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Nigerian architectural education in a sustainable age

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ABSTRACT: This study aims to integrate sustainability into the thinking and teaching of architecture in Nigerian tertiary institutions from an abstract manner to a concrete one by modifying present educational approach and practice as well as developing a road map for its implementation. This paper reveals that sustainability in architecture is multidimensional and requires the ability to critically analyze, process and think creatively about how sustainable solutions might be designed in the Nigerian built environment. The findings of the study show that there is the need for an institutional framework to integrate sustainable concept in both architectural education and practice. This will assist to draw a plan to introduce sustainability design studios and sustainability related courses to the Nigerian architectural education. The study concludes that there is the need to upgrade the training of Nigerian architectural educators and students on how to apply design management techniques to coordinate their green building designs. This will enable future Architects propose designs and architectural solutions to challenges facing communities e.g. climate change, environmental destruction, social disintegration, poverty, natural resource exhaustion, and financial instability. The paper recommends that all stakeholders should cooperate at all levels to achieve sustainability as a unified goal. Finally, the research concludes that policy enforcement, monitoring, awareness, funding, training, research; sustainability strategies, practices and programs must be implemented consciously at all levels in Nigeria. It recommends the introduction of a centre for sustainable buildings in Nigeria as well as concepts and principles of sustainable development by the National Universities Commission, National Board for Technical Education, Architects Registration Council of Nigeria and the Nigerian Institute of Architects.

Conference theme: Education for sustainability
Keywords: architectural education, built environment, green buildings, Nigeria and sustainability,

INTRODUCTION

Nigeria (Africa's most populous nation), independent since 1960, occupies an area of 923,768 km2 with varied climates and seasons. Presently, its estimated population is over 100 million people. Prior to oil, agriculture (before 1970) was the economic mainstay. With financial resources available from oil and no development policy, unguided urbanization and industrialization took place. Uncontrolled population growth, desertification, and deforestation led to degradation and devastation of the environment.

The need to initiate a change in architectural education that supports the implementation of considerations of sustainability in architecture is mainly triggered by the following factors: natural resource depletion, climate change, ecological damage, current building practices have been slow to respond to the need of enhancing sustainable environmental design within a creative architectural discourse; accreditation and qualification criteria established by professional bodies do not yet comprehensively contribute to the efficient promotion of environmental sustainability in building design; university curricula have proved to be sparsely effective in systematically integrating sustainable environmental design in the education of students of architecture.

The role of higher education in creating a more .environmentally sustainable future is undeniable. The aim would be to train the professionals, students and community to be environmentally literate. These issues present a challenge to the educationist as well as to the students of the Built Environment, to reconcile the environmental aspects as part of the built environment.

Sustainable buildings can be defined as those buildings that have minimum adverse impacts on the built and natural environment, in terms of the buildings themselves, their immediate surroundings and the broader regional and global setting. Thus, the rational use of natural resources and appropriate management of the building stock will contribute to saving scarce resources reducing energy consumption and improving environmental quality (Dudek, 2007).

Practicing green measures and embracing the concept of Green Building is one of the ways which can enlighten the individual on how the earth can survive longer in a sustainable way. Currently buildings consume approximately 50 percent of the world's resources. To reduce this demand, the role of sustainable education needs to be examined.

The economist registers that the most prestigious universities' students claim far more information and education in sustainable architecture but the only credit for certain projects that are so called by authors and critics environmental is that they incorporate a garden in their interior or a solar panel that's more symbolic than effective in their roof. Some of the so-called intelligent buildings that come up are usually environmentally dumb since they consume energy in reaction to small climate changes that could easily be fixed by opening a window (Alvarado, 2006).

A sustainable architectural education enhancement program will work to bridge the gap between the demands of the society and the ability of the existing and up-coming professionals to address these demands, towards improving the quality of education and its relevance today and in the future. Schools of architecture need to examine their existing architecture education and their future education plans. This will be done first by examining the curriculum of the Nigerian University in terms of building the undergraduates and postgraduates sustainable awareness.

