representing 20% of the total material requirements were adequate using the bench mark mean of 2.50 while the remaining eight representing 80% of the total material requirements were not adequate.

Table 2b: Utilisation of Instructional Materials of Bricklaying, Blocklaying and Concreting for the teaching and learning of 21st century skills

S/N	21st Century Skills	HU (%)	MU (%)	PU (%)	NU (%)	Mean	SD	Decision
1.	Communication	41 (8.8)	47 (10.1)	201 (43.0)	178 (38.1)	1.9	1.0	Not Utilised
2.	Leadership	77 (16.5)	35 (7.5)	168 (36.0)	187 (40.0)	2.0	1.0	Not Utilised
3.	Problem solving	70 (15.0)	49 (10.5)	223 (47.8)	125 (26.8)	2.1	1.0	Not Utilised
4.	Critical thinking	89 (19.1)	78 (16.7)	178 (38.1)	122 (26.1)	2.3	1.1	Not Utilised
5.	Teamwork	96 (20.6)	55 (11.8)	143 (30.6)	173 (37.0)	2.2	1.1	Not Utilised
6.	Work Ethic	114 (24.4)	46 (9.9)	130 (27.8)	177 (37.9)	2.2	1.2	Not Utilised
7.	Flexibility	112 (24.0)	36 (7.7)	196 (42.0)	123 (26.3)	2.3	1.1	Not Utilised
8.	Interpersonal	111 (23.8)	46 (9.9)	198 (42.4)	112 (24.0)	2.3	1.1	Not Utilised
9.	Collaboration	93 (19.9)	68 (14.6)	174 (37.3)	132 (28.3)	2.3	1.1	Not Utilised
10.	Creative thinking	110 (23.6)	62 (13.3)	142 (30.4)	153 (32.8)	2.3	1.2	Not Utilised
11.	Analysis	118 (25.3)	135 (28.9)	107 (22.9)	107 (22.9)	2.6	1.1	Utilised
12.	Professional attitude	73 (15.6)	117 (25.1)	110 (23.6)	167 (35.8)	2.2	1.1	Not Utilised
13.	Career	93 (19.9)	87 (18.6)	135 (28.9)	152 (32.5)	2.3	1.1	Not Utilised
14.	Digital literacy	157 (33.6)	99 (21.2)	119 (25.5)	92 (19.7)	2.7	1.1	Utilised
15.	Social responsibility	73 (15.6)	162 (34.7)	136 (29.1)	96 (20.6)	2.5	1.0	Utilised

Legend: Highly Utilised (HU), Utilised (U), Poorly Utilised (PU), and Not Utilised (NU)

Table 2b shows that the instructional materials of BBC were utilised for teaching and learning of only three 21st century skills (Analysis, Digital literacy and Social responsibility) representing 20%.

Research question 3: To what extent are the instructional materials for Carpentry and Joinery available and utilised for the teaching of the 21st century skills?

Table 3a: Availability of Instructional Materials Carpentry and Joinery for the teaching of the 21st century skills

S/N	Instructional Materials	HA (%)	MA (%)	PA (%)	NA (%)	Mean	SD	Decision
1	Paint brushes	78(19.8)	154(39.2)	70 (17.8)	91 (23.2)	2.5	1.0	Adequate
2	Marking gauge	80(20.4)	191(48.6)	84 (21.4)	38 (9.7)	2.8	.0.8	Adequate
3	Mortise gauge	51(13.0)	214 (54.5)	86 (21.9)	42 (10.7)	2.7	.0..8	Adequate
4	Squares	113(28.8)	177(45.0)	74 (18.8)	29 (7.4)	2.9	.0.8	Adequate
5	Planes	106(27.0)	172 (43.8)	91 (23.2)	24 (6.1)	2.9	.0,8	Adequate
6	Saws	121(30.8)	205 (52.2)	48 (12.2)	19 (4.8)	3.0	.0.7	Adequate
7	Chisels	126(52.1)	185 (47.1)	51 (13.0)	31 (7.9)	3.0	.0.8	Adequate
8	Counters ink	31(7.9)	118(30.0)	109 (27.7)	135 (34.4)	2.1	.0,9	Not Adequate
9	Rachet braces	30(7.6)	170 (43.3)	113 (28.8)	80 (20.4)	2.3	.0.8	Not Adequate
10	Hammers	138(35.1)	171 (43.5)	46 (11.7)	38 (9.7)	3.0	.0.9	Adequate
11	Cramps	117(29.8)	160(40.7	83 (21.1)	33 (8.4)	2.9	.0.9	Adequate

Legend: Highly Available (HA), Moderately Available (MA), Poorly Availabl e (PA) and Not Available (NA)

Table 3a shows that 80% of instructional materials of Carpentry and Joinery were adequate for the teaching and learning of the 21st Century Skill using the mean value of 2.5, while two of the instructional materials representing 20%, and were not adequate for the teaching and learning of Carpentry and Joinery (CJ).

