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Appraisal of the Relevance of Polytechnic Higher National Diploma Building Technology Curriculum for Effective Occupational Skills Acquisition in Nigeria

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Abstract Polytechnics are established for the production of technical manpower in a variety of technical and professional disciplines to make a country self-sufficient through efficient man power planning, optimum utilization and management of resources. Building construction programme is a major supplier of labour to the sectors of the economy, prominently the construction industries. However, the Nigerian graduates of this programme have been criticized for not meeting the requirements of the construction industries regarding attainment of effective occupational competences. This study therefore, analyzed the content of Higher National Diploma Building Technology curriculum to discover if the cognitive, psychomotor, and affective competences captured in the curriculum were sufficient to support successful acquisition of occupational competencies. The researchers used content analysis to generate and analyze data from the said curriculum through descriptive statistics. The findings of the study revealed that the cognitive competencies dominate the entire curriculum with 88.87%, followed by psychomotor competencies with 9.68% and lastly affective competencies with 6.45%. We concluded that the curriculum is highly lopsided having acute shortage of psychomotor and affective competencies. The authors drew the conclusions based on the analysis of data generated from the curriculum, and therefore didn't extend to include the perceptions of experts in academia and industry on the sufficiency or otherwise of occupational competences portrayed by the curriculum. The findings provide curriculum developers with information regarding the adequacy and/or inadequacy of occupational competences as contained in the Building Technology curriculum. This is important in the event of curriculum renewal towards balanced curriculum that has appropriate representation of all the spheres of occupational competences. This study is the first to analyze the content of any curriculum at Higher National Diploma level in Nigerian polytechnic to identify the satisfactoriness of the occupational competences.

Keywords Technical Vocational Education and Training, Higher National Diploma, Building Technology Curriculum, Occupational Competences

1. Introduction

Construction industry the world over, is acclaimed to be one of the biggest employers of labour as it comprises many fragmented units including contractors, clients, consultants, construction inputs, equipment outfit etc. The Nigerian construction industry occupies an important position among the various sectors of the economy, since it directly or indirectly affects every individual. For instance, the industry plays a vital role in contributing to the Gross Domestic Products (GDP), Gross National Products (GNP), the Gross Fixed Capital Formation (GFCF), employment generation and provision of social amenities. Awere, Edu-Buandoh, Dadzie, and Aboagye, (2016) cited Egmond and Erkelens (2007) that practical and technical know-how of employees is among the vital characteristics that resulted to the success of several construction firms in Africa. The 'practical and technical know-how' are referred to as 'occupational competences', and are set of identified behaviors, knowledge, abilities that directly or positively impact the success of the graduates in the industries (Mukhtar, 2014). These competences are provided to the

graduates in the tertiary institutions through the curriculum.

In Nigeria, the Higher National Diploma course in Building Technology is designed to develop diplomats for an active role in the building industry, such as supervising and managing efficiently the construction of buildings of all sizes from setting out to final completion, understanding and interpreting all kinds of projects drawings, designing and preparing working structural drawings for building structures, among others. The Nigerian polytechnics programme in building technology develops middle level technical manpower mostly for the construction industry. As a consequence, with such a critical responsibility in the construction sector of the economy, the building technology curricula ought to mirror the requirements of the construction industry (Nsiah-Gyabaah, 2007). This study therefore, analyzed the content of HND building technology curriculum in the Nigerian polytechnics. The study specifically assesses the building technology knowledge, skills and attitudes (KSA) in the curriculum to have an insight if it really supports effective acquisition of occupational competencies needed in Nigerian construction industries. The paper argues that this is essential considering the importance of occupational competences in the functional growth and development of construction industries. The occupational competences are job requirements of industries and are also the bedrock of any technology curriculum.

The authors carried out the analysis on the Higher National Diploma Building Technology curriculum of the polytechnic, and specifically examined the document against the three domains of learning developed by Bloom (1956), i.e., cognitive, psychomotor and affective domains, as well as their associated levels. The study determines the extent to which these three domains of learning are covered in the four professional courses of the curriculum. The paper proceeds with literature review highlighting the historical development of TVET in Nigeria, the emergence of polytechnics in Nigeria, the birth of Higher National Diploma Building Technology programme, and basic competencies required by the Building Technology graduates for effective functioning in construction industries. Subsequently, the methodology of the study and the results of the analysis are discussed. The paper concludes with the integrated approach of presenting the discussion and implications of the study.

2. Literature Review

This study discussed literature related for the accomplishment of the research objective under the following: historical development of TVET in Nigeria, emergence of polytechnic education in Nigeria, the building technology programme in Nigerian polytechnics, and basic competencies required by HND building technology graduates

2.1. Historical Development of TVET in Nigeria

Technical education existed long before the establishment of formal schools in Nigeria. People then learnt how to earn a living by becoming experts in the production of goods and services. Young men acquired the rudiments of an occupation from their parents or expert craftsmen to whom they apprenticed. Generations received technical expertise and passed it from one to another, and such remained a part of the people's culture. Long before the introduction of formal education system, Nigerian people had the art of making spears for hunting, the art of making fire, horse saddles, chairs, pots etc. (Tsiga, 2004). Osuala (1987) confirmed this view that before the nineteenth century; the people of Nigeria had mined iron, gold, salt, and other minerals.

