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Pedagogical Insight on Sustainable Nigerian Architectural Education

A Review

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Keywords

Architectural education, sustainable pedagogy, curriculum development

Abstract

This study examines sustainable pedagogical trends in evolving Nigerian Architectural Education. Using theoretical data from desk research and case studies on local and international teaching and learning models, the study qualitatively investigates the capacity of the recently-revised Nigerian architectural education curriculum to provide a sustainable pedagogy to train young designers. The study reveals the 2022 Core Curriculum and Minimum Academic Standards (CCMAS) conforms to global best pedagogical practices of holistic design-based learning for young designers who do not always meet real-world industry expectations. However, the successful implementation of the recently revised CCMAS depends heavily on content delivery and guidance of the learning process by educators. The study acknowledges the shortcomings of the CCMAS which currently lacks the integration of updated and consistent technologies to not only improve teaching dissemination and assessment through hybrid channels, but also inspire innovative output. The study recommends the collaboration of design educators and educational regulatory bodies to periodically review design education pedagogies. The study also recommends the provision of logistic support for practical implementation of indigenous curricula to ensure equity, innovation and attainment of key Sustainable Development Goals.

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1. Introduction

Architectural education comes from a long-standing tradition which blends the arts and the sciences. As a result of the constantly changing dynamics in both fields of endeavour, the professional training of architects appears quite different today from what it was over a hundred years ago when formal training began (Rodic et al, 2013). The Architect is no longer the building environment professional solely engrossed with the preparation of building plans and management of site activities. The practice of Architecture has evolved to include issues of business ethics and ideology, law and arbitration, social studies, corporate culture, health, sustainability, entertainment and so many other tangential issues. The ever-expanding duties of the Architect therefore relies on a corresponding education (and re-education) of its members to ensure they remain equipped and competent to cope with the demands of the profession (Yuping & Shuang, 2017).

Classic models of architectural education are centred around the activities of the design studio where students integrate practical knowledge gathered from non-studio-based theoretical and/or practical courses (Aderonmu, 2013, Joyner, 2019). These courses are based on a curriculum designed to build mastery in technical knowledge, history, arts, culture, graphic communication and technology (Ibrahim & Utaberta, 2012; Huang et al, 2022). The pedagogy employed relies heavily on the mentorship model of training architects which predates formal architectural training practices introduced towards the end of the 19th century (Hargrove, 2011). Though the mentorship model of architectural education has proven effective in the not-too-distant past – and possibly the present, the undeniable shift in recent architectural practice requires constant re-examination of architectural education, particularly the curriculum and the pedagogy employed by educators.

This paper contributes to the discussion on pedagogical reforms in architectural education through an overview of the revised Core Curriculum and Minimum Academic Standards (CCMAS) as adopted by the Nigerian Universities Commission (NUC) in 2022 (Okebukola & Saliu, 2022). The paper also looks at best global practices in architectural education which

would impact positively on local pedagogy for sustainable education delivery of Nigerian Architects.

The discourse avowed in this study goes beyond evaluating the curriculum descriptively, rather it also aims to theoretically examine the interrelationships between sustainable education and national development. According to United Nations (2015), architectural education has given direct support to Sustainable Development Goals (SDGs) 4 and 11 through the integration of sustainability. The fusion of reforms in curriculum to global SDGs in this study consolidates that transformation in teaching and learning methods act as a strategic vehicle to spearhead the development of human capital and environmental resilience.

In sub-Sahara Africa, comparative studies shows that the reform trajectories are similar. South Africa, Kenya and Ghana have been revealed to record shared limitations in training the educator, integrating technology and adapting the curriculum (Anwar et al., 2020; Combrinck, 2018; Olweny, 2020). This study's policy implications are broadly giving its positioning of the CCMAS reform within the context of the African continental narrative by revealing the strategic importance of sustainable architectural education as a driver for socio-economic change and regional innovation.

