

PEDAGOGIC REPOSITIONING OF CURRICULUM IN ARCHITECTURE AND CIVIL ENGINEERING EDUCATION TO MEET INDIGENOUS NEEDS

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Abstract

Inadequate provision for required Traditional Knowledge (TK) is identified as a weakness in the educational curricula that seek to birth adequately-trained and well-motivated professionals with the capacity to pragmatically solve local problems with indigenous technology. The focus of this paper is to review the present curricula of Architecture and Civil Engineering courses, identify the gaps and recommend how they can be filled. The current pedagogical approaches and curriculum context-relevance employed at the Architecture and Civil Engineering Departments of Covenant University Ota, Nigeria were evaluated. Specific references were made to project-based courses that involve architecture and civil engineering. Lectures, site visits, participatory projects and workshops were identified as means of building the capacity of young professionals and students towards the acquisition of the required TK and other relevant skills. It is expected that a successfully-integrated indigenous design would connect all relevant sustainable indices of the design together at different levels. In this way, the sustainability indices of (energy-efficient) designs, construction and maintenance of infrastructure in the built-environment industry would not be compromised. The study recommends the incorporation of all critical elements of traditional based curricula development for best practices that will promote indigenous architecture and civil engineering education for future professionals.

Keywords: Architecture, Civil Engineering, Curriculum Gap, Professionals, Sustainability, Traditional Knowledge.

1 INTRODUCTION

Education is the greatest investment that a nation can make for the quick development of its economic, political, sociological and human resources [1]. Some of the knowledge and techniques previously used to meet human needs in almost all the traditional societies of the world are being gradually replaced with modern technologies. It is increasingly being realised that some of these modern technologies are not sustainable enough to meet indigenous needs [2]. A major challenge, however, is that the context-relevance needed to match-up with imminent indigenous (skill-curriculum gap) challenges are missing as ingredients. If knowledge construction is to have any sustainable measure, there is therefore a need for our educational curricula to facilitate the acquisition of traditional knowledge, skills and technology for solving our societal problems. This need is naturally insatiable, but the onus to initiate a change in project-based (architecture and engineering) education is triggered by many factors: i.e. the natural resource depletion, climate change, ecological damage, and energy-efficiency. These factors are among the indices for indigenous acceptability and implementation of sustainable projects in professional practice [3]. Repositioning of curriculum to meet human needs can be done through pedagogy; the art or science of teaching, and educational methods. The teaching methods that offer services that meet local needs of culture and climate are simply traditional or indigenous.

However, "Traditional knowledge" and "sustainable development" are misconstrued terms, with widely varying definitions and interpretations. The current professional practices have been slow to respond to the dire needs of the traditional societies of the world, perhaps being gradually preponderated by modern technologies. These issues present a challenge to the educationist as well as to the students of the project-based courses in Architecture and Civil Engineering; to reconcile what is taught at school level to the actual human needs in the society. The Architectural and Civil Engineering education are both administered by practicum pedagogy that supply human needs, especially in terms of shelter, roads and other forms of infrastructures. The practice of green architecture and

engineering embracing the concept of traditional knowledge (TK) is one of the ways which can enlighten the individual on how structure in the ecological environment can survive longer in a sustainable way. Currently, buildings consume approximately 50 per cent of the world's resources. To reduce this demand, the role of sustainable education needs to be examined and thoroughly compared with TK requirements as needed in both the educational curriculum and professional practice.

A sustainable architectural and engineering education, traditionally-dieted curriculum and program will work to bridge the gap between the demands of the society and the ability of the existing and upcoming professionals to address these demands towards improving the quality of education and its relevance today, while enhancing the future plans altogether. Schools of architecture and engineering need to examine their existing curricula and their future education plans. This should be done first by examining the curriculum of the Nigerian University in terms of the capacity development of future professionals in traditionally-conscious sustainable education and practice. It was based on this fact that the National Policy on Education was formulated for the country. The policy seeks the inculcation of national consciousness and national unity; the inculcation of the right type of values and attitudes for the survival of the individual and the Nigerian society; the training of the mind in understanding of the world around; and the acquisition of appropriate skills, abilities and competence both mental and physical as equipment for the individual to live in and contribute to the development of his society [4] [5].