The British colonial government began to formalize technical education in Nigeria with the cargo services provided by the United Africa Company Limited and John Holt Limited. Among the people trained and employed by these 2 companies were few clerks, mechanics and craftsmen. Afterwards, the British government realized that the dockyards provided a limited amount of technical training, and therefore recommended for the introduction of formal technical training to enable more Nigerians take up skilled jobs (Osuala, 1987). Consequently, the British introduced technical education courses in Bonny Boys High School in 1900 and Hope Waddle Training Institute, Calabar, as well as Nasarawa School in 1909. In 1946, the British government saw the need for a more formalized and well organized framework for teaching and training a large number of young men and women in a functional and production based skills that would lead to providing the services required by the society.

At independence, Nigeria government and the general society viewed technical education and manual work with disdain and reserved mainly for school dropouts (Ajeyelemi, 1990). Generally, the government did not provide enough funds for the development of technical education which resulted in the critical shortage of technical manpower for the economy. To redress the situation, the government established a National Board for Technical Education (NBTE) in 1977 and the funding of technical education improved considerably. Furthermore, technical education was particularly given prominent place in the National Policy on Education (1977) which was later revised in 1981 to emphasized technical education in various stages of education system (Tsiga, 2004). The policy document defines technical education as "that form of education obtainable at technical colleges, meant to prepare individuals to acquire practical skills and scientific knowledge and attitude required as craftsmen and technicians at sub-professional levels. The general objectives of technical education as contained in the policy document are:

a. To diversify its curriculum to cater for the differences in talents, opportunities and roles possessed by or open to students after their secondary school course.

b. To raise a generation of people who can think for themselves, respect the view and feelings of others, show respect for the dignity of labour and appreciate those values specified under our broad national aims as good citizens.

2.2. Emergence of Polytechnic Education in Nigeria

Nigeria established its first polytechnic in 1947 at Yaba. However, the country remained with no higher technical institution up to 1960. This was because the government moved Yaba higher college to Ibadan in 1948 and its students became the pioneer students of the newly established university of Ibadan. As a result, the Ashby commission in 1960 recommended for the production of needed high level technical manpower and the upgrading by further education of employed Nigerian workers. These recommendations led to a boost in technology education which led to the establishment of polytechnics as well as engineering education programmes in the universities. The polytechnics are established to play a vital role in the educational, scientific and technological progress of Nigeria through training and producing technical manpower necessary for the execution of the National Development Plans, Goals and Strategies. The boost in the increase in number of polytechnic in Nigeria came during the preparation for the third national plan, 1975–1980.

The federal government also identified the acute shortage of technical manpower as a major constraint toward the execution of the second development plan. Responding to this, the government in 1972 established the then National Science and Technology Development Agency which later metamorphosed to federal ministry of science and technology. It then set up a working committee on scientific and technical manpower and science education, which recommended for the establishment of a National Board for Technical Education. The Board has the duties of accreditation of academic programmes, monitoring, and supervision of both public and private polytechnics, technical colleges in Nigeria. There are now101 approved tertiary technical institutions, 130 technical colleges under the purview of the board with different types of ownership summarized in table below:

Table 1. Number, Type and Ownership of Polytechnics, Monotechnics and Technical Colleges in Nigeria

Institution	Ownership			Total
Type	Federal	State	Private	
Polytechnics	21	38	15	74
Monotechnics	23	2	2	27
Colleges of Agric.	17	19	-	36
Colleges of health tech	9	40	1	50
Other specialized inst.	13	-	3	16
IEls and VEls	-	-	71	71
Technical colleges	19	110	3	130

Source: National Board for Technical Education (2011)

2.3. The Building Technology Programme in Nigerian Polytechnics

Building is defined as a permanent or temporary structure, enclosed within exterior walls and a roof, and including all attached apparatus, equipment and fixtures that cannot be removed without cutting in ceiling, floor or walls. The aim of building is for habitation. Building technology on the other hand, is the application of the fundamentals of technology as well as research in technology for the next generation of buildings (Umoh and Nkuma, 2003). Areas of focus in building technology include structures, energy and lighting in buildings, air quality, and control, and building simulations. Building technology as a field of study is a core Department in school or college of environmental studies of every polytechnic. The Higher National Diploma course in building technology is designed to develop diplomats for an active role in the building with emphasis on production. The objectives of the programme include:

a. Supervise and manage efficiently the construction of buildings of all sizes from setting out to final completion.
b. Understand and interpret all kinds of projects drawings – architectural, structural, services to be able to implement them on site.
c. Design and prepare working structural drawing for medium size building structures.
d. Prepare realistic estimates in terms of cost, materials and labour for all building works including maintenance works.
e. Appreciate and determine quality of materials to be used for construction through appropriate tests in line with relevant codes of practice.
f. Carry out surveys of various kinds on existing buildings and prepare a schedule of dilapidation and repairs.
g. Prepare a cost effective, post-tender report for all sizes of building contracts for competitive building (NBTE, 2011).

Successful attainment of these objectives of building technology programme as outlined above will lead to the production of competent building technology graduates that will serve effectively in the Nigerian construction industry. According to Clifford (1999), the construction industry is one of the biggest employers of labour responsible for constructing, repairing, altering and maintaining a wide range of different building structures. The basic value and the importance of the construction industry to the national development cannot be over emphasized. It occupies an important position among the various sectors of the economy because it directly or indirectly affects individuals in Nigeria. It also plays a vital role in contributing to the Gross Domestic Products (GDP), Gross National Products (GNP), the Gross Fixed Capital Formation (GFCF), employment generation, and provision

of amenities (Tallib, 2004).

