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INTEGRATION OF SUSTAINABILITY IN ARCHITECTURAL EDUCATION; A REVIEW & EVALUATION OF VARIOUS APPROACHES

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ABSTRACT

Architecture is the specialized field that facilitates the spatial layout required for human needs and offers a sustainable environment. It combines design and technology while heavily integrating a wide range of disciplines, including sociology, psychology, and other areas of study. It is not exempt from regional politics and economic constraints. Its many facets combine creativity, technical and scientific expertise, and everyday advances. It required a variety of sustainable development strategies. But the inclusion of sustainability is sometimes overlooked or equated with technological superiority. In the 21st century, social, cultural, and environmental challenges must be addressed while also integrating sustainable development, according to the UN decade of education for sustainable development. Regarding architectural education, it was the primary responsibility of the educational institutions to raise students' understanding of the need to be more considerate of how human conduct and design affect the environment. This paper explores various models and approaches that can be used to integrate sustainability knowledge in the traditional architectural curriculum, as well as investigates structural models, and assesses the level of emphasis on incorporating knowledge of sustainability in the curriculum of architecture education in the context of Pakistan. The best and most effective ways to include sustainability information in architectural education have been discussed in detail. The paper ends with suggestions for additional research into the efficacy of architectural curricula that incorporate sustainability knowledge.

Keywords: Architecture education, Curriculum, sustainability, integration, pedagogy, design studios.

INTRODUCTION:

Sustainability is essentially a contentious idea that is mostly used to highlight our worries about the future of the world, covering topics as diverse as urban studies, economics, energy regulations, healthcare, transportation, waste management, and politics. The focus is broad despite covering a wide range of topics; there is just one area of concern: how sustainability should be understood, communicated, and approached as a goal. The term "sustainability" is frequently mistaken with the term "conservation," which refers to merely maintaining the status quo (Becerik-Gerber et al., 2011). Since it is political, it is also employed merely as a motto and is kept in mind by all parties involved. However, the question of whether sustainability is such a nebulous concept remains unanswerable. The difficulty lies in attempting to adequately and effectively define sustainability given its

inherent nature. Whatever the cause, it has gained notoriety as a multifaceted, multidisciplinary concept that is frequently employed as a prefix for environmentally sensitive concerns at the start of any development.

A generally used definition of sustainable development is provided in Brundtland Report (Keeble, 1988): “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Due to increased environmental awareness among society's numerous stakeholders over the past two decades, architectural schools have been more interested in integrating sustainability topics into their lectures and overall curriculum. Even some architectural schools are now providing environmental design courses that are more closely related to the traditional architectural curriculum and use multidisciplinary methods. However, there is a subdued opposition to sustainability that is widespread among historians and theorists, and this has unwittingly turned many architects away from ecological problems.

After being discussed for many years, contemporary architecture education has managed to include sustainability themes in its curricula. The first such discussion started when Agenda 21 of the UN conference on environment and development was published in 1992, which forced society to consider its role in environmental degradation. Sustainability was thus included in architectural education along this approach at all levels—technical, political, and even legal.

Ethical considerations should be the primary justification for including sustainability concepts in architectural education (Fox, 2000). The architect's primary responsibility is to create in a way that will enhance the wellness of its users, thereby preventing harm and taking guidance from the medical communityfar. The integration of sustainability into architectural education is proceeding extremely slowly, and there is no trace of a sustainable design. The issue of sustainability required to be covered as part of the educational process for architects because they are crucial stakeholders in the agents in charge of responding to the constantly changing built environment.

SUSTAINABILITY AND ARCHITECTURAL EDUCATION:

The constructed environment is shaped in large part by the building industry, which makes it liable for detrimental environmental effects (El-Feki & Kenawy, 2018). Being a significant player in the construction industry, architecture has the potential to influence the entire industry in the direction of sustainable development in the fields of buildings and cities by making the necessary knowledge and skills available to aspiring professionals to meet the challenges of the present and the future. Future architects should be familiar with and conscious of how their ideas, actions, and repercussions will affect the communities and environment around them.

Although the inclusion of sustainability issues in architectural education is highly significant, several resistances to the educational system and instructional methods have also been noted. While some universities support the integration of sustainable environmental education within the field of architecture, others believe that it is impractical given the already packed curriculum. As it is generally known, there is a critical need to incorporate sustainability principles into architecture education. Along with another crucial, powerful motivator of worldwide validation, pushing for the inclusion of

sustainable content in the architectural curriculum, ethics has been considered an important basis for its inclusion. The United Nations guidelines on education policy for a sustainable built environment also encourage universities and support their critical role (Commission et al., 2005). The development of instructional methods and research were prioritized.