Educational growth and social development in developing countries are hindered by a lack of adequate, efficient delivery of quality sustainable education. This could be as a result of certain challenges that curriculum issues faced in schools. The curriculum issues have suffered so much neglect at the same time inextricably linked to matters on educational concerns and reforms around the world. In a sense, experiences of educational reform strategies almost all over the world have shown that curriculum is at the same time a policy and a technical issue, a process and a product, involving a wide range of institutions and actors. Therefore, the term "re-integration," in this context, will be operated as a form of evaluation process-product strategic insertion of traditional ingredients into the existing curriculum structure. This paper, therefore, drew heavily on the fundamental TK content and context relevance of the existing curricula of architecture and civil engineering departments of a private university in south-west Nigeria; as a pre-test measure of its sustainability index. This afterwards can be employed as module for all other schools.

1.1 Traditional Education Curriculum in Nigeria

The role of architecture is to create places where users' needs are met and where they feel more relaxed and satisfied. Architecture, the art and science of making places, is influenced by such factors as behavioral, socio-cultural and physical among others which inform the design of spaces created for human activities. Based on this, there is need to identify specific needs of human and not design for anonymous people. It has been observed that design studio is given casual approaches in the conception of space and form; unfortunately they are not often part of the curricula of architectural schools. Design studio briefs are often developed based on real life situations, so, architecture students are left to imagine and interpret the needs of the clients. In most cases, these interpretations did not address the users' needs. The design studio is therefore central to architectural education that proffers solutions to indigenous human needs. Therefore, architects, engineers and other allied professionals must be aware of these factors to have successful designs and execution of programmes.

As a result of insufficient traditional diets in the existing curriculum, there has been a wide disconnection or gap between the types of education offered informally at home and community and formal one in school. This also reflects in the educational policy, its implementation, review, development, and the performance in the practicing field. In order to establish a curriculum as an institutional apparatus and improve the skills and welfare of the graduates, the delegates to the National Political Reform Conference, in particular the National University Commission (NUC), Architects Registration Council of Nigeria (ARCON), Nigerian Institute of Architects (NIA) and Nigeria Labor Congress (NLC), needs to push for a well redesigned, monitored, controlled and TK-Oriented curriculum programme. Also, conscious effort should be made by the stakeholders to agitate for increase in funding of research for traditional aspect of the training as integral part of the general educational policy and planning in the on-going national economic transformation program.

More importantly, the society needs competent graduates in the areas of improvisation, innovation, fabrication, industrial design and manufacturing of well packaged indigenous products. Also, needed

are well trained artisans in building industry who can work out details in metal works, sculptures, wood works, ceramics, textile designs, auto mechanics and truck drivers, carpenters, plumbers, electricians, computer, database and Web/Network technicians, bookkeepers and clerks, foremen, technicians and vocational expertise who can make the trainees to function well. The untrained emergency project contractors, and technicians in the building industries causes more damages to building, vehicles, and innocent people when they are contracted to service. Also, because of poor knowledge of indigenous educational awareness in the training process, they have made many people to incur heavy debts and others to their early grave. The current preoccupation with university education in Nigeria reduces economic opportunities of those who are more oriented toward work than academic [6]. Not everyone needs a university education. Many of the so-called “expatriate engineers” who are being paid huge sum of money in dollars to build the houses, roads and bridges in Nigeria are graduates of vocational colleges; yet, Nigeria is not taking this sector seriously.

1.2 Philosophical Underpinnings and Traditional Mindsets

The revolutionary measures of pedagogic repositioning as opposed to the traditional mindset stated that instead of disconnecting students from the built up home and community experiences, schools should therefore be seen as the extension of the home and the community. In this way, students would expend much from practical knowledge on what they have picked up informally in family and in their community. The school should aim in this wise through the ‘modus operandi’ of the curriculum to deepen and entrench such understanding in context relevance of traditional knowledge in terms of the school’s philosophy, policy, curriculum and syllabus. This will enable the young people to reflect upon the traditional knowledge context and incorporate its value into their professional services and civic engagements after graduation.