However, several experts consider functional growth and development of construction industry as a function of effective attainment of occupational competencies in building technology programmes by the students. These competencies include cognitive, affective and psychomotor skills which cannot be attained without an appropriately planned and effectively implemented curriculum.

2.4. Basic Competencies Required by HND Building Technology Graduates

Competency is a functionally linked complex of knowledge, skills and attitudes that enable successful task performance and problem solving (Wiek, Withycombe and Redman, 2011). The US Department of labour defined competency as 'a cluster of related knowledge, skills and abilities that affects a major part of one's job (a role or responsibility), that correlates with performance on the job, that can be measured against well-accepted standards, and that can be improved through training, development, and experience'. Each trade or a particular task has a requisite of explicit set of competencies to carry out it proficiently, and the persons who would execute the task ought to be conversant with those competencies. A remarkable feature of a competence is that it centers not on what an individual can do but on what an individual can learn. This forward looking approach makes it quite popular amongst training providers and recruitment experts. Figure 1 shows the elements of a competency.

From the figure, one can deduce that competency in performing any job requires firstly the acquisition of theoretical knowledge of the concepts and principles behind the job. Secondly, it requires one to acquire the manual dexterity or physical manipulation of hands and muscles in accomplishing the task. This is also referred to as fine motor skill, the coordination of small muscles, in movements—usually involving the synchronization of hands and fingers—with the eyes. Thirdly, one needs to acquire and exhibit affective values or attitudes which involves our feelings, emotions, and mind-set. This element of competency includes the manner we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, viewpoint and thoughts. Lastly, a person needs to attain a certain proficiency level in executing the job. The knowledge, skills and attributes (KSA) are the major elements of competence of any occupation, and are usually reflected in the training programmes of that occupation.

The knowledge or cognitive elements of competence in building technology are the mental competencies required to successfully learn educational subjects. Fundamental cognitive competences must work well to efficiently facilitate a building technology graduate to read, think, prioritize, understand, plan, remember and solve problems. For instance, selecting and applying appropriate information of analyzing problems is a cognitive competence. Cognitive competences are inevitably related to both psychomotor skills and attitudes in that they are learnt first theoretically before applied practically in the workshop, laboratory or workplaces.

Psychomotor skills on the other hand are skills in which the processes involved are primarily muscular or are described in granular or muscular terms. These skills enable graduates of building technology to use standard and specialists laboratory instruments to conduct experiments and report on them, design, construct, test and evaluate building structures. Psychomotor skills are the physical abilities required by graduates for smooth transition from school to work. Developing psychomotor skills necessitates practice that can be measured in terms of speed, precision, distance, procedure or techniques in executing a particular task. Cognitive and psychomotor skills are closely related to affective skills as many research findings indicated that good affective skills are seen as more vital for job survival than cognitive or psychomotor skills.

Affective competences are described as non-technical abilities which include employability skills, dependability, a positive attitude and traits. Affective objectives typically target the awareness and growth in attitudes, emotions and feelings. Affective competences are ways of feelings and general behavior that reflect an individual's values, emotions, motives and interest. All the aforementioned competences are usually referred to as occupational competences/skills and are provided to building technology students in the polytechnics through the curriculum.

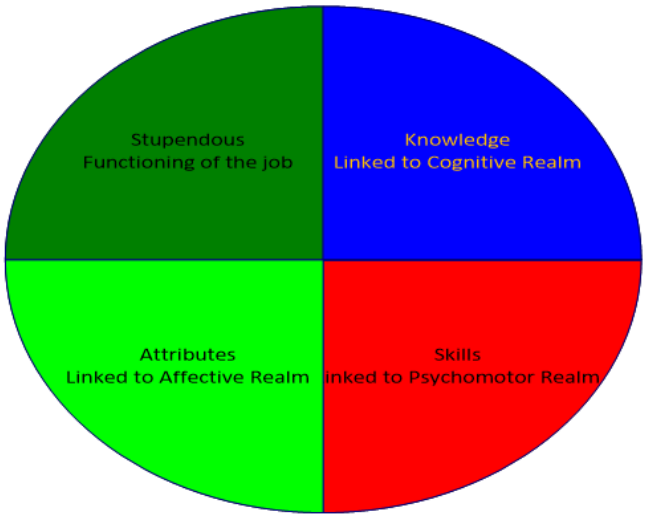

Figure 1. Elements of a competency

Kofoworala (2003) defined occupational competences as an integrated demonstration of a cluster of related knowledge, skills and attitudes that are observable and measurable necessary to perform job independently at a prescribed proficiency level. These occupational competences are the job requirements necessary for employment in a variety of building construction industries for social, economic, vocational, and interpersonal development. The benefits of investing in occupational competences/skills cannot be underestimated. For instance, it accelerates the growth of investment and productivity and translating those gains into higher income and sustainable job creation, it minimizes the displacement cost of technological change by preparing workers for alternative employment, it supports national and international commitment to expanding the coverage of good quality basic education as a right and an indispensable foundation for vocational training, life-long learning, and employability skills crucial for work in industries (Mukhtar, 2014). The process of competency development does not end in training institutions, but is a lifelong series of doing and reflecting. Occupational competencies are the characteristics that allow one to perform the duties of their occupation. Kumbo (2000) asserts that the crises and issues related to industrial competencies have speeded up the pace of change in the economies and societies. Employers are increasingly concerned with what workers know, understand and are able to do in practice, rather than focusing on formal qualifications.