Table 3b: Utilisation of Instructional Materials of Carpentry and Joinery for the teaching and learning of 21st Century Skills

S/N	21st Century Skills?	HU (%)	MU (%)	PU (%)	NU (%)	Mean	SD	Decision
1.	Communication	17 (4.3)	95 (24.2)	127 (32.3)	154(39.2)	1.9	0..8	Not Utilised

S/N	21st Century Skills?	HU (%)	MU (%)	PU (%)	NU (%)	Mean	SD	Decision
2.	Leadership	7 (1.8)	113 (28.8)	109 (27.7)	164 (41.7)	1.9	0..8	Not Utilised
3.	Problem solving	15 (3.8)	81 (20.6)	194 (49.4)	103 (26.2)	2.0	.0.7	Not Utilised
4.	Critical thinking	37 (9.4)	56 (14.2)	175 (44.5)	125 (31.8)	2.0	.0.9	Not Utilised
5.	Teamwork	23 (5.9)	52 (13.2)	172 (23.8)	145 (37.2)	1.8	.0.8	Not Utilised
6.	Work Ethic	19 (4.5)	115 (29.3)	131 (33.3)	128 (32.6)	2.0	.0.9	Not Utilised
7.	Flexibility	41 (10.4)	87 (22.1)	142 (36.1)	123 (31.3)	2.1	.0.9	Not Utilised
8.	Interpersonal	51 (13.0)	58 (14.8)	214 (54.5)	70 (17.8)	2.2	.0.8	Not Utilised
9.	Collaboration	15 (3.8(	98 (24.9)	173(44.0)	107 (27.2)	2.0	.0.8	Not Utilised
10.	Creative thinking	21 (5.3)	71 (18.1)	173 (44.0)	128 (32.6)	1.9	.0.8	Not Utilised
11.	Analysis	24 (6.1)	131 (33.3)	122 (31.0)	116 (29.5)	2.1	.0.9	Not Utilised
12.	Professional attitude	12 (3.1)	91 (23.2)	129 (32.8)	161 (41.0)	1.8	.0.8	Not Utilised
13.	Career	27 (6.9)	96 (24.4)	143 (36.4)	127 (32.3)	2.0	.0.9	Not Utilised
14.	Digital literacy	38 (9.7)	113 (28.8)	205 (52.2)	37 (9.4)	2.3	.0.7	Not Utilised
15.	Social responsibility	28 (6.6)	112 (28.5)	161 (21.0)	94 (23.0)	2.1	.0.8	Not Utilised

Legend: Highly Utilised (HU), Utilised (U), Poorly Utilised (PU), and Not Utilised (NU)

Table 3b shows that the instructional materials for Carpentry and Joinery were not utilized for the teaching and learning of the 21st century skills using the bench mark mean of 2.50.

Discussion

The findings revealed that most of the instructional materials of Plumbing and Pipefitting, Carpentry and Joinery and Blocklaying, Bricklaying and Concreting were not adequate for the teaching and learning of the 21st century skills in TVET colleges. This could be due to poor funding of the sector. This was in agreement some of the heads section, teachers and students of the selected trade who remarked that “the materials for teaching and learning of the trades were not adequate”. Inadequate instruction materials could lead to poor skills development

of students in the trades. This assertion was supported by Maduewesi (2010) who stated that poor achievements and skills development of students are partly caused by inadequacies of instructional materials. Similarly, Mapaderun (2002) added that adequacy of facilities; equipment and supplies in schools promote effective teaching and learning activities.

The Utilisation of instructional materials for teaching and learning is an important aspect of training programmes in TVET colleges. However, the findings of this study revealed that the instructional materials of Plumbing and Pipefitting, Carpentry and Joinery and Blocklaying, Bricklaying and Concreting were not effectively utilised for the teaching and learning which could mitigate the acquisition and assessment of 21st century skills in TVET colleges. This assertion agrees with Ugwuanyi (2013) and Olumorin, et al. (2010) who observed that instructional materials are necessary in teaching and learning of construction trades especially now that skills required for employment in the 21st century are constantly evolving. The Head of Department of Plumbing and Pipefitting, Government Technical College, Enugu, Nigeria reported that "21st century skills is entirely a new concept… therefore, teachers certainly will not be able to utilise instructional materials at their disposal for the teaching and learning of the skills unless they are properly trained". This has serious implication on the assessment of the skills. If the teachers do not have sound knowledge of 21st century skills, they will not be able to effectively utilize the available instructional materials in the various trades for teaching, learning and assessment of the skills. Pellegrino (2014) remarked that teacher's classroom quizzes, mid-term, or final exams, nationally and internationally-administered standardized tests, which are used to ascertain students' knowledge and skills of a subject have become an integral part of the educational landscape particularly the teaching and learning process. Perhaps, Guskey (2003) was more assertive in the finding that the best classroom assessments also serve as meaningful

sources of information for teachers, helping them identify what they need to teach and the instructional materials they need for the instructions.

Ineffective utilisation of instructional learning materials for the teaching and learning of the 21st century skills as found by this study was corroborated by Care, Griffin & McGaw (2018) who stated that assessment of 21st century skills is still in its infancy and this may account for the inability of teachers to effectively utilise the instructional materials for teaching and learning of the skills. In a similar vein, Tan, Choo, Kang, & Liem (2017) argued that assessment of 21st century skills is not yet common teachers and educators and this is one of the major challenges in the implementation of teaching and learning of these skills.

Conclusion

The study showed that most of the instructional materials for Plumbing and pipefitting, Carpentry and joinery and Blocklaying, bricklaying and concreting were not adequate and also not effectively utilised for the teaching, learning and assessment of the 21st century skills in TVET colleges. In some cases where the materials were adequate, they were still not effectively utilized for the teaching, learning and assessment of the 21st century skills.

Recommendations

To improve the teaching, learning and assessment of the 21st century skills in TVET colleges, the following recommendations were made:

1. Government and relevant stakeholders should provide adequate instructional materials for teaching and learning of 21st century skills in TVET Colleges.
2. Trainings of teachers on for 21st century skills should be carried out.
3. Efforts should be made by teachers to utilise instructional materials for the teaching and learning of 21st century skills in various vocational trades in TVET colleges.

4. Government and relevant stakeholders should strengthen monitoring and evaluation mechanism for ensuring effective utilization of the materials.

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