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TRANSFORMING KENYAN DESIGN EDUCATION THROUGH SUSTAINABLE AND UBUNTU-BASED STUDIO SPATIAL PLANNING: A CASE STUDY OF MASENO UNIVERSITY

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Abstract

Studio-based learning is the core pedagogical approach in design education, supporting experiential learning, collaboration, and the integration of theory with practice. However, many design studios in Kenyan universities face spatial, infrastructural, and pedagogical constraints that hinder collaborative learning and sustainable design practices. This study examined how integrating sustainable construction principles and Ubuntu-based collaborative learning enhances studio pedagogy for design students in the Department of Art and Design at Maseno University. The department was selected as the case study because its students specialize in their chosen design disciplines from the first through the fourth year of study. This specialization gives them extensive experience with studio-based learning and the ability to provide informed feedback on design studio requirements in their study area. The study adopted a mixed-methods case study design employing a cross-sectional survey design. The target population comprised 680 students enrolled in the Department of Art and Design and four lecturers teaching studio-based courses. A sample of 87 students, determined using Yamane's (1967) formula, was selected through purposive sampling alongside the four lecturers because of their direct experience with the studio environment. Data were collected through direct observation, semi-structured questionnaires administered to students, and open-ended questionnaires administered to lecturers. The research instruments were reviewed by experts in interior design to establish content validity, while a pilot study yielded a Cronbach's alpha coefficient of 0.94, indicating excellent reliability. Quantitative data were analyzed using descriptive statistics to identify patterns in spatial use, learning preferences, and studio challenges, while qualitative data were analyzed thematically to explore experiences of collaboration, studio culture, and learning environments. Findings indicate that existing studio spaces are constrained by overcrowding, limited collaborative zones, inadequate lighting and ventilation, and insufficient flexible furniture, which collectively hinder effective studio-based learning. Respondents emphasized the need for open-plan layouts and flexible spaces that facilitate collaboration and peer learning. The study further found that sustainable construction strategies such as passive ventilation, daylighting, and use of locally available materials are both environmentally and economically viable within the studio context. The findings demonstrate that aligning spatial design with pedagogical goals and Ubuntu principles fosters creativity, collaboration, and sustainability-oriented thinking. The study proposed a context-responsive design studio concept that combines flexible spatial layouts, collaborative workspaces, exhibition areas, and sustainable design strategies to support hands-on learning. The study concludes that context-sensitive and culturally grounded studio environments are essential for preparing future designers for sustainable and collaborative professional practice.

Keywords: *Studio pedagogy, sustainable construction, Ubuntu philosophy, collaborative learning, design education.*

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Introduction

Globally, design education has undergone significant transformation in response to rapid technological advancement and evolving societal needs, requiring curricula and pedagogical approaches that equip learners with the knowledge, skills, and competencies needed for future professional practice (Meyer & Norman, 2020; Pei et al., 2023; Brosens et al., 2023). Central to this transformation is the design studio, which remains the primary pedagogical environment for experiential, project-based, and practice-oriented learning. As noted by Toprak and Hacıhasanoğlu (2019), Milovanovic & Gero (2020), and Petrova (2021) the design studio is widely recognized as the cornerstone of design education because it provides an authentic project-based learning environment in which students develop design knowledge, problem-solving skills, reflective practice, and professional competencies through iterative design activities and critiques. However, for the successful implementation of these teaching methods, there is a need for learning environments where there is sufficient studio space and technological facilities available. Across many African higher education institutions, resource limitations and inadequate learning infrastructure continue to constrain the adoption of constructivist studio pedagogy. For example, Vandeyar and Mohale (2022), observed that, despite the creation of various legislative acts aimed at eliminating educational inequalities since 1994, many schools in South Africa still struggle with infrastructure and resource problems required for proper education. Similar challenges have been reported across many African universities, where increasing student enrolment has not been matched by corresponding investment in studio infrastructure. Consequently, under-resourced learning environments make it difficult to adopt collaborative approaches that characterize studio-based education. Despite these challenges, collaboration remains the key pedagogical tool in design education as it facilitates communication, knowledge construction, and better academic results (Elboj and Niemelä, 2010; Lai, 2011). Within the African context, Ubuntu philosophy provides a culturally grounded philosophical framework that complements collaborative studio pedagogy. Ubuntu, commonly expressed through the phrase "a person is a person through other persons," emphasizes communal relationships, shared responsibility, mutual respect, and interdependence (Mbiti, 1969). Contemporary scholars (Udom 2024; Oveh and Atomatofa, 2025) further present Ubuntu as a multifaceted concept embracing the principles of African ontology and including human dignity, care, hospitality, solidarity, interdependence, and interconnectedness. In educational institutions, Ubuntu philosophy creates learning environments that emphasize mutual support and cohesion among learners. Unlike individualistic educational models that emphasize competition, Ubuntu advocates community-oriented learning in which knowledge is co-created, shared, and strengthened through collaboration (Ukpokodu, 2016). These principles closely align with the collaborative nature of design studio education, where learning occurs through dialogue, peer critique, teamwork, and shared creative processes. Mohamed et al. (2018) adds that sustainability has also become another important principle to be considered when designing modern education programs to help students cope with environmental problems. Including the concept of sustainability in the studio design is imperative as it helps develop necessary skills in order to reduce the damage caused by humans to the natural environment (Mohamed et al., 2018). Sustainable design strategies, including passive ventilation, daylighting, renewable energy technologies, and the use of locally available low-carbon materials, improve indoor environmental quality while reducing resource consumption and operational costs (Prior et al., 2018; Mirasgedis et al., 2024; Warang et al., 2023). These considerations reinforce the need for design studios that not only support effective pedagogy but also provide sustainable, collaborative, and adaptable learning environments. These global and regional developments are also influencing higher education in Kenya, where institutions are increasingly adopting competency-based, learner-centred, and industry-responsive approaches that emphasize practical skills, innovation, and experiential learning (Mauki et al., 2020; Hadullo, 2021). The Commission for University Education (CUE) has further advanced this agenda through the development of the University Competency-Based Education Framework (UCBEF), which promotes collaborative, authentic, and technology-enhanced