Professional Architect and Engineer need to have strong respect for traditional and indigenous values. This has to do with tenets of instructions in vocations like carpentry, sewing, cooking and weaving which makes one understand the basis of survival- the most neglected aspect of life by the theorist of human conditions. In a bid to revive the context relevance of traditional knowledge in the educational process, one may take a cue from some international agencies that have also proposed or adopted principles for the use of TK in relation to sustainable development (SD). The International Council of Science (TICS) and UNESCO, for instance, propose the following principles (ICSU 2002): they are to (1) Ensure the full and effective participation of traditional knowledge holders during all stages of elaboration of sustainable development policies, plans and programs, alongside the scientific and technological community; (2) Acknowledge and respect the social and cultural bases, including the authority and structures within which traditional knowledge is embedded; (3) Recognize the rights of traditional people to own, regulate access and share benefits of their unique sets of knowledge, resources and products (4) Ensure that traditional knowledge holders are fully informed of potential partnerships and that these are only entered into with prior informed consent; (5) Promote models for environmental and sustainable governance that incorporate principles of genuine partnership and collaboration between scientific and traditional knowledge; and (6) Promote training to better equip young scientists and indigenous people to carry out research on traditional knowledge.

2 RESEARCH METHODS

Covenant University, a private university in Ota, Ogun State, Nigeria, was selected for this study. Two (2) curricula were selected, both from Architecture and Civil Engineering Departments, respectively. These were chosen because they both have pedagogic, professional affiliation, licensure and project-based characteristics; hence their ‘modus operandi’ is similar enough for comparison. The curricula were qualitatively analysed with the aim of comparing their education content and context relevance with the core traditionally indigenous study areas identified in the literature, and by the Nigerian National Universities Commission (NUC), Architects Registration Council of Nigeria (ARCON), Nigerian Institute of Architects (NIA), Nigerian Society of Engineers (NSE) as well as the Council for the Regulation of Engineering in Nigeria (COREN). In this respect, courses examined may not necessarily bear an obvious traditional nomenclature. Courses that deal with history of architecture, traditional architecture, entrepreneurial development studies, and other traditionally-indigenous areas of professional practice and procedures as well as sustainable technology were selected for investigation.

2.1 Curriculum Evaluation and Results

Table 1: Perceptual Indices of TK content in the Architecture Curriculum

UNDER GRADUATE COURSES	TK-Related Undergraduate Course	Total TK-Related Units	Credit Load of Architectural Design Studio(ADS) Courses per level	Program Allowance for TK Implementation in Architecture Programmes	Impact of TK on Graduation Requirements (TK/173)	Capacity Building & Sustainability Requirements for Professional Competence& Practice
100 Level	ARC111/121 (Architectural-Graphics = 3 units each), ARC112/122 (2units), ARC113 (3units) TOTAL= 13UNITS	3 units	0 units	None	3/175 = 0.017	Need to introduce the simple elements of in terms of site visits and excursions to relevant places of interests
200 Level	ARC213/ARC223 (History of Architecture- 2 units each) ARC214 (Interior Design), ARC215/225 (Building Structures = 3 units each), ARC216/226 (Building Structures = 3 units each). TOTAL = 18 UNITS	18 units	ARC211/221 (Architectural-Design Studio = 4units each); 8units	Detail Knowledge of wood-timbers, jointing system still need to be made explicit; elements of structures in terms of simple beams and columns' systems	18/175 = 0.089	More emphasis on pedagogic goals especially in the integration of building structures to architectural design studio works; also emphasis should be given to construction material that are being used in rural areas. People usually construct their houses themselves as they are used to using the locally available materials. Great tendency is often to try and use new materials which are not necessarily better than the old ones.
300 Level	ARC313/323 (History of Architecture) ARC315/325 (Building Structures = 3 units each) ARC316/326 (Building Components Methods = 3 units each) ARC322 (Landscape = 2 UNITS); ARC324 (2 units). TOTAL = 20UNITS	20 units	ARC311/321 (Architectural Design-Studio = 4 units); 8units	Site visits made to project sites within and outside the schools during the semester; in order to understand practically the structural members and relate to classrooms' situations	20/175 = 0.114	Practical assignments be given regularly and good interconnections between structural designs and detailed understanding of components involved inTK
400 Level	ARC415/425 (Building Structures) ARC416/426 (Building components & methods v & vi) ARC417(2UNITS) ARC427 (Introduction to professional practice = 2 UNITS) ARC418 (Traditional Architecture) TOTAL= 18 UNITS	18nits	ARC411/ARC 421 (Architectural Design Studio); 8 units	Visits to project sites and Excursions to places of significant architectural interest	18/175 = 0.089	Introduction of Workshop practice as part of the curriculum, student industrial work experience in fabrication, construction in timber, reinforced concrete and steel building