The study was objectively pursued by underscoring two main research questions as a guide: (1) How adequate is the revised CCMAS for the delivery of sustainable architectural education in Nigeria? (2) To what extent can design education pedagogy attend to future objectives while maintaining the essence of traditional values in architectural education? These overarching questions are readdressed at the study's conclusion to establish a clear logic between conceptual framework and the research findings.

2. Literature review

Preparing students for a profession in Architecture remains the primary objective of architectural education. The educational processes which foster the development of design capability in architecture students are rooted within the learning processes which occur within the constructs of design

teaching (Dizdar, 2015). Upon recognition of Architecture as a profession during the Renaissance, persons allowed to practice were deemed competent upon acquiring skills in various aspects of design and construction (Sinhal, 2016). Formalisation of the atelier (or studio) system from the 19th century, through the Beaux-Arts and later the Bauhaus School, integrated learning from the precedents of a Maestre (Master or Mentor) and self-directed learning, respectively (Salama & El-Attar, 2010). Simulating architectural education to real-life practice has a lot of bearing on how design education is actually taught in schools of Architecture (Sinhal, 2016). The design studio is therefore widely acknowledged as the core of architectural education which is buttressed by various theoretical and practical content obtained from non-studio-based courses over the learning duration (Dassah et al, 2018).

Several writers have described design-based education as a reflective exercise centred around design projects, either individually or in groups of 2-20 learners, fostering habits needed for integrating, applying and sharing knowledge. Where the learning process is supervised by a master craftsperson, discussions are intense and dynamically tilted towards the learners' ability and willingness to learn. Other student-centred models which have evolved in architectural education include the Hidden Curriculum Critical Pedagogy, the Transformative Critical Pedagogy and the Self-regulated Design Learning Model. These models highlight important observations about the pedagogies in architectural education which are currently run in most institutions (Iftikhar, Crowther & Burton, 2018).

Extracts from fragmented extant literature corroborates an existing gap between curriculum reforms and pedagogical methods needed to achieve sustainable learning outcomes. Though some studies have encapsulated reforms in curricula contents (Aderonmu, 2013; Emma-Ochu, 2009), a few others theoretically posit how such curricula reforms give rise to quantifiable transformation in pedagogy that promotes competencies in sustainability practices (Boarin & Martinez-Molina, 2022; Burton & Salama, 2023; Đorđević et al., 2022). The gap based on these evidences, provide the study's conceptual and empirical foundation, which broadens the existing body of knowledge by situating architectural pedagogy as a systemic mechanism with direct influence on human capital development and sustainable development.

Constructivist Learning Theory (CLT) and Transformative Learning Theory (TLT) form the theoretical groundings of this study. Both theories underscore learner-centred strategies including, knowledge co-creation and reflective thinking (Opere et al., 2020; Vygotsky, 1978). From the lens of constructivism, learners (in this case the architectural learners) develop personal knowledge and understanding through experiences gained from social interaction, iteration, reflection and practical engagement in projects in the studio. Transformative learning on the other hand, extends the constructs through encouraging mindsets and values that are sustainability-oriented

Within this framework, sustainable pedagogy is conceived as an integrative approach that aligns curriculum design, instructional methods, and learning outcomes with environmental and socio-cultural objectives. The conceptual link between curriculum structure, pedagogical methods, and sustainable learning outcomes is presented in Figure 1, illustrating the dynamic relationship between national policy frameworks (CCMAS), institutional practice, and student capability formation.

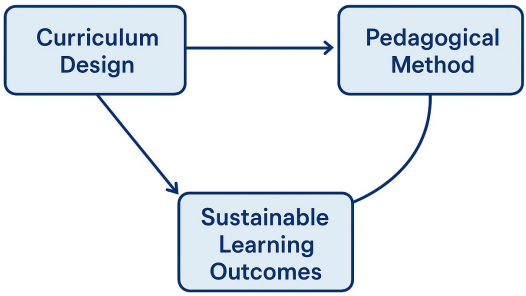

Figure 1: Interrelationship between Curriculum Design, Pedagogical Method, and Sustainable Learning Outcomes (Authors' model).