Studies in Nigeria however, indicated that many building technology polytechnic graduates have lamented the high level of unemployment in construction industries, and have agreed that their prospects have worsened (Onwuka, 2009; Asumbe, 2002). Despite the progress made in extending access to polytechnic education to various parts of the country, the percentage of graduates' unemployment has assumed alarming proportion. Tallib (2004) supported this finding that many young people entering the workforce are not well prepared to meet the demand of a dynamic work environment. Furthermore, Muhktar (2019) declared that 67% of TVE graduates from the polytechnics do not possess the requisite skills for employment or be self-employed for sustainable living. This is perhaps that the present curriculum does not reflect the modern trend because of globalization enhancing the transfer of technology in the various sector of the economy. Due to their training therefore, these graduates are lacking in competences needed to enable them cope with novel approaches of doing things in the construction industries. As a result, occupationally, they are hardly patronized except with additional training. This therefore, implies that polytechnics in Nigeria are reduced to mere suppliers of semi-skilled labour to the job market. Perhaps these problems have emanated due to the insufficient curriculum content that refused to capture the adequate knowledge, skills and attitudes in building technology for effective employment in the construction industries. Consequently, the authors set out to carry out a content analysis of Higher National Diploma building technology curriculum of Nigerian polytechnic to assess the sufficiency or otherwise of the occupational competencies.

3. Objective and Research Question

This study analyzed the content of Higher National Diploma building technology curriculum in the Nigerian polytechnics. The study specifically assesses the building technology knowledge, skills and attitudes (KSA) in the curriculum to have an insight if it really supports effective acquisition of occupational competencies needed in Nigerian construction industries. The research question that informed the content analysis therefore, was whether the KSA captured in the curriculum were sufficient to support

effective acquisition of occupational competencies needed in Nigerian construction industries.

4. Methodology

4.1. Data Collection

Content analysis is a research means employed to establish the presence of specific words, themes, or concepts as contained in some particular qualitative data. Via content analysis, researchers can quantify and examine the existence, importance and relationships of certain words, themes, or concepts. Researchers can then draw deductions vis-à-vis the meaning within the texts. Presently researchers globally used two general types of content analysis: conceptual analysis and relational analysis. Conceptual analysis determines the existence and frequency of concepts in a text, while relational analysis develops the conceptual analysis further by examining the relationships among concepts in a text. Each type of analysis may lead to different results, conclusions, interpretations and meanings.

In this study, the researchers used conceptual content analysis to generate data from the HND building technology curriculum currently used uniformly in all the Nigerian polytechnics offering building technology programme. The National Board for Technical Education (NBTE) produced this curriculum and made it available to the polytechnics as a benchmark minimum academic standard (BMAS) to set out standards for HND building technology graduates in Nigeria. The BMAS is a 144-page document, and has provided details of the various courses taken by the students in the polytechnics. The document contains information on the programme title, awarding certificate, goals and objectives of the programme, entry requirements, nature and structure of the curriculum, accreditation procedures, conditions for the award of HND, guidance noted for teachers, and the list of courses. The curriculum contains 3 components including (i) General studies courses – which consist courses in Arts and Humanities, and shall account for not more than 15% of the total contact hours of the programme; (ii) Foundation courses – consist courses in Mathematics, Principles of Architecture and Management, Law etc, and shall not account for more than 15% of the total works covered in the syllabus; (iii) Professional courses – consists of Construction Technology, Building Services and Maintenance, Estimating and Price Analysis, etc. These account for between 60-70% of the total contact hours.

Because this study targeted the sufficiency of cognitive, psychomotor and affective competences in the curriculum, only professional courses are included in the study. These courses give the students the theory and practical skills needed to practice in the industries, and include Building Construction Technology (BCT), Building Services and Maintenance (BSM), Structural Design and Detailing (SDD), and Estimating and Price Analysis (EPA). The researchers decided not include other components of the curriculum, i.e., General studies and Foundation courses, because their contents are outside the scope of this study. Furthermore, the curriculum provided vital information on various topics covered under each course, general and specific learning outcomes expected of students, teachers activities as well as resources for teaching activities. The descriptions of what students are expected to learn are clearly stated, and they are considered as useful indicators of teaching/learning materials in a HND building technology class. Meanwhile, the descriptions of the 4 courses analyzed by this study, even though featured specific learning outcomes expected for students, might not be wholly representative of what the lecturers assessed in the HND building technology students.

4.2. Data Assessment

The question that informed the content analysis was whether the cognitive, psychomotor and affective competences in the HND building technology curriculum were sufficient to support the acquisition of adequate occupational skills needed in the modern day construction industries. It was therefore of interest to analyze the statements of performance objectives, i.e., the mentions of knowledge, skills or attitudes in the 4 identified professional courses, and represent the cognitive, psychomotor and affective domains of learning. In the data assessment, these are labeled as ‘Parent Nodes’. According to Bloom (1956), the cognitive node had 6 child nodes, while the psychomotor and affective nodes gave rise to 5 child nodes each. The curriculum was then scrutinized and coded at the child nodes. In the process of coding, the authors gave emphasis and considerations to the objectives of the HND building technology programme. The researchers searched for the following keywords or action verbs in the curriculum for coding.