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learning (CUE, 2026). As a result, institutions of higher learning are required to create educational settings that support collaboration, creativity, and digital integration. However, many design studios were developed to suit traditional teaching approaches and smaller student populations, making them inadequate for contemporary studio-based learning. Several universities have responded to these changing pedagogical demands by redesigning their studio environments. One notable example is Studio Reassembled at Taubman College which provides a relevant international model for addressing such spatial and pedagogical challenges. It replaces the traditional one-to-one studio model with a shared, flexible, and collaborative learning environment that integrates modular furniture, shared resources, and embedded academic and technical support. The studio operates as a "living lab," where spatial design and pedagogy continuously interact, promoting collaboration, visibility of student work, and interdisciplinary learning (The Plan, 2025; Architizer, 2026). This model demonstrates how adaptable studio environments can enhance experiential learning and resource sharing in design education. Although international models demonstrate the educational value of flexible and collaborative studio environments, there is insufficient evidence on ways to implement them in African universities that work with restricted resources. Furthermore, existing research has separately looked at the principles of studio teaching, sustainable design and design studios' space, with limited attention given to integrating indigenous philosophies such as Ubuntu into the spatial planning of design studios. At Maseno University, the Department of Art and Design has experienced increasing student enrolment alongside limited expansion of studio facilities. Existing design studios are characterized by overcrowding, inadequate lighting and ventilation, insufficient digital infrastructure, and a shortage of specialized learning spaces, creating a mismatch between the collaborative principles underpinning contemporary design education and the physical learning environment available to students. These challenges provided an appropriate case for examining how studio spaces can be reimagined to support both sustainable and culturally responsive pedagogy. Therefore, this study proposes a context-specific studio framework that integrates sustainable construction principles with Ubuntu-based collaborative learning to improve studio pedagogy. The proposed framework contributes to design education by demonstrating how culturally responsive, sustainable, and collaborative design principles can be integrated into the planning of design studios for resource-constrained higher education contexts in Kenya and across Africa. It also provides practical guidance for the planning and redesign of studio learning environments that better support contemporary design education.

Research Methodology

This study adopted a mixed-methods case study design within which a cross-sectional survey design was used to collect quantitative and qualitative data from students and lecturers at a single point in time. Preliminary site observations were conducted to document the characteristics of the existing studio spaces and to refine the survey instruments before administering the questionnaires. The case study was conducted in the Department of Art and Design at Maseno University to examine the adequacy of existing design studio spaces and develop a context-responsive studio design. The target population comprised approximately 680 students enrolled in the Department of Art and Design and four lecturers teaching studio-based courses at Maseno University. The student sample size was determined using Yamane's (1967) formula, which yielded a sample size of 87 students from the target population. Purposive sampling was then used to select the 87 students enrolled in studio-based courses because of their direct experience using the design studio facilities and could provide information relevant to the study objectives. Purposive sampling was also used to select the four lecturers responsible for studio-based teaching because of their direct experience with the studio environment and its functional challenges, ensuring alignment with the study objectives. A semi-structured online questionnaire survey was administered to the students and open-ended questionnaires to the four lecturers to collect data on their experience with the existing learning spaces and requirements for a design studio that supports design learning at Maseno University. Data were collected through direct observation, a semi-structured