1. ARCHITECTURAL EDUCATION IN NIGERIA

Architectural education in Nigeria has experienced dramatic turn-around over a period of time since it was introduced into the country in 1947 with the establishment of Yaba College now Yaba College of Technology, Lagos State. The next college of architecture, Nigerian College of Arts, Science and Technology located at Ibadan in 1952, was later relocated to Zaria, in the present Kaduna State in 1955. It was later to form the core faculty of the present day Ahmadu Bello University, (ABU), Zaria in 1962.

At the onset and within this period, only diplomas in Architecture were awarded to students. The diploma being awarded qualified the students upon graduation to be exempted from parts I and II of RIBA (Royal Institute of British Architects) Professional examinations; but only to sit for the final diet before being certified registered architect. In essence, the Nigerian architectural education was tailored after the British education and to a larger extent in line with the curriculum of our colonial masters.

The link with RIBA was maintained till 1968, when the course programme was again restructured into two-tier, with the offer of the Bachelors Science (B.Sc.) and Master of Science (M.Sc.) degrees in architecture.

The University of Nigeria, Nsukka was established in 1962, thereby making it to be the second university offering architecture in the country. In 1970, the University of Lagos, Akoka, Lagos established the department of architecture, thereby making it the third university department. Presently, the number of departments of Architecture in Nigeria has increased to twenty-four universities and twenty-two polytechnics / colleges of technology, with the recent establishment of several private institutions of higher learning thereby totaling forty six.

2. PRESENT STATE OF SUSTAINABIITY IN NIGERIAN ARCHITECTURAL EDUCATION

Presently, the majority of current architectural education neatly skips any examination of how societies maintained themselves (in a more or less sustainable state) in the past and what sort of built environment this generated. In the current world situation where a number of resources that are essential for the current western lifestyle, such as oil for energy and phosphorous to grow food, have a known life, it would seem vital that the architects of the future should be learning to define the future through understanding how societies in the past have learned to live within the limited resources available to them. (Vale and Vale, 2009).

Nigerian architectural education at present, the closest to a consideration of what the future might be like is presented in some type of course, often optional or peripheral, with the word "sustainable" in its title. Some of these courses raise the issue of resources and this often leads to the study of buildings that use solar energy for heating and cooling. Seldom do these courses explore architecture for a society living without fossil fuels and other non-renewable resources. Students are not being asked to design buildings that use only renewable resources, and rarely is the whole architect/client relationship examined in such a context. The assumption of architectural education is that the current economic model will still exist in a sustainable future and that buildings will be procured in the same way as now, it is just that they will more or less face the sun for winter heating and may have a grass roof for summer cooling.

Currently, in the Nigerian architectural education inclusions of sustainability aspects are fragmented relying heavily upon individual efforts of lecturers that are familiar and inclined towards the subject matter. There is a need to review the existing curriculum to significantly include the worthy aspects of sustainability in the courses content and delivery mode.

3. INTEGRATING SUSTAINABILITY EDUCATION INTO THE FUTURE ARCHITECT

In the United States of America, for example, the American Institute of Architects is at present *seeking* to inject ecological literacy and sustainability principles into architecture education. It is also worth noting that, in the USA, sustainability has been added since 2004 to the 'Conditions for Accreditation for Professional Degree Programs in

Architecture', with a particular emphasis on the "understanding of the principles of sustainability in making architecture and urban design decisions and in the creation of healthful buildings" (NAAB, 2004). The US Educators Practitioners Network is also closely working with the Society of Building Science Educators, the AIA Committee on the Environment, and the AIA Sustainability Discussion Group to generate a Carbon Neutral Design Resource for educators and professionals (Boake, 2008). This resource will provide invaluable practical guidelines that will support the process of design and planning of carbon-neutral projects, including case studies that illustrate successfully constructed buildings and an extensive bibliography of available software and tools (Wasley, 2007).