Table 2. Keywords/Action Verbs Used in Coding

Domains	Levels	Examples of Keywords/Verb Used
Cognitive domain	Evaluation	approves, compares, concludes, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, and summarizes, supports.
	Synthesis	categorizes, combine, compiles, creates, composes, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.
	Analysis	analyzes, breaks down, compares, contrasts, and diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers outlines, relates, selects, and separates
	Application	applies. Changes, computes, constructs, demonstrate, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
	Comprehension	comprehend, converts, depends, distinguishes estimates, explain, extends, interprets paraphrases, predicts rewrites, summarizes, and translates.
	Knowledge	defines describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states,
Psychomotor domain	Naturalization	design, specify, manage, invent, project-manage
	Articulation	construct, solve, combine, coordinate, integrate, adapt, develop, formulate, modify, master
	Precision	demonstrate, complete, shoe, perfect, calibrate, control
	Manipulation	re-create, build, perform, execute, implement
	Imitation	copy, follow, replicate, repeat, adhere
Affective domain	Characterization	act, display, influence, solve, practice
	Organization	build, develop, formulate, defend, modify, relate, priories, reconcile, contrast, arrange, compare
	Valuing	argue, challenge, debate, refute, confront, justify, persuade, criticize
	Responding	react, respond, seek, clarification, interpret, clarity, provide other references and examples, contribute, question, present, cite, become animated or excited, help team, write, perform
	Receiving	ask, listen, focus, attend, take part, discuss, acknowledge, hear, be open to, retain, follow, concentrate, read, do, feel

A statement of performance objective had to clearly and specifically state what students should learn or do as a condition for coding. The researchers obtained and tabulated descriptive statistics as shown in table 3. The parent node column featured the 3 domains of learning as described by Bloom (1956). These are the cognitive, psychomotor and affective domains. The child node column featured the stages or levels in each domain arranged hierarchically from the least complex to the most complex level. The cognitive domain comprises the following levels - knowledge, comprehension, application, analysis, synthesis and evaluation. The psychomotor domain involves - imitation, manipulation, precision, articulation, and naturalization. The affective domain has levels that include - receiving, responding, valuing, organization, and characterization. We used the frequency column to enter the number of performance objective guided by the keywords or the action verbs shown in table 2 above. The frequencies are numerical representations of the parts of data coded as belonging to cognitive, psychomotor or affective domains. The expected occurrence column contained an anticipated appearance of the various levels of the domains. The assumption was that each level of the 3 domains should appear in a course as much as the number of stated general learning outcomes in that course. The researchers reasoned that a single appearance of each level for each general learning outcome should be the minimum expectation for the presence of occupational competence. Consequently, the expected occurrences of each level of the domains for BCT, BSM, SDD, and EPA are 15, 18, 19 and 4 respectively. We expect each domain of learning to be adequately present in the professional courses. The calculation of the percentage within potential content was based on the formula: (Frequency/Expected Occurrence) × 100. This equation provided an idea of how occupational competencies, based on its spread potential, fared in terms of coverage within the curriculum.

5. Results and Findings

The researchers analyzed HND building technology curriculum for its sufficiency in occupational competencies based on the 3 domains of learning: cognitive, psychomotor and affective competencies. The results of the analysis are presented below under the 4 professional courses analyzed.

5.1. Cognitive Competency Content

Figure 2 below shows the rate of recurrences of the 6 levels of cognitive domain of learning in the 4 identified professional courses of building technology curriculum. 'Knowledge' is the least complex level in the domain, and recorded the highest incidences at BSM and BCT with 45 and 41 occurrences respectively, much higher than the

expected occurrences. It also recorded a significant appearances in SDD with 12 incidences and fairly low appearances with 2 occurrences. 'Synthesis' is the second most complex level and recorded second highest occurrences in SDD with 40 incidences, 14 in BSM and recorded no incidence in BCT and EPA. Then comes 'comprehension' as the second most complex level in the cognitive realm, and recorded the third highest occurrences at BCT with 30 incidences much higher than the expected occurrences, as well as 13 and 15 incidences in BSM and SDD courses. However, it was recorded only once in EPA.

'Analysis' comes fourth with 27 incidences in BCT which surpass the expected occurrences, 12 and 7 incidences in BSM and SDD courses. It also recorded fairly low occurrence in EPA as it was mentioned only once. The fifth frequently mentioned level of cognitive domain is the 'application' recorded ten times in SDD, 3 times in BSM, and not mentioned in BCT and EPA. 'Evaluation' is the most complex level in this domain, and therefore recorded the lowest incidences in the curriculum. 'Analysis' appeared only 3 times in SDD, 2 times in BSM, once in BCT, and no mention in EPA.