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questionnaire administered to students, and open-ended questionnaires administered to lecturers. Site observations guided by an observation checklist assessed the functionality of the existing design studio facilities, focusing on spatial layout, circulation patterns, lighting and ventilation, furniture arrangement, and material finishes. Observations were documented through photographs, sketches, and field notes. These observations established the baseline conditions of the existing studio environment and informed the development of the student and lecturer questionnaires. The student questionnaire examined studio utilization, satisfaction with existing facilities, environmental conditions, learning preferences, and spatial requirements. While lecturers' questionnaire explored their instructional experiences, operational challenges, and recommendations for improving the design studio environment. Observation data were analyzed descriptively and presented using photographs, sketches, floor plans, and narrative descriptions. Quantitative questionnaire data were analyzed using descriptive statistics including frequencies, and percentages in Microsoft Excel and presented in tables, charts, and graphs to identify patterns in user satisfaction and preferences. Qualitative responses were analyzed thematically to identify recurring issues related to spatial functionality and environmental conditions. Findings from all data sources were integrated to inform the development of a context-responsive design studio emphasizing sustainability, flexibility, collaboration, and functionality. The proposed studio design was developed through an iterative design process that translated user needs, lecturer recommendations, and observational findings into architectural concepts. Preliminary layouts were refined through successive iterations before being modelled and visualized using Archicad software using architectural drawings and three-dimensional renderings. The research instruments were reviewed by two experts in interior design to establish content validity. A pilot study involving 17 participants who were not included in the main study was conducted to refine the questionnaire. The reliability was assessed using Cronbach's alpha, which yielded a reliability coefficient of 0.94, indicating excellent internal consistency. Ethical considerations were observed throughout the study. Participation was voluntary, informed consent was obtained from all respondents, and confidentiality and anonymity were maintained. The information collected was used solely for academic purposes.

Results and Discussion

Assessment of the Existing Design Studio Environment

The first research objective was to assess the adequacy of the existing design studio environment at the Department of Art and Design, Maseno University. The findings are presented below.

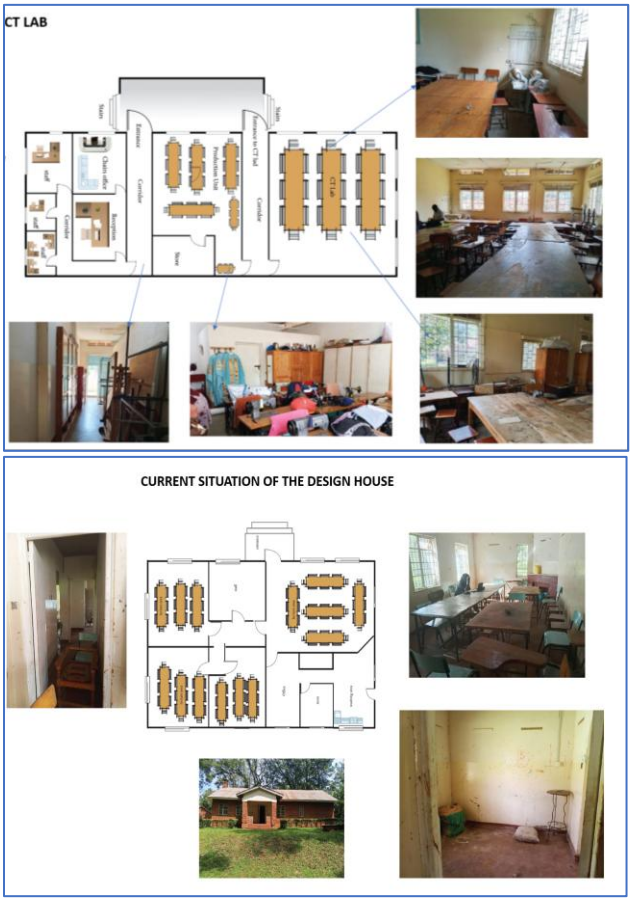
Situational Analysis of the Existing Studio Environment

Site observations conducted in the Department of Art and Design in Maseno University revealed considerable physical, spatial, and environmental deficiencies in the existing Clothing and Textiles Laboratory (CT Lab). The laboratory was characterized by overcrowded workspaces, narrow circulation paths, worn furniture surfaces, inadequate natural lighting due to security grills, poor ventilation, and deteriorating wall and floor finishes, all of which limited the effective use of the studio space (Figure 1a). Similar deficiencies were observed in the Design House, where overcrowding, excessive furniture, and restricted circulation reduced the functionality of the main studio area. Structural deterioration of the walls and the corrugated metal roofing also raised concerns regarding insulation, weather protection, and long-term durability (Figure 1b). These findings are consistent with previous studies that identify overcrowding, inadequate infrastructure, and poor environmental conditions as major barriers to effective studio-based in education institutions (Vandeyar & Mohale, 2022). They also reinforce the view that the physical studio environment plays a critical role in supporting collaboration, creativity, and experiential learning, which are fundamental to contemporary design education (Toprak & Hacıhasanoğlu, 2019; Milovanovic & Gero, 2020). These findings highlight the need for studio environments that are not only functionally adequate but also capable of supporting the collaborative and experiential learning approaches promoted in contemporary design education. Overall, the findings indicate that the existing design studios lack the spatial, environmental, and technological capacity

Received 01/06/2026; Revised 17/07/2026; Accepted 31/07/2026

required to support contemporary studio-based learning. The observed overcrowding, inadequate environmental conditions, deteriorating facilities, and limited infrastructure demonstrate the need for a more flexible, sustainable, and collaborative studio environment capable of supporting contemporary design pedagogy.