Concurrently, in the United Kingdom, to address current pedagogical and professional challenges and facilitate discussion between academics, designers and representatives from qualification bodies, in 2008 the 'Designs on the Planet' workshop series was set up as a forum by Oxford Brookes University, the University of Nottingham and Cardiff University, with the primary aim of contributing to the development of environmental responsibility as a creative factor in the practice and pedagogy of architecture (Stevenson, et al., 2009). The workshop series was sponsored by the Centre for Education in the Built Environment (CEBE) and supported by the Royal Institute of British Architects (RIBA), which is at present working with the UK Architects Registration Board (ARB) to review existing criteria for qualification so as to meet contemporary professional demands and legislative requirements (e.g. the Code for Sustainable Homes, DCLG, 2007).

3.1 Environmental awareness campaign in government, schools, adults, community and leaders' programmes to encourage participation of all in sustainability.

In Nigeria, environmental awareness is not a prominent feature of education programmes in institutions of primary, secondary or higher learning. However, its presence helps to mainstream environmental education programmes into schools as a regular part of the curriculum, increase public environmental awareness and demonstrates a commitment to environmental protection. Environmental education can be integrated into existing disciplines or it can be taught as a subject as early as primary school as well as in adult education programmes this will foster the environmental responsibilities amongst students.

Awareness raising campaigns are found to be successful when they are targeted at specific groups because information can be tailored to the activities, needs and challenges of the group. Additionally, involving organizations and communities in environmental protection and enforcement can create a sense of stewardship towards the environment, ease hardship through the collaboration and provide a forum for new ideas and greater participation.

Awareness can be raised amongst children who are taught about the need to conserve water and instilling the next generation with an environmental consciousness at a very early age. This awareness raising is also observed to permeate into the workplace. Employees are seeing the advantages of working in improved environments which equates to working in a sustainable building. Employers recognized the effects of working conditions as it will have a trickledown effect within the workplace especially in the productivity of staff. Leaders can play an influential or even decisive role in how people act. Education of leaders can assist in facilitating the implementation of sustainable buildings. As a global concern, over the last two decades literature talked about the missing link between architectural education and professional practice (Elnachar, 2010).

The print, broadcast, and Internet media can be a powerful ally in educating the public on environmental matters. The government has work with the media to broaden the environmental interests amongst the public. The involvement and participation of celebrities in media campaigns has been found to be an effective way of increasing understanding of the importance of environmental issues and enforcement.

3.2 Implementing sustainable principles and green buildings in courses in Architecture and Construction.

In Nigeria, the National Universities Commission, National Board for Technical Education, Architects Registration Council of Nigeria and the Nigerian Institute of Architects are yet to approve sustainability as part of the knowledge to be acquired throughout the architecture education, sustainable issues and development has not coordinated in the curriculum in a systematic way, where it has been introduced. Although there were some inputs integrating sustainable issues and development but these are piecemeal and do not give exposure to the students in broader perspectives. The education is only limited to single discipline with isolated topics based on the knowledge and interests of the lecturers. New curricula, courses and techniques are needed for whole architectural education emphasizing on how buildings are developed and designed, and how interdisciplinary teams can be used to maximize energy efficiency, reduce resource waste, and improve the environmental quality of the buildings being constructed and re-connecting them to the natural environment.

A typical four to six years architectural training in Nigeria focuses on the required range of skills and creativity in design, managerial, media, and technical expertise with core subjects or courses ranging from design, technology, history, theory, practice and environmental behavior.

The success of sustainability in design and in the built environment relies on how institutions of higher learning respond to the ideas generated as a result of widespread interest in sustainable development. If sustainability is to

become an essential aspect of society and economical development then it has to become an essential part of education (Samad & Rahman, 2007).

Studies show that a complete integration of sustainable development across the curriculum, i.e. in all modules and parts of relevant subjects and activities through all phases is needed in encouraging sustainable practices in civil engineering fields (Shafii, 2007). The fundamental idea is that when sustainability is to become essential for all activities within society and all sectors of economy, it cannot remain as an isolated field of expertise but must form mindset for everyone.