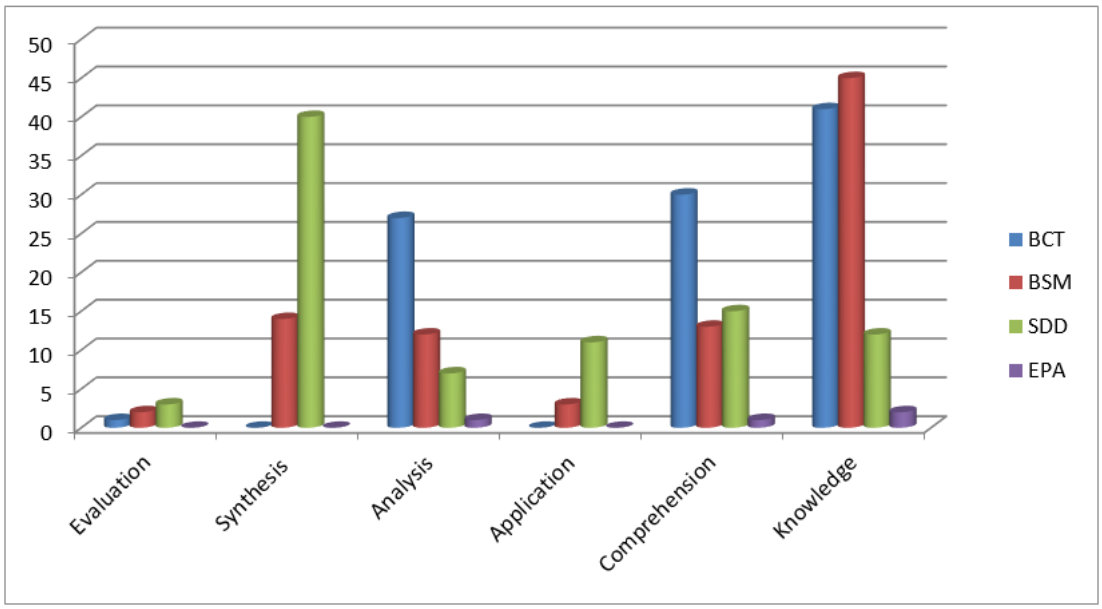

Figure 2. Frequencies of various levels of cognitive domain of learning in the curriculum

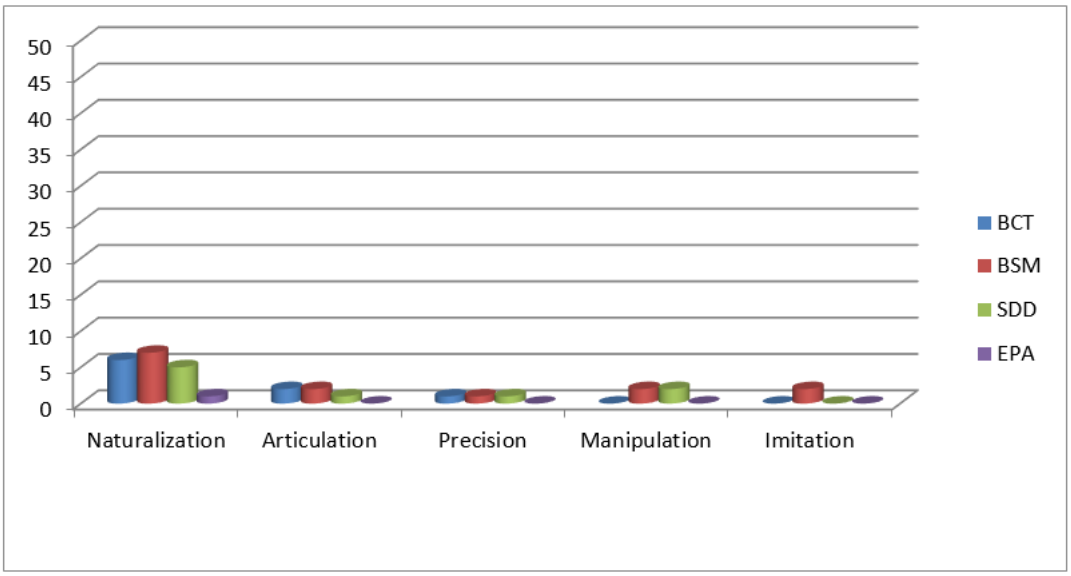

Figure 3. Frequencies of various levels of psychomotor domain of learning in the curriculum

5.2. Psychomotor Competency Content

Figure 3 shows the rate of recurrences of the 5 levels of psychomotor domain of learning in the 4 identified professional courses of building technology curriculum. 'Naturalization' is the most complex level of psychomotor domain and recorded 6, 7 and 5 incidences in BCT, BSM and SDD respectively, all far below the expected occurrences. It was also recorded just once in EPA. The figure also revealed that 'Articulation' was recorded twice each for BCT and BSM, once in SDD and absent in EPA. Similarly, 'Precision' was recorded once in BCT, BSM and SDD courses, while it was absent in EPA. While 'Manipulation' recorded 2 incidences each for BSM and SDD, it was absent in BCT and EPA. 'Imitation' was not mentioned in BCT, SDD and EPA, but was recorded twice in BSM.

5.3. Affective Competency Content

Figure 4 below shows the rate of recurrences of the 5 levels of affective domain of learning in the 4 identified professional courses of building technology curriculum. 'Characterization' is the most complex level in this realm and has not appear anywhere in the 4 courses analyzed. 'Organization' is the second most complex level and had 5 and 2 incidences in BCT and SDD, with no occurrences in BSM and EPA. 'Valuing' was missing in BCT, BSM and SDD, but appeared once in EPA. 'Responding' is the second least complex level and was recorded 4 times in BCT, twice each for BSM and SDD, and not mentioned in EPA. The least complex level in affective realm is 'Receiving'. This level was recorded twice each for BCT, BSM and SDD, while it was absent in EPA.