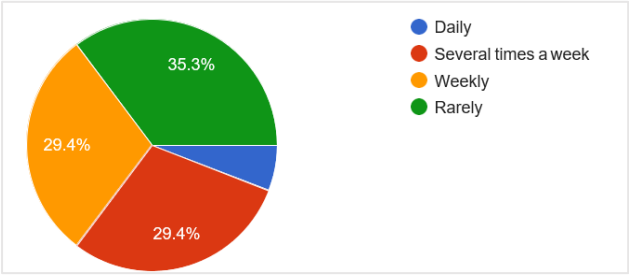
Figure 1
Floorplan of the current CT Lab and Design House



Studio Usage and Overall Experience

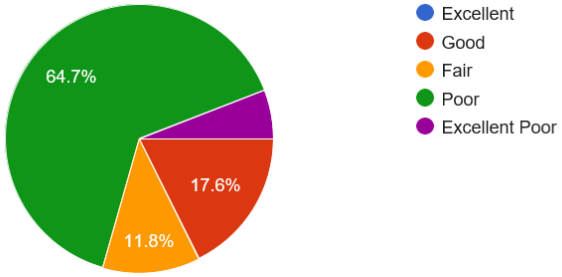
A total of 77 students from the Department of Art & Design took part in the survey. The findings 7showed varying levels of studio usage among students. Approximately 35.3% of respondents reported rarely using the studios, while 29.4% used them weekly or several times a week. Daily users represented a smaller proportion of respondents. See Figure 2 below.

Figure 2
Studio Usage



Regarding overall experience, 64.7% of respondents rated the current studios as poor, while 17.6% rated them as good and 11.8% as fair. See Figure 3 below.

Figure 3
Overall experience



The observation results indicating overcrowding, poor environmental conditions, and deterioration of physical infrastructure are aligned with the infrequent use of the studio and overall negative users' experience. All of the above results suggest that the present studio environment is unsuitable for studio-based learning or sustained participation of students. The same findings were provided by Díaz-López et al. (2022), who found out that poor studio environments have a negative effect on students' engagement and their learning experience. Krawczyk and Zender (2022) also suggested a link between poor ambient quality and discomfort as well as poor learning outcomes.

Suitability of Current Studios

Most respondents perceived the existing studios as unsuitable for Fine Art and Design learning. Approximately 70.6% of students rated the studios as "Not Suitable," while 23.5% considered them suitable. See Figure 4 below. These perceptions were consistent with the situational analysis, which identified

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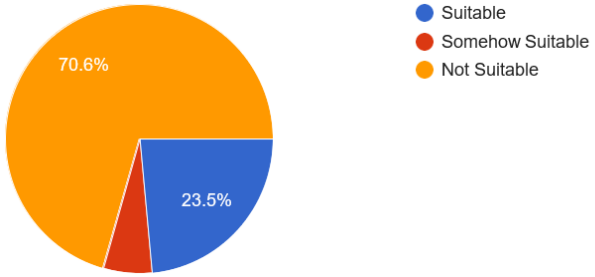
inadequate circulation, overcrowding, poor ventilation, and deteriorated building finishes. Lecturer responses further confirmed that the existing Clothing and Textiles Laboratory, originally designed to accommodate approximately 20 students, now serves much larger classes, resulting in congestion and reduced effectiveness during practical sessions. The perceived unsuitability reinforces earlier findings on low satisfaction and limited engagement, pointing to a general mismatch between studio design and pedagogical needs. Similar observations have been reported by Krawczyk and Zender (2022), who argue that inadequate spatial quality negatively affects creativity, collaboration, and design learning.

Figure 4
Suitability of Current Studios



Spatial and Environmental Requirements for the Proposed Design Study

The second research objective was to identify the spatial, environmental, technological, and pedagogical requirements that informed the proposed design studio framework.

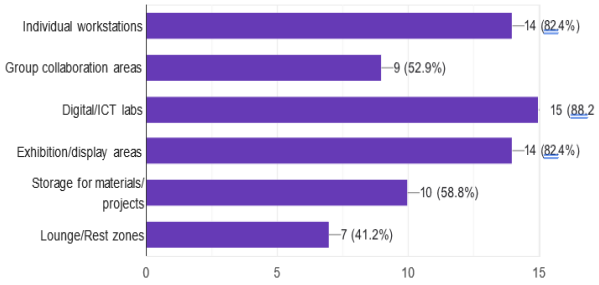
Evaluation of Studio Layouts

The Design House received a mean rating of 3.06 out of 5, while the CT Laboratory received a mean rating of 3.12 out of 5. Although these ratings indicate moderate acceptability, qualitative responses revealed concerns regarding congestion, inadequate workspace, poor lighting and ventilation, and insufficient accommodation for increasing student numbers. Respondents further noted limitations in practical workspaces and equipment accommodation, suggesting that the current layouts no longer adequately support studio-based learning. These findings reinforce the observation results and highlight the need for more flexible and functional studio layouts.