The findings are discussed as follows: From Table 1, Architecture program in CU offers a total of 175 credit units of courses from year one to year four and out of the 175 units, a total number of 23 (55 units) VTE-related courses were incorporated into the curriculum, 6 (24units) ADS courses contents are offered. While in Table 2, Civil Engineering offers 212 credit units courses from year one to year five. Out of the 212 units, 68 units were designated for VTE courses. Further examination of the curriculum revealed that two major courses (Building Structure, Building component and Methods) were seriously hinted at VTE, while (ARC214) content has little context relevance to VTE in its implementation.

Table 2: TK-related courses in the Civil Engineering curriculum of CU

Undergraduate Courses	TK-Related Undergraduate Courses	Total TK-Related Course Units	Civil Engineering		
			Impact of TK on Sessional units Requirement (TK-Related Units/Sessional Units)	Impact of TK on Graduation Requirements (TK-Related Units Offered/Graduation Units)	Capacity Building & Sustainability Requirements for Professional Competence & Practice
100 Level	EDS111 - Entrepreneurial Development Studies I (1 unit); EDS121 - Entrepreneurial development Studies II (1 unit)	2 units	$2/47 = 0.043 = 4.3\%$	$2/212 = 0.009 = 0.9\%$	Need to introduce the simple elements in terms of site visits and excursions to relevant places of interests
200 Level	GEC213 -Material Science and Raw Material Studies (2 units); EDS211 - Entrepreneurial Development Studies III (1 unit); GEC229 - Student Work Experience Program (1 unit); EDS221 - Entrepreneurial Development Studies IV (1 unit); GST221 - Nigerian People and Culture (1 unit)	7 units	$7/50 = 0.14 = 14\%$	$9/212 = 0.042 = 4.2\%$	More emphasis on pedagogic goals especially in the aspect of introducing students to Civil Engineering. It is also important to entrepreneurial and computer programming and aided design. Excursions to villages can be arranged for students by their course instructors to reinforce some TK concepts of their courses
300 Level	CVE317 - Civil Engineering Materials (2 units); EDS311 - Entrepreneurial Development Studies V (1 unit); CVE328 - Elements of Architecture (1 unit); EDS321 - Entrepreneurial Development Studies VI (1 unit)	5 units	$5/42 = 0.119 = 11.9\%$	$14/212 = 0.066 = 6.6\%$	Practical assignments are given regularly and good interconnections between structural designs and detailed understanding of components involved. Student should be taken through practicals that will enable them understand theoretical concept.
400 Level	EDS411 - Entrepreneurial Development Studies VII (1 unit)	1 unit	$1/29 = 0.034 = 3.4\%$	$15/212 = 0.071 = 7.1\%$	Introduction of Workshop practice as part of the curriculum, student industrial work experience in fabrication, construction in timber, reinforced concrete and steel building