Graduates from Nigerian schools of Architecture have recently come under scrutiny from employers and clients over their perceived inabilities to meet up with the contemporary creative and business demands the profession requires, despite possessing commendable academic achievements (Akande et al, 2006; Maina & Salihu, 2016). This suggests that architectural graduates possess the necessary academic qualifications but often lack requisite hard or

soft skills which demonstrate many of the evolved competencies the profession is hinged upon in present day (Eshun, 2016; Kararmaz & Ast, 2017). The perceived successes (or lack) of the standard of current design education in Nigeria relies heavily on the educational pedagogies employed. Pedagogy is the science and art of teaching (Brown, 2019; Emma-Ochu, 2009). It is concerned with the methods and techniques of the teacher, the learning behaviour of the student, and the teaching tools used to transmit the learning information.

Some researchers have opined that since architectural education is prone to longevity, the learning process is more akin to andragogy or heutagogy, which connote self-determination for matured learners who seek problems and answers by themselves with minimal instructors' control (Anteet & Binabid, 2024; Blaschke, 2019). However, a universal theory on the subject is that architectural education is more closely aligned with pedagogy but it incorporates certain key features of both andragogy and heutagogy.

In architectural education, several factors contribute to the overall effectiveness of the pedagogy which dictates student performance (Tezel & Casakin, 2010). These range from personal attributes to the physical learning environment. Therefore, in addition to recent developments in Virtual Reality (VR), Artificial Intelligence (AI) and Machine Learning (ML), architectural education faces the specific challenge of equipping the next generation of designers for a future of yet-to-be-defined possibilities steeped in a tradition of creative freedom of expression to address real-world problems in the built environment (Ioannou, 2018; Okagbue, et al, 2023; Sciannamè, 2023; van der Vlist, et al, 2008). Building a lasting legacy of sustainable pedagogy in architectural education provides the main theme of this paper in order to ensure graduates are fully equipped to face future evolving objectives of the profession.

3. Methodology

This study employed a systematic literature review and desk research of over 30 scholarly articles on pedagogy in architectural education, as well as a comparative analysis of global models of architectural education from

specific regions including North America, Europe, Asia and Africa. The study also used a qualitative content analysis of emerging findings from literature to expound quantitative data on pedagogies in architectural education from source countries. The purpose of this form of mixed-method study was to elucidate on narratives that are not easily deduced from either purely quantitative or qualitative data (Crossman, 2017; Dudovskiy, 2018). The search strategy for the information made use of Google AI to identify the architectural programmes of established schools of Architecture around the world which is then cross-referenced against the revised CCMAS of the NUC. The data is presented in descriptive interpretation of direct and published information using simple tools of statistical means such as charts, tables and percentages. By adopting universal criteria of interpretation, the analysis minimised subjectivity by accepting contextual differences in the educational models examined.

4. Findings and discussion

The results presented in this study are directed at addressing the concerns posed about the adequacy of the revised CCMAS for delivery of sustainable architectural education in Nigeria, and the ability of design education pedagogy to attend future objectives while maintaining the essence of its traditional values. In order to maintain a reasonable scope of discussion for this study, the findings will be centred around the teaching tools used for learning, of which curriculum and strategic aids are a key component. Inferences about the roles and input of specific teaching strategies and student learning behaviour will be used to proffer recommendations. The analysis will be discussed under the 2 main themes raised by the study questions as follows:

Adequacy of Nigerian design education curriculum

Curriculum or programmes of study are a central part of pedagogy. They are fashioned to reflect certain principles which foster central schools of thought amongst the participants. Architectural education, which has its antecedents in science and art, is universally accepted to comprise instruction in arts and

drawing, building systems and technology, humanities and social studies, historical and theoretical studies, environmental control studies and the physical sciences (Emma-Ochu, 2009). These modules are emphasised in undergraduate and/or postgraduate study at selected durations. The highlights of the pedagogical models of the Constructivist and Transformative Learning Theories effectively address sustainable design education needed for the desired learning outcomes.