A sustainable environment's program should consist of an interdisciplinary set of courses spread throughout various university departments, such as Architecture, Anthropology, Agriculture, Biology, Botany, Building, Civil Engineering, Estate Management, Urban and Regional Planning, English, Economics, Forestry and Natural Resources, Geography, Humanities, Landscape Architecture, Philosophy, Political Science, Psychology, Quantity Surveying and Sociology. The sustainable environment's program's broad scope offers students comprehensive exposure to the close relationships between the environment and every field of human endeavor (Shafii, 2008).

Schools of architecture should take a proactive role in promoting ecological literacy through aggressive advocacy for green building projects in their own institutional communities. Also assessing the state of ecological literacy in architecture education as part of a long-term effort to inject sustainability principles into architecture education and present a mosaic of current activities as the basis for an ongoing discussion of the future of environmentally progressive architectural education.

There is real need of reorienting architectural education towards sustainability so that architects are trained to have a clear understanding of how their role interacts with others to bring about good buildings and designs in many contexts.

Information and communications technology is today one of the most critical tools in architectural education. New ways to deliver instruction are now available, with the resulting ability to reach students in many ways other than the traditional classroom setting. Changes in research tools and methodologies in many disciplines and professions have resulted from the spread of information technology throughout the disciplines. New computerized studios such as design methods, computer aided design (CAD) visualization, paperless architectural studio and the virtual design studios have been introduced in many architectural schools as new ways of practicing and teaching architectural design. Recent developments to computer networks are offering further opportunities for collaborative work and knowledge transfer at the global scale.

4. OBSTACLES TO ARCHITECTURAL EDUCATION IN A SUSTAINABLE AGE

Many of the barriers to sustainable outcomes in the property sector in Nigeria are related to government at all levels, infrastructure, funding and learning. Direct barriers include lack of awareness, lack of skills (translating awareness into action), and the time and cost of pioneering new approaches

Barriers to sustainability initiatives in architectural education in Nigeria include inadequate funding and planning in setting up departments of architecture, limited expertise on sustainable buildings of the inadequate number of lecturers' available, lack of inspiring prototypes to counterbalance prevalent non-sustainable lifestyles, unawareness of environment crisis, shortage of studio spaces, lack of workshops, laboratories and equipment to teach courses of high technological input, inadequate number of books and journals of sustainable buildings, lack of technical courses that support sustainable design studios inside the classroom, the question of aesthetic and high cost of sustainability outside the classroom.

Other obstacles include inadequate managerial and administrative staff, unresolved ambiguity around defining sustainability principles, efforts often lack linkage to one another, lack of sincere commitment on the part of governments (federal, state and local) to prioritize education (especially technological education) which is the bedrock of infrastructural developments and obsolete curriculum.

5. RESEARCH METHODOLOGY

The study surveyed a total of 368 students and 368 members of the Nigeria Association of Architectural Educators in Nigeria (ARCHES), a body that was established in 1978 on the state-of the-art of curricular structures in Nigerian tertiary institutions by a simple random sample. The research study was conducted in some selected states of Nigeria comprising of Abia, Akwa Ibom, Anambra, Bauchi, Delta, Edo, Ekpoma, Gongola, Imo, Kaduna, Lagos, Niger, Ogun, Ondo, Osun, Oyo, Plateau, and Rivers states. In these states are universities or polytechnics offering architecture as a course of study.

The study conducted an analysis of the state of sustainable education at tertiary level (including curricular contents and structure, course syllabuses, delivery methods, assessment criteria, etc.), and investigated how these relate to the conditions for accreditation of academic curricula and requirements for professional qualification as established by National Universities Commission, National Board for Technical Education, Architects Registration Council of Nigeria and the Nigerian Institute of Architects.

This task included a general overview of education literature and a comparison of the state-of-the art with contemporary theories/practice. In addition, the study ascertained the level of awareness, knowledge, ability-base and requirements of sustainable design within schools of architecture, so as to identify strengths and weaknesses of various pedagogical methods and define an agenda for sustainable architectural education that consistently responds to the demand of enhancing environmental design in buildings and therefore contributes towards a sustainable built environment.