500 Level	EDS511 - Entrepreneurial Development Studies IX (1 unit); EDS521 Entrepreneurial Development Studies X (1 unit)	2 units	$2/46 = 0.043 =$ 4.3%	$17/212 = 0.080 =$ 8.0%	Exposing student to world of work. Seminars, workshop and skills that will help after they are graduated. The program should emphasize strong foundations in critical thinking and technical skills and also incorporate cutting edge laboratory and field works.
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The courses that have TK input or provide allowance for course instructors to teach TK in the undergraduate civil engineering curriculum of CU were selected based on critical assessment of the course outlines of each of the courses in the curriculum. Table 1 shows that only 8% of the total course credit units required for civil engineering students' graduation have allowance for TK. Discussion with some civil engineering course instructors, however, indicate that the actual percentage of the total course credit units that a typical civil engineering graduate of CU is exposed to is less than 8%. The unavailability of or few standard publications or literatures on indigenous earth building construction, for instance, compared with those on modern construction technology may be responsible for the less-emphasis on traditional earth building construction by the civil engineering curriculum and course instructors [7]. However, student excursion to villages can be arranged by course instructors to reinforce some TK concepts of their courses. TK-related courses in civil engineering curriculum should introduce the undergraduate students to the use of indigenous materials for construction and waste containment. Courses such as GEC213 (Material Science and Raw Material Studies) and CVE317 (Civil Engineering Materials) provide their course instructors the opportunity to introduce students to locally-available materials used for earth-building construction and waste containment. GST221 (Nigerian People and Culture), CVE317 and CVE328 (Elements of Architecture) should also introduce students to the traditional construction methods, processes and designs, and their cultural variants. Our environment was reported to be more-friendly to living organisms when traditional construction materials and technology were used by the early men. Thus, TK plays a vital role in today's drive for sustainability education.

3 DISCUSSIONS

The findings are discussed as follows: From Table 1, Architecture program in Covenant University offers a total of 175 credit units of courses from year one to year four and out of the 175 units, from year 1-4, a total number of 20 (55 units) TK-related courses were incorporated into the curriculum, 6(24units) ADS courses contents are offered. While in Table 2, Civil Engineering offers 212 credit units courses from year one to year five. Out of the 212 units, 68 units were designated for TK courses. Further, examination of the curriculum revealed that two major courses (Building Structure, Building component and Methods) were seriously hinted at TK, while (ARC 214) content has little context relevance to TK in its implementation. For the civil engineering program, a number of courses are provided that place emphasis on the TK curriculum. The science and engineering programs introduce practices and skills through supervised hands-on workshop and laboratory exercises. These exercises include familiarization with basic tools that relates to each discipline in science and engineering so as to entrench basic knowledge in the students. The former courses have considerable TK-content and context relevance. It was however observed that although both relevant TK courses actually addressed TK matters but there was no medium to integrate them together to address professional practice demands. Seminars and Workshops will afford them the skills required after they are graduated. The program should emphasize strong foundations in critical thinking and technical skills and also incorporate cutting edge laboratory and field works.

Although, Covenant University has broken barriers in the field of entrepreneurial development studies (EDS), customized in line with the vision of raising future generation leaders. In the same way, this study has enumerated factors that contribute to the professional responsive methods of project design and implementation- it emphasized a pragmatic problem-solving formula. The issues on context relevance of the TK diets on architecture and civil engineering programmes emphasized dynamic improvement on the conditions of professional training in terms of capacity building and development of students to prepare them to meet different needs of the awaiting clients' categories. The incorporation and application of TK studies is also part of the architecture and engineering school philosophy. Finally, this study concludes that capacity development of future professionals be equipped with relevant TK Dieted-courses in a flexible manner that would allow to meet the needs of

clients, communities and nation at large. Also, avenues need to be created in terms of project based assignments; student architects, engineers and others in the allied professions should be strategically integrated by curriculum instruments while in school in order to foster their sense of synergy derivable in team work before and after graduation.

3.1 Instituting Policy Framework for Indigenous Sustainable Education in Nigeria

The small and medium enterprises (SMEs) are universally recognized as catalysts in the socio-economic development of any country. They are veritable vehicles for the achievement of macroeconomic objective in terms of employment generation at low investment cost and the development of entrepreneurial capabilities, indigenous technology, stemming rural-urban migration, local resource utilization and poverty alleviation. Capitalizing on the catalytic role of the SMEs in nurturing economic development, successive governments in Nigeria since the 1940s have been formulating policies favourable to the development of the subsector though not well actualized in most cases. But in order to synergize the potentials of sustainable curriculum values embedded in our educational system which serves as input source of our development, then the output can be well placed if there are good avenues to showcase their talents gifts, skills and other forms of potentials. Moreover, it is pertinent at this economic stage of life that an ideological framework should be established to synergize the economic values of education, vocation, community participation and governance together. This is also necessary so that individuals can evaluate their inputs into the societal system and maximize values on the output levels. Another way is to allow individuals to showcase their talents in conference, exhibition and workshop presentations. This will enable stakeholders and community to give patronage to their works. In this way, industrialists, manufacturers and the elites can form a kind of 'Bauhaus Ateliers', whereby, competitions can be thrown open to participants in order to win prize for a particular creative work done. Jurors or critics can be set up among the stakeholders to evaluate such entries of works.