Anteet and Binabid (2024) identified 12 themes based on pedagogical approaches in design education which integrate these instructional models. Table 1 presents the relationship between the curriculum modules and the pedagogical approaches associated with each module:

Table 1: Architectural education curriculum modules and corresponding pedagogical modules

Architectural Education	Module (Instructional unit)	Theme	Description
Studio-based design learning	**Art & drawing**	Physical modelmaking	Blended strategy of sketching and scaled modelling
	History & Theory	Creativity stimulus	Infusion of pedagogical tools that enhance creativity, design skill and comprehension of the design process
		Critiques	Building students' critical skills using constructive feedback from instructors and peers individually or in groups
		Dialogue	Building healthy studio environments based around effective and multi-voiced dialogues between instructors and students
		Students' leaning styles and autonomy	Adopting diverse studio settings to accommodate students' diverse learning styles
	Building systems & technology	Experiential learning	Hands-on learning in the design studio helps students better understand building materials and work better with heritage-context projects.
	Humanities & social studies	Collaboration: interdisciplinary environment, teamwork, and group work	Bringing students from different design-related disciplines, institutions, cultures and countries to work together on a project
		Participatory stakeholder engagement	Combining traditional design studios with principles of participatory action to allow students integrate social and technical aspects
	Environmental control	Problem-based learning	Encourages students to learn by solving open-ended problems in the environment in student-centred learning

	Physical sciences & ICT	Digital design	Formation of a hybrid approach that combines digital and analogue practices to generate more creativity and accurate design solutions that meet human needs.
		Immersive technology	Use of immersive technology such as simulation, Extended Reality, Augmented Reality, and IVR for its promising potential & positive impact on students' ability to self-critique and work in groups
		Pedagogical strategies	Introduction of multi-scalar approaches to dependent and independent pedagogies of criticism, jury, peer learning, and self-learning

Sources: Anteet and Binabid, (2024); Enwerekowe and Chong, (2023).

The study findings shows that holistic design-based learning which is typical of architectural education incorporates a wide range of modules (or instructional units). Close examination of the features of the themes identified by Anteet and Binabid (2024) reveals that the universally accepted pedagogy of design education draws from a curriculum of robust learning which has the potential to evolve continuously. The main features of sustainable design education as derived from the comparative assessment highlights the role of student self-learning which also fluctuates between heutagogy and andragogy. The implications of this finding are of particular significance to the attainment of SDG 4 that seeks to provide quality education for designers to ensure the sustainability of the architectural profession. The attainment of SDG 11 is achieved when the expected learning outcome of effective design education leads to the development of sustainable cities and communities.

Cross-referencing the 12 themes with the modules outlined in the 2022 CCMAS template (Okebuola & Saliu, 2022) shows that the CCMAS performs comparatively well as a requirement for a comprehensive guide to sustainable architectural education in Nigeria. The CCMAS contributes 70% of the core content of the Architecture programme to which individual schools contribute 30% of local content reflective of ideology and context. Table 2 goes further to show the impact of each module on global architectural programmes which sheds more light on the potential diversity and influence of the programmes on graduates.