It can be observed from the figures 2 – 4 that although some of the levels of cognitive realm were not adequately captured in the curriculum, the cognitive competency content dominates the entire curriculum when compared with the other 2 domains, i.e., the psychomotor and affective domains as shown in figure 5 and table 3 below. The table shows that cognitive competences were recorded up to 286 times representing 83.87% of the entire occupational competencies in the curriculum.

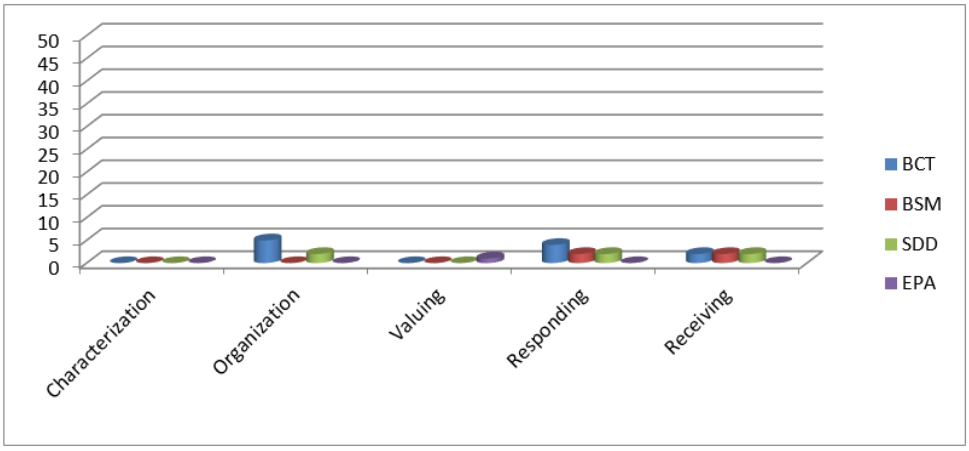

Figure 4. Frequencies of various levels of affective domain of learning in the curriculum

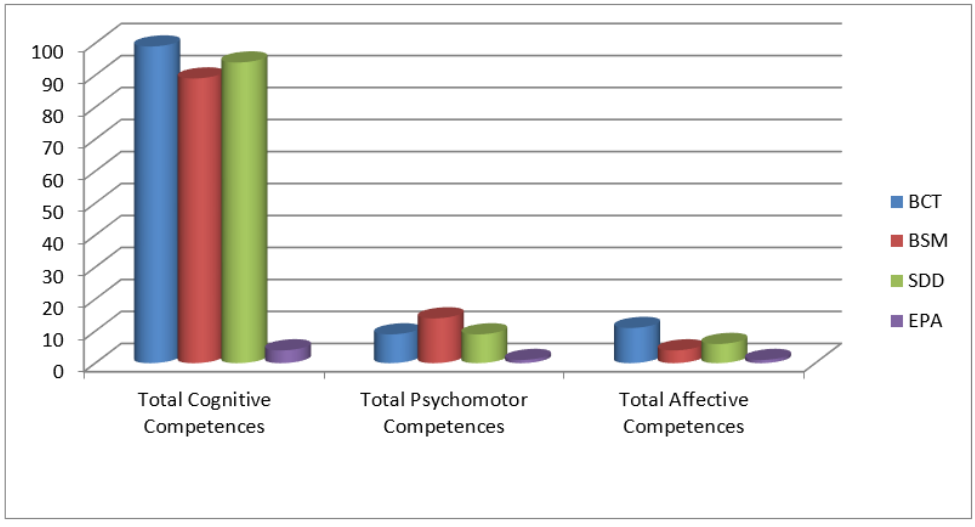

Figure 5. Frequencies of competencies by domains of learning in the curriculum

Table 3. Distribution of Occupational Competences in the Curriculum

Courses	Total Cognitive Competences		Total Psychomotor Competences		Total Affective Competences		Total	
	Frequency	%	Frequency	%	Frequency	%	Freq.	%
BCT	99	83.19	9	7.56	11	9.24	119	100
BSM	89	83.18	14	13.08	4	3.74	107	100
SDD	94	86.24	9	8.26	6	5.50	109	100
EPA	4	66.66	1	16.66	1	16.66	6	100
Total	**286**	**83.87**	**33**	**9.68**	**22**	**6.45**	**341**	**100**

6. Discussion and Implication

This study examined the content of Higher National Diploma Curriculum in building technology of Nigerian polytechnics to understand whether the cognitive, psychomotor and affective skills are sufficient to support effective occupational competence acquisition for modern day construction industries. A holistic discussion coupled with the necessary implications of the findings is presented below.