Spatial Requirements for the Proposed Studio

Students identified several missing or inadequate facilities within the current studio environment. The most frequently identified spaces included digital and ICT laboratories (88.2%), individual workstations (82.4%), exhibition and display areas (82.4%), storage facilities (58.8%), collaboration spaces (52.9%), and lounge or rest zones (41.2%). See Figure 5 below. Additional suggestions from respondents included sip-and-paint areas, charging stations, cleaning equipment rooms, assignment check areas, art libraries, ceramics and sculpting spaces with kilns, outdoor creative areas, and weaving spaces. The identified gaps indicate a strong demand for multifunctional studio environments that integrate production, display, digital work, and informal learning spaces. The lecturer responses similarly reported a shortage of specialized laboratories such as stitching laboratories, laundry rooms, fitting rooms, ironing rooms, storage rooms, pattern drafting rooms, and exhibition rooms was also indicated among others. The shortage of adequate storage facilities resulted in project damage, messiness, and inefficiency in project evaluation and presentation. Additionally, respondents also pointed out the shortage of staff offices, work desks, and boardrooms at the department level. The combination of inadequate workspaces, insufficient exhibition areas, lacking storage spaces, and equipment shortages implies deficiencies in structures that limit production and displaying processes. This result can be explained by the opinions of lecturers who argue that current facilities are inappropriate for practice-based learning.

Figure 5
Missing and Inadequate Spaces



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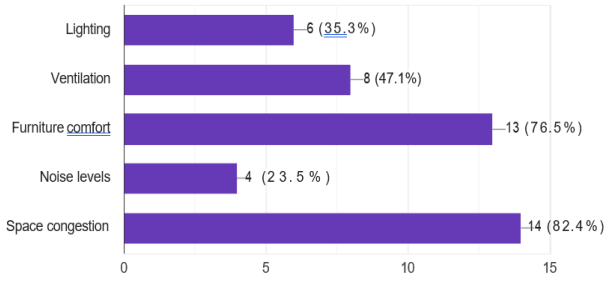
Environmental and Technological Requirements

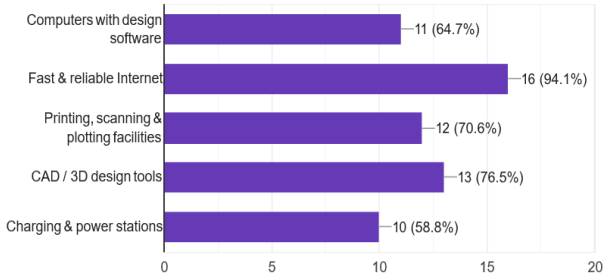
Responses from students identified several environmental conditions affecting productivity within the studios. The most frequently reported factors included congestion (82.4%), furniture comfort (76.5%), ventilation (47.1%), lighting (35.3%), and noise levels (23.5%). See Figure 6 below.

Figure 6
Environmental Factors Affecting Productivity



Quantitative ratings further indicated low levels of satisfaction with workspace or production space (mean = 1.82), exhibition space (mean = 1.71), equipment availability (mean = 2.06), and storage facilities (mean = 2.06). Students also prioritized fast internet connectivity (94.1%), CAD and 3D design tools (76.5%), printing, scanning and plotting facilities (70.6%), computers with design software (64.7%), and adequate charging stations. See Figure 7 below. The lecturers reinforced these findings by stating the need for improved technological infrastructure, citing inadequate computer networking facilities, limited electrical outlets, and insufficiently equipped computer laboratories as major barriers to contemporary design education. The results show that existing studio facilities fail to address the environmental and technological challenges of current design education. The students' high regard for the importance of reliable internet access, digital design technology, and versatile learning spaces suggests an increasing trend of the transition from the traditional production-oriented studios to hybrid spaces supporting physical and digital design. The desire to have proper ventilation, lighting, and comfort levels highlights the significance of applying sustainable design approaches, including daylighting, natural ventilation, and environmentally friendly materials, in order to improve both the performance of facilities and students' educational experience (Iwuanyanwu et al., 2023; Barnaby et al., 2024). Thus, the results show that contemporary studio facilities should embrace ergonomic design, environmental comfort, digital technology, and sustainability.

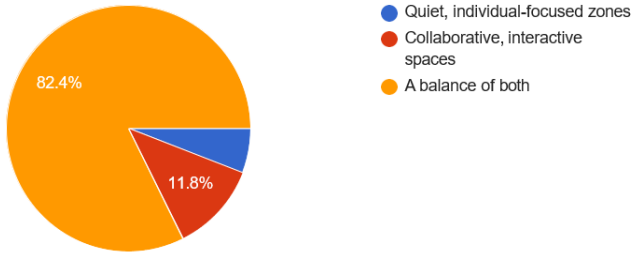
Figure 7
Digital Facilities for the New Studio



Collaborative Learning and Indigenous Design Values

Most respondents (82.4%) preferred learning environments that support both collaborative and individual work activities. This preference underscores the need for flexible studio configurations that accommodate diverse learning modes within the same spatial system. See figure 8 below.