Table 2: Comparative analysis of the various modules in architecture in the US, Europe, Asia, Africa and Nigeria.

s/no	Module (Instructional Unit)	Nigeria	Asia	US/Canada	UK	Africa
1.	Architectural design studio	5	5	5	5	5
2.	Art and drawing	3	1	4	1	2
3.	Historical and theoretical studies	4	1	4	3	4
4.	Building systems and technology	4	5	4	3	3
5.	Humanities and social studies	2	1	4	3	1
6.	Environmental control	2	3	3	3	2
7.	Physical sciences and ICT	3	3	5	-	4
	Mean score (impact factor)	3.71	2.71	4.14	2.57*	3.00

** Mean score exclusive of physical sciences and ICT*
Impact on curriculum composition: 5 = very high, 4 = high, 3 = average, 2 = low, 1 = very low

Sources: Asia – National University of Singapore, Singapore; US/Canada – Columbia University, New York, USA & Carnegie Mellon University, Pittsburgh, USA; Europe – London Metropolitan University, England; Africa – University of Cape Town, South Africa; Nigeria – University of Jos, Plateau state. Adapted from Enwerekowe & Chong, 2023.

Based on descriptive analysis on the Severity Index (SI) ranking of desk research on the curriculum adopted by global schools of architecture, the findings on Table 2 show that schools of Architecture in North America (US/Canada) have the highest ranked programmes for inclusivity and diversity of modules. This sort of robust curriculum is part of a pedagogy that has been instrumental to groundbreaking research from schools such as the University of Maine and the University of Florida, USA. Maine developed the BioHome3D (Figure 2) and Florida developed the Vapour-Induced Phase-Separations 3D Printing (VIPS-3DP).

Both schools of architecture developed and tested then-revolutionary methods of 3D printing of buildings. Maine used a bio-based wood waste composite of pulverised sawdust and a polymer binder and Florida used an eco-friendly, dissolvable polymer-based liquid which includes metal or ceramic particles (Dooley, 2024; UMaine, 2022). These products are environmentally-conscious and can withstand extreme weather conditions and building stresses. Enhancing pedagogical tools, such as the CCMAS, in Nigerian schools of Architecture could well advance similar indigenous

research into the conversion of more readily available organic and inorganic waste such as single-use plastics, fly-ash, corn husks, etc. to provide affordable domestic building solutions.

Figure 2: BioHome3D prototype. Source: The University of Maine (2022)

By comparison, architectural schools in Asia, which also score very highly in the use of technology and concerns about environmental control, implement curricula traditionally detached from humanities and social studies. By implication, they are pioneering centres of design innovation in building systems which are easily adaptable to diverse cultures in their quest for universal acceptance. The shortcomings of the Asian model may be reflected in the detachment from social inclusivity in the programmes for design education. Similar detachment from sustainable antecedents in history and the humanities may be reflected in the learning outcome of the Asian model.

Therefore, the structure of the recently developed CCMAS programme for Nigerian schools of Architecture has the potential to provide an adequate framework for sustainable training of future architects. However, the shortcomings of the CCMAS are hinged on the integration of updated and consistent technologies which will not only improve teaching dissemination and assessment through hybrid channels, but also inspire innovative output similar to counterparts in global schools of Architecture. Despite the significant increase in hybrid teaching practices in Nigerian design education following the COVID-19 pandemic, disparities in infrastructure and digital

literacy remain a stumbling block to adopting pedagogies driven by advanced technology (Ceylan et al, 2024). *This hampers the realisation of key SDGs 4 and 11 affecting provisions of quality education and community development, as well as raising concerns for economic growth and development (SDG 8), ability to innovate (SDG 9), and equity in global community outlook (SDG 10).*

Future trends in traditional Nigerian architectural education

Traditionally, architectural education stems from a pedagogy that is both teacher-centred (Maestre model) and student-centred (self-learning). Following its antecedents in arts and science, the architectural model of education has the rather unique purpose of striking a balance between 5 pedagogical approaches as shown in Figure 3 (Relleve, 2019). The discussions around pedagogy involve the teachers, the programmes of learning and the teaching tools. Exhaustive studies on the programmes of learning in architectural education draw many parallels between design theory and design competence exhibited in the studio and eventual practice (Aderonmu, 2013; Almendra, 2012; Ambrose et al, 2010; Crowther, 2013; Eshun, 2016, Iftikhar, Crowther & Burton, 2023; Tezel & Caskin, 2010; Uluöglu, 2000).