Generally the findings of the study based on the documentary analysis of the existing HND building technology curriculum revealed series of imbalances in the curriculum with regards to and within the three domains of learning. For instance, the result shows a great inconsistency at the upper level of the cognitive domain across the four courses, especially EPA where these levels were rarely represented. However, there was a higher concentration of lower level cognitive competences (i.e., comprehension and knowledge levels) across the courses except for EPA. On a general note, cognitive competence represents 83.87 percent of the entire occupational competences captured in the curriculum. This implies that the students will at most times learn theoretical concepts and principles of the curriculum, even though the curriculum recommends that there should be a balance of theory to practice in the ratio of 50:50 or 60:40 or the reverse. It was also recommended by the curriculum developers that there should be as much as possible, the integrated approach of teaching the theory and practical work. These findings are follows the work of Taiwo (1998) whose work revealed that the technology curriculum of the programme is deficient regarding practical skills which results in inadequate skills acquisition. This is also supported by Okorie (2000) who noted that the preparation of technicians and technologists in polytechnics was extremely theoretical and so the graduates recede from embracing jobs where they might be called upon to exhibit their acquired practical skills.

The findings of the study also indicated that only 9.68 percent of the total occupational competences captured in the curriculum represent psychomotor competence. This reveals a highly lopsided curriculum of technology in which the practical aspects are supposed to have the highest proportion. All the upper and lower levels of psychomotor domain were greatly underrepresented and even some were absent in the courses. For instance, imitation which happens to be a lowest level of the domain was absent in the 3 of the 4 courses. Furthermore, manipulation the second lowest level of the domain was deficient in 2 of the 4 courses. This goes with precision level occurring only once in the 3 of the 4 courses. Analysis of the document has clearly showed a significant deviation from the developer's suggestions. This implies that HND building technology students will graduate with acute shortage of psychomotor competences that will help them face the novel challenges in the construction industries. This is perhaps the main reason why MAN (2010) claimed that technology graduates from Nigerian tertiary institutions always had to undergo re-training before assigning them to their duties in industries. The finding also follows Kailani, Gyallesu and Yaro (2017) that discovered the following obstacles as stumbling blocks to students' practical skill acquisition in a Nigerian polytechnic. These include: students' lack of sound technical background, leading to poor quality projects; large class size which result in lecturers' inability to organize proper practical session for the students and obsolesce of many machine/equipment in workshops/laboratories. Kailani and Haruna (2014) also reported several complaints from industries that new recruits from schools especially those from polytechnics do not possess the basic skills for tasks performances.

The results also demonstrate that affective competences received only 6.45 percent of the whole occupational competences depicted by the curriculum. Only 'organization' and 'responding' levels of affective domain were represented at a very low point in 2 - 3 courses analyzed. The curriculum developers were silent on affective competences, despite its significance to the success of technology graduates as they consist of the non-technical abilities, employability and dependability skills. The affective competences neglected by the developers of the document are very crucial because they involved positive attitude and traits paramount in the construction industries. This finding contradicts Awere, Edu-Buandoh, Dadzie, and Aboagye, (2016) that HND building technology graduates in Ghana possessed non-academic attributes which the employers emphasized as criteria for graduates' employability and performance in the

construction industry. These attributes included verbal communication, teamwork, time management, commitment and interpersonal skills. Atsumbe and Saba (2008) while commenting on affective competences stated that "one of the main purposes of engineering and technology education programmes is to help individual students to develop desirable and affective work attitudes …of an occupation to enter and progress in the occupation". Similarly, the finding is disputing the work of Mukhtar (2014) which revealed that 20 affective competences posed to experts in academia and industry, required by electrical engineering graduates were adjudged adequate. The implications of this finding involves substantiating the fear allayed by Atsumbe and Saba (2008) that lack of proper affective and work ethics will continue to cost engineering graduates their job, because poor attitude and lack of work related interpersonal skills are the main reasons young workers lose their jobs. Atsumbe further stressed that affective work competences are more important for job survival than either cognitive or psychomotor skills. The main argument supporting the importance of affective work competences in engineering education relates to the provision of a basis for a value-based decision in the designing, implementing, and evaluation of technology, in situations ethically complex (Prime, 1993).

7. Conclusions

This study specifically assesses the cognitive, psychomotor and affective competences in building technology curriculum to establish whether the competences captured in the curriculum were sufficient to support effective acquisition of occupational competencies needed in Nigerian construction industries. The researchers perceived this as necessary to ensure that the curriculum has really captured the novel competences in conformity with the modern construction industries. Construction industry accounts for an average of over 3% to the annual gross domestic product and an average of about one-third of the total fixed capital investment in Nigeria. Construction is an important sector that contributes greatly in the economic growth of a nation. It is an investment-led sector where government shows high interest, and contracts the industry to develop infrastructure related to health, transport as well as education sectors. As a result, the building technology programme as a major supplier of labour to the construction industry has to periodically undergo an evaluation to ascertain the competences are relevant to the industries. The findings of the study revealed that the cognitive competency content dominate the entire curriculum with 88.87%, followed by psychomotor competency content with 9.68% and lastly affective competency content with 6.45%. The lack of adequate content in psychomotor and affective competences makes the curriculum to be less relevant for effective acquisition of occupational competences. Therefore, the National Board for Technical Education should organize and monitor the process of reviewing the curriculum by inviting experts from construction industries and academia, with a view to having a balanced curriculum with appropriate representation of the three domains of learning towards acquisition of occupational competences for efficient performance in the construction industries. The findings also provide curriculum developers with information regarding the inadequacy of occupational competences as contained in the Building Technology curriculum. This is important in the event of curriculum renewal towards balanced curriculum that has appropriate representation of all the spheres of occupational competences.

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