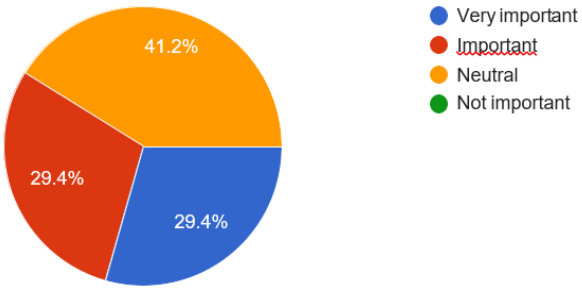
Figure 8
Preferred Learning Environment



Responses regarding the integration of African indigenous philosophies in studio design varied. Approximately 29.4% of respondents considered such integration to be important or very important, while a significant proportion remained neutral. See Figure 9 below.

Received 01/06/2026; Revised 17/07/2026; Accepted 31/07/2026

Figure 9
African Indigenous Philosophies in Studio Design



Although the quantitative findings indicate that only a moderate proportion considered African Indigenous philosophies to be important, qualitative responses consistently emphasised collaboration, cultural identity, shared creativity, and collective learning through concepts such as Ubuntu, Harambee, and Ujamaa. These findings suggest that Ubuntu was considered an important cultural and philosophical framework within the study, although it did not emerge as a primary design requirement in the quantitative findings. These findings support the view of Oveh and Atomatofa (2025), who describe Ubuntu as a relational framework for spatial design, and Choane (2025), who highlights its contribution to inclusive learning environments. Responses from lecturers emphasized the need for collaborative learning by identifying the absence of specialized studios, storage facilities, exhibition spaces, and staff work areas as factors that limited interaction and critique sessions. All these results suggest that the studio design must take into consideration not only the functional needs but also those concerning collaboration and cultural expression and learning. This study had limitations as it was based on a single case which limits generalizability to other institutions. The study is also discipline-specific, focusing on design studio-based learning environments, therefore the results may not directly apply to other academic fields with different spatial and pedagogical needs. Finally, the proposed studio framework is conceptual and has not been implemented or tested in practice. Its effectiveness therefore, remains theoretical and would require future validation through implementation or post-occupancy evaluation.

Development of the Proposed Studio Design Framework

Project Justification

The proposed studio design framework was developed to address the deficiencies identified in the existing studio environment through site observations and feedback from students and lecturers. The findings revealed shortcomings in pedagogic and space terms in relation to the current studios. Increased numbers of students have resulted in overcrowded studios with decreased functionality and inefficiency in practical teaching. In addition, the current studios do not adequately cater for modern design teaching, which is becoming increasingly dependent on technological, collaborative, and dynamic studio environments. The absence of specialized production, presentation, storage, and administrative areas hinders the development of a studio environment that fosters creativity and critique. Therefore, the proposal for redesigning the studios takes into account the requirements of both students and lecturers, as well as the current trends in teaching and institutional policy.

Design Framework and Concept Development

The proposed studio design framework was developed from the empirical findings of this study. It incorporates flexible spatial organization, sustainable construction strategies, technology-enabled learning spaces, and Ubuntu-inspired collaborative environments to address identified spatial, environmental, technological and pedagogical needs while supporting contemporary design education. The framework is further informed by the Ubuntu philosophy, which emphasizes interconnectedness, collective responsibility, and mutual support within learning communities. In the context of studio design, Ubuntu promotes collaborative learning, peer critique, shared creativity, and active participation in the design process. Qualitative findings further highlighted the importance of integrating indigenous philosophies with contemporary technologies and pedagogical approaches. Consequently, the proposed design incorporates shared workspaces, interactive learning areas, and flexible studio zones that support both collaborative and individual learning. Circular and interconnected spatial

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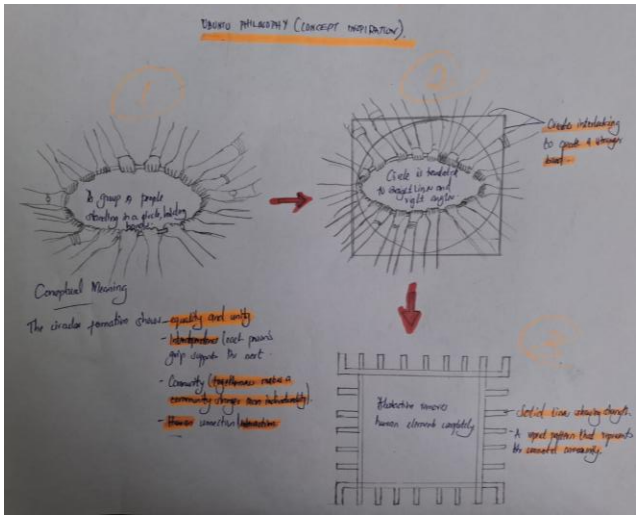
forms reinforce unity and teamwork, while the use of locally produced brick and earth-toned finishes reflects sustainable construction principles and contextual identity. Neutral interior finishes ensure that students' creative work remains the visual focus of the studio. (see Figure 10).