SOME CONFLICTING THOUGHTS

Given its diversity, architecture can be seen as a complicated discipline. It requires a variety of competencies, including design creativity, scientific knowledge management in construction activities, the ability to work out aesthetics based on philosophy, and numerous conflicts in the modern world. In addition to many other topics, all of the aforementioned elements must be addressed in architectural education (Santini, 2020).

If we think about the different allied technology subjects in the curriculum, we will observe that these are more needed to be in line with environmental issues, but at the same time it put forward some diatribes encouraging the concept of sustainability.

If we use eco gadgets as an example of "fake sustainability," we can see that they are being used as status symbols rather than to increase efficiency. The same is true for LEED or BREEAM certifications, which place too much emphasis on energy efficiency and a fragmented view of sustainability rather than the full picture, which also includes resource depletion or pollution. These certifications are also accused of neglecting traditional construction methods, endorsing subpar building life cycles, and potentially harming local identities. While there has been very little progress toward sustainability (Wargo, 2010).

The field of design employs increasingly intricate strategies toward sustainability. Following writings by well-known practitioners has become popular as a trend. There are two types of them: those that view sustainability as a guiding principle essential to the design process and those who view it as a feature secondary to the process' more crucial elements, as is now the case with plumbing or electrical systems. These modern architects include Ken Yeang, Bjarke Ingels, Renzo Piano, and Richard Rogers. The sustainability component of their projects is evident in their work.

Efficiency is not the major or primary component of the design process for the second group. This does not imply that the buildings these architects have developed are any less sustainable or that they are unaware of the subject of environmental sensitivity. However, formal experimentation and other facets of the social significance of buildings are given precedence in their work. This group includes well-known architects like Remment Koolhas and Peter Zumthor (Jacobsen & Tester, 2016). According to their descriptions, their architectural designs place a greater emphasis on formal elements, the spatial impacts of various places, or contextual relationships.

Up until recently, there was a general criticism of sustainability in the arts and humanities aspects of the architectural curriculum, either as a general idea or as it was used in building. The phrase is frequently avoided by architectural historians and theorists because of its obscurity. Another reason why sustainability is not widely accepted in the humanities is that there isn't enough theoretical support for it or that green building doesn't make a substantial architectural contribution.

PERCEPTION OF SUSTAINABILITY WITHIN ARCHITECTURE:

As architecture combines the arts, ecology, social, and political concerns, sustainability is frequently referred to as green, ecological, environmentally sensitive, and energy efficient. But none of the phrases completely captures the complexity of sustainability. If we describe architecture as the science, art, and technology of designing the built environment, it is an exact match to promote sustainability as a foundation to justify technology innovation, rather than incorporating the making of wise design decisions. Furthermore, grading systems that offer a checklist to evaluate buildings have been developed by policymakers as a tool to manage quantifiable sustainability aspects and execute economic policies.

Various Methods for Integrating Sustainable Environmental Education

There are several different categories for the suggested strategies. As narrated by (El-Feki & Kenawy, 2018) Wright (2003) suggested one such integration model. He offered three possible approaches for incorporating sustainability into architectural education. According to his first approach, sustainability may be incorporated into all curriculum modules because of its nature. It is predicated on the notion that implying sustainability is inseparably linked to the essence of real philosophy and practice.

Using this methodology, the Educate (2011) project went on to suggest two curricula, referred to as linear and completely integrated. Sustainability knowledge is covered in parallel with the various courses according to a linear paradigm. In contrast, the design studio modules are the main focus and are seen as interdisciplinary working areas in a fully integrated structure. The key focus is that it is thought that every instructor is fully cognizant of the complexities of sustainability and will be able to enhance the curriculum as a result.

The existing curriculum modules for the second method are required to be modified to integrate environmental control methods and systems. The partially integrated structure was employed in this strategy to identify potential solutions for producing environmentally comfortable spatial configurations for building users in the design studio modules. Environmental science and design studios that are completely interdependent are suggested. The theme in the design studios and related subjects was maintained responsive to the environmental control systems while the rest of the curriculum stayed the same. A technology domain technique was proposed, where environmental system modules may cover the sustainability material needed by architecture students.

The third concept, which (Iulo et al.,2013) refers to as the "core value method," involved reviewing and incorporating sustainability in the entire architectural education curriculum into various modules.