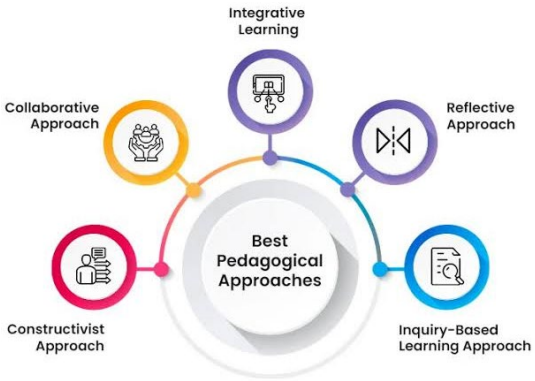

Figure 3: Best pedagogical approaches (Relleve, 2019).

Although this study does not provide an in-depth empirical analysis of the attributes and competence of architectural educators, the study findings from the available literature show that like all professional fields such as Law, Medicine and Engineering, Architecture is a severely regulated course of study and teaching. Educators are usually trained and licensed professionals at different cadres of engagement. Learners must also meet certain academic and personality requirements to commence study. Competence and compatibility with the profession are usually demonstrated through portfolios and dossiers of both learners and educators.

Distinctively, the provisions of the Nigerian Universities Commission which are adopted in the CCMAS stipulate that each school of Architecture has an acceptable composition of junior-, mid-level and senior-educators to meet accreditation requirements. Junior cadre educators are needed to provide zeal for innovation, IoT, and a sense of adventure. Mid-level educators nurture a spirit of experimentation through creative thinking and senior cadre educators are needed to develop experienced critical thinking. The educator who employs iterative critiques (pedagogy) to teach the conceptual basis of design (content) using appropriate manual and digital tools enriches the design learning process.

How educators deliver their content and guide the learning process is a very important aspect of pedagogy. Educational content should be diverse yet insightful enough to cover all aspects of the built environment, business, social studies, law, technology and health. The information disseminated is required to be updated to include modern trends and current issues in the profession (Güler, 2022; Soliman et al, 2019); yet rooted in the past which respects culture, tradition, longevity, order and classicism.

Additionally, educators are expected to take full advantage of available technologies which include AI, ML, IoT (Internet of Things) and VR to keep learners involved and stimulated (Ioannou, 2018; Leathem et al, 2019; Nisha, 2019; Saleh et al, 2023; Sciannamè, 2023). The learning process should be engaging enough to create teacher-centred strategies that guide and nurture developing learners but significantly independent to foster self-realised learning and conceptualisation (Gyurkovich, 2020; McClean, 2009).

Architectural education has come a long way from the 19th century industrial-style draughtsman studios. These have been upgraded with many aspects of modern design consultation spaces which include virtual learning centres, private and public discussion spaces, production rooms and workshops, break rooms and digital presentation/media rooms in many schools of architecture around the world (Iranmanesh & Onur, 2022).

Figure 4: Architectural studios in Nigerian public universities – devoid of technological teaching aids, sparsely furnished and insufficient furniture in University of Jos (top left and right) and MAUTECH (bottom left and right). Source: authors' file.

The requirements of the CCMAS also include the provision of benchmark minimum facilities for the delivery of quality architectural education in

Nigeria. These include (but are not limited to) furnished and equipped design studios with drafting tables, art and modelling studios, technical workshops, environmental systems laboratories (with field and controlled environment equipment), CADD laboratories, staff accommodation and lecture theatres. These requirements are expensive and require routine upgrading to remain up-to-date. Many Nigerian public schools of Architecture grapple with the cost of provision and maintenance of such facilities to the detriment of students' learning as shown in Figure 4.