Figure 10
Conceptualization



Spatial Analysis of the Proposed Design

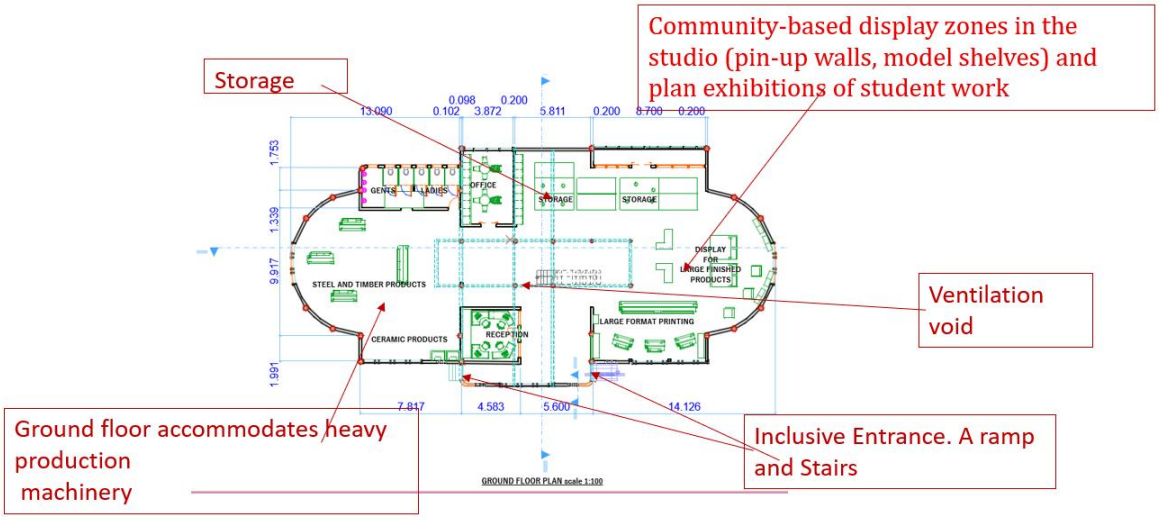
This proposed studio building will serve as a vertically integrated learning space with five floors that supports activities such as creation, collaboration, digital innovation, and interaction between various individuals at all five floors of the building. Every level has been carefully designed to be used as an interactive studio space.

Ground Floor: Production Studio and Community-Based Display

As shown in Figure 11 below, the ground floor acts as an open production studio focused on large-scale fabrication involving metals, timber, ceramics, and digital fabrication. Such a setup prioritizes collaborative spaces, clear circulation, and visibility, using a single interconnected workspace where individual studios do not apply but are replaced by a shared one. With a larger scope of activities involved, working in teams becomes crucial in handling materials, assembling the structure, and operating machines. Clear visibility allows learners to see what is going on in other areas and helps in developing skills through informal teaching from peers. By having shared spaces for storage and machinery, students are reminded of their reliance on each other, and this aligns with the Ubuntu philosophy of "I am because we are." In order to showcase their achievements and get constructive feedback, learners have a community-based display space which helps with reflective learning and interaction with others. A community-based display gives students a crucial opportunity to interact with the public and learn more about how their design ideas are seen, used, and affected overall. Students who engage directly with people of the community receive insightful feedback that helps them refine their design processes and promotes a more socially conscious approach to design education (UNESCO, 2022). Participating in the community also makes it possible for indigenous knowledge, cultural values, and life experiences to be shared, which enhances students' comprehension of local circumstances and requirements. Additionally, by incorporating regional knowledge systems into design practice, community-based displays support the preservation and enjoyment of cultural identity. According to Freire (1970), Sanders & Stappers (2008), and UNESCO (2022), these kinds of shows foster cooperation between students, local practitioners, artists, and people of the community. Western Michigan University (2024) argues that studios within communities allow for enhanced engagement with the outside world by integrating studies with society and business needs. Another element contributing to the interaction is a reception area.

Received 01/06/2026; Revised 17/07/2026; Accepted 31/07/2026

Figure 11
Ground Floor



First Floor - Clothing and Textile Studio

On the first level, a seamless studio system where clothing and textile learning are integrated is provided through a series of laboratories, manufacturing, fitting rooms, laundry, storage space, and administrative offices. Rather than separating classrooms, the design integrates the process of design to production through a seamless system of workstations for drafting patterns, cutting, stitching, and assembling. The production area completes the studio process by integrating small scale manufacturing into the process, while fitting ensures that the evaluation process is part of the process of design. Laundry facilities promote sustainability, while storage ensures proper resource allocation.

Second Floor - Interior Design and Arts Studio

Based on students' and lecturers' expressed need for exhibition spaces, the second level provides the integration of digital laboratories, art studios, model making labs, and exhibitions into one flexible environment called the studio ecosystem. The inclusion of a digital laboratory responds directly to students' prioritization of digital and ICT facilities (88.2%) and lecturers' concerns regarding inadequate computer networking infrastructure. The Interior Design Studio acts as a hub, connecting all other functions. The spatial openness and adjacency create opportunities for inter-disciplinary interaction and collaboration. Using modular walls, pin-ups, and adjustable furniture makes the space suitable for different types of learning such as group work and lectures. The digital lab enables design and visualization using computer-aided software.