6. FINDINGS

The study surveyed a total of 201 students and 237 members of the Nigeria Association of Architectural Educators in Nigeria (ARCHES) who returned questionnaires and were found useable resulting into a response rate of 54.62 % for students and 64.4 % for academic staff.

The following tables show the summary of the questionnaire investigation into the ranking of categories of recommended changes / suggestions to integrate, promote and emphasize sustainability aspects in the Nigerian architectural education in a sustainable age.

Table 1: Ranking of categories of recommended changes / suggestions to integrate, promote and emphasize sustainability aspects in the Nigerian architectural education in a sustainable age.

Table 1: Descriptive statistics of suggestions to integrate sustainability in the Nigerian architectural education.

Categories of suggestions to integrate sustainability	Ranking	Mean	Standard deviation	Variance
Government factors	1	3.651	2.256	4.523
Private sector support	11	1.922	1.609	3.431
Monetary factors	6	2.685	2.364	4.006
Public sector support	13	1.525	1.304	2.855
External support	14	0.768	2.341	2.081
Professional bodies support	2	3.235	2.534	4.701
Publicity requirements	10	2.087	1.977	3.411
Resource factors	5	2.694	2.071	4.234
Educator factors	4	2.763	2.301	4.614
Regulatory requirements	3	3.016	2.333	5.662
Internal & external collaboration	15	0.663	2.473	3.622
Research requirements	12	1.762	1.962	3.502
Educational programmes	7	2.514	2.301	4.617
Curriculum review	8	2.441	2.061	3.708
Student factors	9	2.231	1.817	3.907

Table 1 presents the descriptive statistics of the rankings of the suggestions to integrate sustainability in the Nigerian architectural education the results show that government factors has the highest priority attached to it, followed by professional bodies support, regulatory requirements, educator factors, resource factors, monetary factors, educational programmes, curriculum review, student factors, publicity requirements, private sector support, research requirements, public sector support, external support, and collaboration in that order.

Table 2: Level of awareness of sustainable buildings among architectural educators and students in Nigeria.

Level of awareness of sustainable buildings	Students		Academic staff	
	Frequency	Percentage	Frequency	Percentage
Unaware	14	6.96 %	4	1.69%
Aware	187	93.04%	233	98.41%
Total	201	100%	237	100%

Table 2 shows that a great number of the architectural students and academic staff are aware of sustainable buildings while a few are not aware of sustainable buildings.

Table 3: Level of preparedness of architectural students and lecturers to preparedness to learn and participate in sustainability design and buildings.

Level of preparedness to participate in sustainable buildings in course work and studio	Students		Academic staff	
	Frequency	Percentage	Frequency	Percentage
Not prepared	6	2.98%	4	1.687%
Undecided	8	3.98%	3	1.27%
Prepared	187	93.03%	230	97.04&
Total	201	100%	237	100%

Table 3 above shows the degree of preparedness of architectural students and lecturers to learn and participate in sustainability design and building, 93% of the students are prepared to study sustainable design and buildings in the regular course work and studio

The study shows that there is the need to integrate sustainable concept and practice in design thinking in all levels ranging from ideological level (sustainability as a conceptual and an ethical reasoning for architecture) to the methodological level (principles and strategies for various range of disciplines) and finally the practicing level, by introducing sustainability related syllabuses to the architectural education, and inculcate the ability to critically analyze, process, and think creatively about how sustainable solutions might be designed in the Nigerian built environment

7. RECOMMENDATIONS

The paper recommends that all stakeholders within the society – government, accreditation and regulatory bodies, professional bodies, educational institutions, lecturers, students and the general public should cooperate and be committed at all levels to achieve sustainability as a unified goal.