The concept of sustainability has to be incorporated into the architectural curriculum to promote lifelong learning. The first step in achieving this goal is to acknowledge sustainability as a fundamental idea and as a pressing problem. The curriculum must incorporate in-depth information and a preference for advanced courses over beginner ones. It is imperative to instill in architecture students a way of thinking that recognizes the significance of sustainability challenges and different measures within the built environment. The curriculum must include material that emphasizes the delivery of an integrated sustainable idea that is combined with the other fundamental elements of

architecture. Design methodologies are often standardized in architecture schools; sustainability can be implemented into a sensible step-by-step integration to actualize the responsive curriculum. However, it's possible that the faculty members must first resolve any disagreements and consensual concerns.

ARCHITECTURE EDUCATION IN PAKISTAN:

Comparing Pakistan to other nations around the globe, architectural education is quite young. When Pakistan gained independence from Britain in 1947, there were a few foreign-trained architects, but there was no single school of architecture at the time. In 1954, a school was founded in Karachi, and 1958, the National College of Arts was established with the capability of providing diploma courses in a variety of areas (Naz, 2010). To provide a systematic degree program in architecture, the department of architecture was formed in 1962 at the University of Engineering and Technology, Lahore. Only five institutions were operating nationwide that offered architecture within the first 50 years of the nation's independence.

Curriculum in Pakistan:

The Higher Education Commission of Pakistan (HEC), in close coordination with the Pakistan Council of Architects and Town Planners, is responsible for developing the curriculum in Pakistan and major categorizing its subjects (PCATP). The studios/workshops, allied sciences & Technologies, history, theory and critical analysis, professional practice and communication tools, and electives are the primary five areas (Pakistan, 2013). With concepts and elements of environmental, sustainable, and ecological design, such as green technology, sustainable construction, and sustainable building materials, knowledge connected to sustainability can be encompassed within the allied sciences.

Allied Sciences & Technologies:

The most fundamental construction knowledge regarding building materials, construction techniques, concerns with human comfort and the environment, and lighting is covered in this subject of the architectural curriculum. The goal of these courses has always been to teach students how to establish a secure and comfortable environment. However, in the modern era, these also serve the added aim of disseminating technological information for resource efficiency, low energy use, and pollution control.

Design Studios:

The backbone of architectural education is made up of design courses. It includes everything, from design studios, modeling, and drawings, through graduation theses. These are the main courses in which students develop their design abilities, critical thinking skills, and technical knowledge. In Pakistan, 82 minimum credits out of 170 total credits are required for graduation. The studios are the topic where knowledge from all other subject areas is combined, whether it be from theory, associated courses, or the arts and humanities. Students are expected to thrive in these skills of knowledge integration. This aspect becomes extremely important when discussing the sustainability element, which is the topic of this article, and when decisions are made during the design process. The use of sunlight can be improved with the right orientation, the quantity of insulation needed can

be altered with the right materials, and the choice of façade materials and styles can greatly influence whether natural ventilation is aided or impeded.

The design studios are not used for typical classroom instruction. These are the designated areas where the teacher and students create the classic Master and apprentice relationship. All issues, whether they relate to design disciplines or the integration of knowledge learned from other courses, are resolved by deliberation and agreement.

It contains sustainability information and design studios, which is a complicated phenomenon. Within the studios, the primary focus is not on efficiency calculations or environmental impacts. The design studio's methods will be more technical if the term sustainability is employed. Therefore, the term "sustainability" can be used in design course curricula within quotation marks.

When it comes to the architectural design studio, the overall situation is not straightforward and the students are expected to learn, abide by, and incorporate the construction specifications while creating the spatial configurations. The spaces also needed to have aesthetic value, meaning, and the best possible scenarios. When choosing the many components of the suggested design during the design process, some studios pay particular attention to the environmental concern for the trends of sustainable design solutions (Shari & Jaafar, 2006). The legislation included in the bye-laws of the buildings' designs in actual settings will be the more persuasive element. The integration of sustainability in the design studio subjects will then be unavoidable once the students have been exposed to these real-world settings with some legal restrictions.

History, Theory, and critical analysis:

The courses in this field cover the history, objectives, and guiding principles of architecture. Among these are the historical, socioeconomic, cultural, and ethical challenges. The lectures in this area are meant to teach the students about the historical development of various architectural styles, formal architectural terminology and movements, and the ideologies behind these developments.

The added goal of this category is to help the students learn how to take a critical stance toward the environment in which they will practice and act. Environmental issues are currently the more significant aspect of the context. The topics covered use examples from many environmental disciplines with a focus on the socially relevant material. Within this category, certain lectures on the topic of sustainable architecture are added.