3.2 Teaching Mechanism and effective learning in Civil Engineering Program

In the national strategic planning goal, every State needs to set standards for student performance and hold schools accountable in meeting those standards. The goal is to raise performance for all students and close the achievement gaps thereby setting clear expectations for all students, regardless of their background. Four (4) types of pathway standards were identified in literature, namely:

- i. Content standards
- ii. Performance standards
- iii. School delivery standards
- iv. System performance standards

In all these, architectural and engineering education can interconnect these benchmark values to establish a nexus that will dovetail the traditional pedagogic and practice skills into the required professional pathways in a synergized form. There are bundles of prospects for professionals in these fields: for instance, educators and practitioners must jointly establish content standards benchmark through which required Traditional Knowledge and skills learnt in schools are clearly spelt out as a way of bridging the gap between schools and practice. Also, educators and practitioners have the obligation to setup performance standards benchmark which specifies the level of achievement students should attain in schools and at graduation point; in order to be considered proficient.

In addition, accreditation board [Nigerian Universities Commission (NUC), Nigerian Institute of Architects (NIA), Architects Registration Council of Nigeria (ARCON)], Nigerian Society of Engineers (NSE) as well as the Council for the Regulation of Engineering in Nigeria (COREN) have the statutory role to establish school delivery standards of monitoring, evaluating, control and review the resources. It should also state the capacity that the schools should maintain with sincerity and on regular basis for students to reach the required standards. Lastly, the school systems should establish a national policy on system performance standards which emphasize practically the support they have in stock to enable students to meet these standards. Therefore, availability of adequately trained and well-motivated professionals with the capacity to solving problems of national concerns and indigenous needs are very important. The architecture and engineering programs introduce practices and skills through supervised hands-on workshop, design studio and laboratory exercises. These exercises

include familiarization with basic tools that relates to each discipline in architecture and civil engineering so as to entrench basic knowledge in the students. The student at Covenant University embarks on a 12 weeks student work experience program (SWEPE) program that equips them with skills in all practical engineering programs that is being offered in the University. However, the skills acquired in SWEPE cannot be compared with experienced gained when the students go for a six (6) months industrial training, where they are exposed to real life practical that is related to the profession of their choices.

4 CONCLUSION AND RECOMMENDATIONS

The high Points of traditionalism and indigenous technologies are that (i) the lectures, site visits, participatory projects and workshops have been identified in the past as vital means of capacity building of professionals; be it instructors, young graduates and students; towards the acquisition of the required traditional knowledge, skills and technology. Therefore, to redeem these professions from colonial imposition and servitude, it is emergent that the integration of TK courses into the curricula would connect all relevant sustainable indices of the design together in different scales. In this way, the sustainability indices of (energy-efficient) designs, construction and maintenance of infrastructure in the built-environment industry would not be compromised.

Therefore, the incorporation and engagement of all critical elements of traditional element be employed in the curricula of schools; for best practices in the promotion of indigenous architecture and civil engineering education of future professionals. More so, the disconnect between architecture, engineering, and other students in allied programmes study relationship in school be bridged by creating a nexus of participatory workshop practices, practical, site visits, and industrial attachment of future professionals to specific architecture and civil engineering practicing firms in order to acquire relevant knowledge, skills and acumen to meet societal needs and expectations. More so, the proprietor base will do more to the system by supplementing and aligning their educational policies and implementation strategies with specific emphasis 'on active labour markets' requirement and ensure its effectiveness. Beyond aforementioned ingredients, much more can also be achieved by improving labour force skills and competences through local and international linkages with education and training systems adopted by the developed nations.

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