A systematic policy in Nigeria is essential, one that concentrates on all three important parts of an educational system: well-defined goals, planning in accordance with these goals and the assessment of programs to refine goals. This paper proposes two level programs consisting of architecture education system and sustainable architectural design subsystem (This consists of sustainable theoretical and design studio teaching/practical courses, and interdisciplinary courses, relating to sustainability education in architectural curriculum). This should require students to work on and analyze real life environmental problems relating to water and energy systems at different scales either on the campus itself or in the community at large. Thereby implying a review of the present curriculum of the architectural education and the need to specifically bridge the gap between the academic environment and the professional practice world which will infuse in the prospective architect what the school could not give through Student Industrial Work Experience Scheme (SIWES).

Adequate research, human, financial and time resources must be devoted to sustainable architectural education.

Architectural educators and professionals should promote sustainable architecture through direct experiential learning, using appropriate methodologies, tools and techniques, must continually evolve and disseminate the knowledge base of sustainability through exemplary research and architectural practice. The knowledge base must

be widely disseminated in a manner that is easily accessible to students, educators, practitioners and the general public via a web portal or online sustainable search engine.

Generate and perpetuate a dialogue, collaboration and partnership locally and internationally between the professionals, academics and students to facilitate and encourage exchange of ideas, joint research, study tours and faculty exchange programs in order to extend domestic and international connections

There is the need for the architectural education system to place emphasis on fostering attitudes compatible with sustainability behavior and needs as well as human capital development through the training of lecturers in sustainable building to teach, supervise and support students. Also, there is the need to attract and sustain world renowned sustainability specialists and under their guidance, students should receive substantial training in sustainable architecture design and cultivate a global competitiveness in the international society.

CONCLUSION

The introduction of education on green architecture in Nigeria and the existing rating systems on an international level such as the Building Research Establishment Environmental Assessment Method (BREEAM, UK); Comprehensive Assessment System for Building Environmental Efficiency (CASBEE, Japan); Green Globes (Canada); Green Star, (Australia, New Zealand and South Africa); the Leadership in Energy and Environmental Design (LEED, US); Haute Qualité Environnementale (HQE, France) and the Indian Green Building Council (IGBC) Green Homes will create a more informed approach towards designing buildings based on the principles of sustainable architecture at a national level.

To achieve architectural education for sustainability lecturers should take a leadership role, breaking new grounds to prepare society for a sustainable age accelerating change in a world of increasingly diverse and growing populations, an expanding economy, and changing global environment and technology. Also, **p**olicy enforcement, monitoring, awareness, funding, training, research, sustainability strategies, practices and programs must be implemented consciously.

There is the need to cooperate with other groups, provide networking and cluster opportunities for architectural schools, lecturers and students, support schools in their growth from awareness through to leadership in education for sustainable development, foster empowerment in sustainability program and focusing on student involvement and learning

There is the need to integrate sustainable concept in design thinking in ideological level, methodological level and the practicing level. This hierarchical multi-layer approach can help to formulate a value-based design philosophy for introducing sustainable design laboratory/studio and sustainability related syllabuses to the architectural education.

Developing a sustainable design curriculum should be part of the focus and a long term goal of architectural sustainable thinking in education worldwide since the architect's fundamental responsibility is to create environmentally responsive designs, creating connections between people and aspects of place. This demands perceptual and analytical abilities pertaining to ecological wisdom and practical means essential to create a built environment that would fit a triplet system of social, economic and environmental attributes.

Literal cooperation and participation between academic and practical expertise is essential to incorporate sustainability concepts within the educational process. Sustainability has many approaches so it is necessary to introduce the Value Engineering, train students on how to utilize this managerial methodology to organize their green building design thinking. Sustainability as a continuing cyclic concept requires feedback action which encourages introducing post occupancy evaluation to the architectural profession. This will enable future Architects propose designs and architectural solutions to challenges facing the world e.g. climate change, environmental destruction, social disintegration, poverty, natural resource exhaustion, and financial instability. The paper recommends that all stakeholders within the society should cooperate at all levels to achieve sustainability as a unified goal. Finally, the research concludes that policy enforcement, monitoring, awareness, funding, training, research, sustainability strategies, practices and programs must be implemented consciously.

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