When compared to the other facets of the profession, the incorporation of environmental issues in the architectural humanities portion is unquestionably constrained. Given that human activity has such a significant detrimental impact on the environment, the understanding of historical and cultural phenomena related to environmental issues becomes more pertinent when applied to architectural education. However, the interest of architects in nature is relatively slower to develop into a fully committed approach to environmental issues. With the help of environmental humanities, which offer historical, theoretical, and speculative approaches to evaluating the sociocultural aspect of environmental challenges, the situation is currently improving substantially. Exams on environmental issues could be incorporated into architectural education through indirect

methods like the growing interest in environmental social issues like green gentrification or social justice.

DISCUSSION AND RECOMMENDATIONS

Architecture practice is a measure of how sensibly the 'environment' is responded to while designing in any given context. Research focuses and research issues in the field of architecture are another indicator of how seriously sustainability as a subject is taken. Though 'sustainability' as a concept and idea is no more novel in Architecture education, however, lapses in the holistic perception of the subject can be observed where sustainability is given a limited interpretation as 'energy efficiency or 'rainwater harvesting or any other interconnected technique. Clarity of the overall subject and its significance for human and global lifecycle and safety is of greater importance, before narrowing it down to sets of limited procedures.

Strategies for incorporating Sustainability

The study illustrates that there is a general agreement on the significance of integrating sustainability in architectural education. Accordingly, to improve and maintain such integrations, a set of recommended actions are presented because of the study.

- **Multidisciplinary Integration**

Sustainability; as the term advocates, is about interdisciplinary collaboration between different fields and professionals. This requires creating a respectful and conducive environment, where a variety of professionals can clearly express their expertise to formulate comprehensive goals and a way forward.

- **Administrative Involvement**

Involvement of policymakers and different tiers of administration is inevitable because willingness coming from the top will help in raising overall awareness about sustainability of the whole society in general and University administration in particular. It can be done through workshops and campaigns, which will trigger different administrative forums to think and consequently become part of the sustainable mindset.

- **Legal Procedures and Approvals**

From an execution standpoint, it is suggested that sustainable applications should be made a mandatory part of the legal permits. To smoothly start the process, in the beginning, incentives could be offered to the members and designs that are more aligned with the principles of sustainability.

- **Curriculum relevance and revisions**

To cope with a certain society and environment the curricula is to be updated and upgraded. Attention should be paid to infiltrate sustainability in the whole curriculum throughout, then monitor and update accordingly.

- **Sustainability – As Subject and Object**

Sustainability in architecture education could be divided into two parts i.e. Subjective or Qualitative and Objective or Quantitative. The subjective part may be taught in the early years, where broader concepts and ideas can be discussed for awareness and importance of

the subject area. In the later part Objective or Quantitative spectrum of sustainability could be taught in the senior years.

Horizontal and Vertical Courses

After registering Sustainability as an integral part of the architecture, The second most important stage in architecture academia is: What, How, and When should each part of sustainability be introduced to students? Coordination between horizontal and vertical layers of different courses related to sustainability and architecture design & theory is extremely important. Horizontally, a series of courses that complement design studios and other courses need to be carefully sorted on different levels. Establishing a smooth Vertical ladder to connect horizontal layers is also of great importance to increase the level of cohesive complexity among all courses of architecture education. Handling limitations in terms of allowed credit hours in the curriculum might be a tedious job. To overcome, it is believed that it would be helpful if sustainability is spread among all design studios with different dosages; capacities, approaches, complexities, and required theoretical inputs. Appropriate levels could be deliberated to deal with sustainable issues that can vary from a spectrum of climate to building materials, appropriate building technologies, and renewable energy resources i.e wind, solar, etc. Bearing in mind that it should be dealt with as a holistic system, that encompasses the trio (social, economic as well as environmental systems both passive and active). It could be applied not only to design studios but to other related courses as well, that include building construction, history & theory, and project management courses, etc. It would enable students to understand and cope with sustainability as an integral part of the design, as important and applicable as other main parameters of architecture education, like building typologies and building technologies, etc. It might then be registered that sustainability is not a random add-on layer to projects, instead, it is well integrated and emerges from the core of architecture design.

Advanced Studies and Research

Developing specialty areas for research and higher studies would help create an environment, where society in general and architecture education, in particular, would start benefitting from the real fruit of sustainability. Some of the possible niches in this regard are given as under.

- **Faculty Awareness and Training**

The teaching staff must adopt new techniques and become more involved in raising community awareness. A key component of this process is having qualified faculty. Universities should expand their opportunities for producing sustainability experts. Students should be allowed to innovate and teachers should encourage them to do more research.

- **Project and Research Funding**

To involve dedicated individuals for productive outcomes they must be incentivized in terms of funds allocation, grants, and scholarships.