The practice of private-partnership collaborations with industry-based investors has become a lucrative way to equip institutions with facilities dedicated towards the production of research and development output: such as the BioHome3D. This form of practical learning, in many ways, fulfils the primary mandate of schools of design. *Additionally, well-equipped learning facilities encourage outcomes that lead to the attainment of SDGs 3, 8, 9 and 10 which promote learners' well-being, economic growth in the built environment, innovative designs and reduce learning inequalities across the globe.*

In suitably equipped learning environments, design educators are free to implement design pedagogies that build up collaboration and group work in interdisciplinary environments (Deutsch, 2020) using digital design techniques, immersive techniques and creativity (Kebritchi et al, 2017; Masdéu & Fuses, 2017). The flexibility of the CCMAS encourages individual schools of Architecture in Nigeria to expand their pedagogical approaches towards versatility and relevance for modern day (and future) practice during routine and regular review. Recent studies have repeatedly supported student-centred design pedagogies which encourage interaction, self-critique, engagement, and peer-to-peer and instructor dialogue (Fleischmann, 2021; Hargrove, 2011). Ideological inclinations, thus, suggest that futuristic architectural education may be leaning more towards heutagogy or andragogy which, in turn, will lead towards further research on these perspectives (Blaschke, 2019).

Further interpretation of findings using the lens of transformative learning corroborates that for education to be sustainable, such pedagogy is broadened

by design to extend its coverage beyond the contents of its curriculum and allow for reflexivity, digital literacy and collaboration (Blake et al., 2013; Nanjundaswamy et al., 2021; Singer-Brodowski, 2023; Zhou et al., 2025). Based on these instances, the CCMAS in Nigeria can take elements from the Design-Build and Community Studio models of South Africa and Kenya respectively, which relates design pedagogy to social interaction and environmental stewardship (Asongu & Odhiambo, 2018; Odhiambo, 2018).

These principles apply pedagogy to developmental objectives, by entrenching learning into issues of sustainability in real life. The study supports a strategic pedagogical policy that calls for periodic review, partnerships between industry and education and also prioritizes investment in digital infrastructure as a way of advancing architecture education in Nigeria.

5. Conclusion

Architectural teaching and learning have taken on a lot of changes in recent years. While the rudimentary principles and ideologies may have remained consistent for all and sundry, this study highlighted the significance of evolving pedagogical components needed to equip suitably trained entrants into the profession. The studio in architectural education will remain the hub of collaborative interdisciplinary creativity where learners are encouraged to incorporate new technologies. Integrating emerging technologies means these collaborative experiences transcend physical studios as stakeholders can benefit from cultural and social experiences in different campuses and countries across the world. Architectural educators need to familiarise themselves with the advanced technologies already being used by students in order to have a common language of communication with them. In doing so, they will also be able to develop strategies to prevent the learners from excessive dependence on technology which could diminish learners' capacity for critical thinking skills and has the tendency to generate cookie-cutter designs.

The study set out to examine the adequacy of the Nigerian curriculum for sustainable Nigerian architectural education and the implementation of deep-rooted pedagogical interventions. The findings reiterate that sustainable

education stands to benefit from pedagogical tools such as the CCMAS which adopt universal instructional modules and themes. The study findings also show that routine and regular updating of design education pedagogies sustains learning values which include dialogue, peer learning, participatory design, problem-solving and brainstorming through desk crits and group discussions.

This study recommends that learning processes should be engaging enough to create teacher-centred strategies that guide and nurture developing learners, but are significantly independent to foster self-realised learning and conceptualisation. The study also recommends the inclusion of independent, industry-based partnerships which are known to significantly enhance real-world applications of learning outcomes. The study proposes the expanded study of pedagogy from a wider research base to determine trends that may be helping or hurting architectural education (e.g. wider samples, polytechnic programmes, specialised programmes like landscape design, urban design etc.). The study also recommends further study on effective pedagogies that would help architectural educators nurture students' creativity demonstrated in the design studio.

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