- **Sustainable Rehabilitation**

More specialized courses that study how to transform an existing non-sustainable building into a sustainable solution, notably in terms of energy efficiency and carbon emission

reduction, should be added to the curriculum. It might turn out to be yet another intriguing field, both for research and application at the master and doctoral levels.

Flexible Adaptation of Curriculum

Since there can be no global pedagogy that encompasses the idea of teaching/learning architecture, suitable for all social, cultural, and environmental settings, it is difficult to come up with a single universal answer for developing a sustainably responsive curriculum. Within the composition and tradition of each region, school, and faculty, integrating environmental, technological, cultural, and human-centered approaches to the architectural curriculum should be taken into consideration. Understanding human resource capability is crucial for achieving a curriculum for sustainably responsive architecture. Conducting interactive, unconventional forums where the free flow of opinion exchange is made possible could be the first step in improving the capacity of concerned faculty members in the area of sustainability. A localized agreement on instructional techniques to raise students' interest and awareness may be the product of facilitators in the provision of training opportunities. As a result, curriculum updates that incorporate post-evaluation discourses and evidence-based learning and address social and technological knowledge of sustainability in the built environment should be made regularly.

CONCLUSIONS

Academically speaking, all parties involved concur that incorporating sustainability into architectural curricula is crucial and must be introduced, followed, reviewed, and updated regularly. Sustainability will eventually occur. The government is in the process of mandating it to the point that it becomes law. When it happens, sustainability will flourish on a mass scale. For this evolution, architecture schools need to be properly prepared far in advance. Additionally, exposure to international experiences and exchanges through joint programs and collaboration with foreign universities ensures that the frontiers of architecture education are expanded to the point where sustainability finally permeates society as a way of life. Universities must continue balancing prescriptive inclinations with challenging knowledge claims, therefore critical debates about sustainability within the field of architectural humanities should continue without downplaying the significance of environmental challenges. Sustainability is now a major topic of conversation in many spheres of modern life and has become indissociably linked to political and development objectives. Therefore, regardless of differing viewpoints on the matter, architecture education must give students the right tools to create well-informed arguments and approaches to the problem. In the field of architecture, attitudes toward sustainability are tightly linked to worldviews, ideologies, and even regional settings; therefore, it may be impossible to reach a consensus on its consequences. The dynamic nature of the concept of sustainability should be embraced within all parts of the discipline, even though the discipline of architecture is used to dealing with contentious concepts —such as beauty, even the concept of architecture itself.

In conclusion, the schedule of each course should be created in a way to highlight specific concerns for sparking critical knowledge of linked concepts to inspire a high interest in sustainable architecture. The creation of real-time analogies and the measurement of real-world phenomena could support the sustainability narrative. It is possible to evaluate life-cycle concepts in terms of various material scenarios to promote awareness of sustainable

practices. The ability to establish methodological thinking for fostering a holistic sustainable architectural approach that prioritizes its constituents, such as context, social construct, energy performance, investment, and indoor environmental health, among others, should be developed to internalize the concept of sustainability. Future architects would be able to foresee the use of a flexible method to address sustainability in the built environment without underestimating any of the qualitative and quantitative assessments of a particular scenario. The absence of a comprehensive grasp of sustainability in architectural education has a significant impact on the profession of architecture and the laws intended to achieve a sustainable built environment.

Given the aforementioned ideas, it would be pointless to develop a stereotypical curriculum to encourage the study of sustainable design. Architectural education should adopt a flexible approach that aims to introduce the concept of sustainability as a way to understand the relationship between the built, natural, and contextual environments. Architectural education has a valuable diversity of cultural, social, aesthetic, and technological concepts. Only by offering a flexible curriculum that incorporates sustainability issues into all courses while utilizing a discussion-based approach and evidence-based learning could this flexibility be achieved.

As a manner of approaching integrated curriculum design to attain sustainability as an inherent value of architecture, we propose the need for a three overlapping layers model in our conclusion on sustainability in architectural education. By taking "vertical" courses, students can gain specialized knowledge about particular facets of sustainability, which forms the first layer. The second layer is made up of "horizontal" course integration. These layers guarantee that the specialized knowledge imparted in various "vertical" courses is connected and organized.

The third layer focuses on using students' ideas to create a transdisciplinary "problem net" for ecological design in architecture design studios. To promote sustainability as an intrinsic value, design studios should foster holistic thinking that can be accomplished through layered approaches. Recognizing the need for change and developing sustainable strategies in line with it is the challenge of teaching sustainable design. The major areas that need to be critically examined for quality assurance in the architecture program are the curriculum, the background and experience of the teachers, the integration of sustainability issues in the classroom, and creating a suitable relationship between horizontal and vertical courses throughout the entire program.

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