Curiosity Spaces Floor with Collaborative Platforms

This floor functions as an integrated set of open and collaborative spaces based on the Studio Reassembled concept, allowing interactions between students, lecturers, experts from industries, and the local community. Collaborative workspaces were incorporated in response to students' preference for environments that support both collaborative and individual learning, as well as the qualitative emphasis on Ubuntu, shared creativity, and collective learning. These spaces can be utilized as dynamic spaces for communication, mentoring, and collaboration. Adjacent lounges facilitate informal learning and socializing, whereas digital rooms offer a dedicated space for focused work and are connected to the collaborative areas. The circulation system facilitates interactions without compromising spatial organization and privacy when needed. Nonetheless, open spaces may cause noise and distractions. For that reason, soundproofing techniques have been considered in enclosed spaces like meeting rooms. It is consistent with Baird & Dykes (2010) who argue that noise can affect the quality of learning and well-being.

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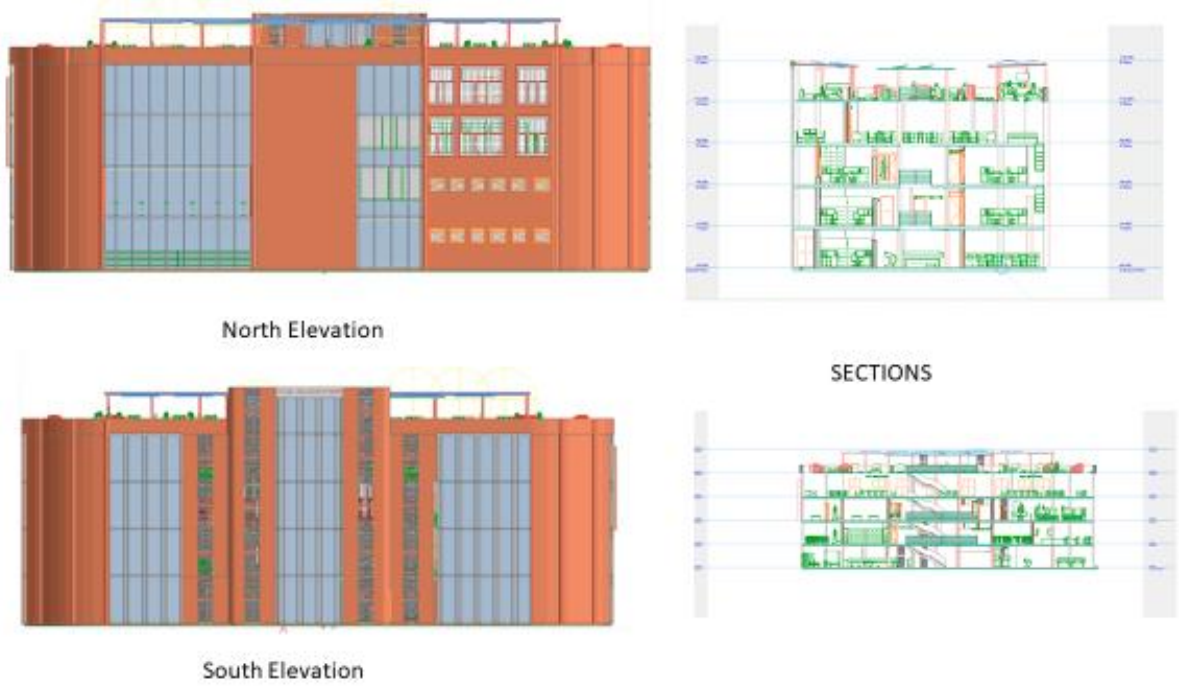
Rooftop - Outdoor Social and Learning Space

Because students identified a need for informal collaborative spaces and sustainable learning environments, the rooftop incorporates shaded discussion areas, green roofing, and rainwater harvesting to support these functions. The use of solar panels to generate power, green roof systems for cooling the building and harvesting rainwater, and shaded social areas forms some of the sustainability measures on the roof. Such practices greatly minimize the consumption of natural resources. According to Ifechukwu Gil-Ozoudeh et al. (2023b), water-saving technologies, including low-flow fixtures and rainwater harvesting systems, contribute to substantial reductions in water consumption and utility expenses. Studies indicate that green buildings can achieve water savings of 30% to 50% compared to standard buildings, translating into lower water bills and reduced pressure on municipal water resources.

Exterior Expression

The studio building design is meant to blend well with its environment. Large windows allow ample natural light inside the studio spaces, making indoor activities visible outside, thus creating a lively learning environment. The inclusion of brick walls on the exterior gives the building strength and longevity that match the existing campus buildings. The landscaping, which includes trees, plants, and sitting areas, helps soften the building and creates outdoor spaces for students' leisure activities. See figure 12 below the proposed building elevations.

Figure 12
Building Elevations

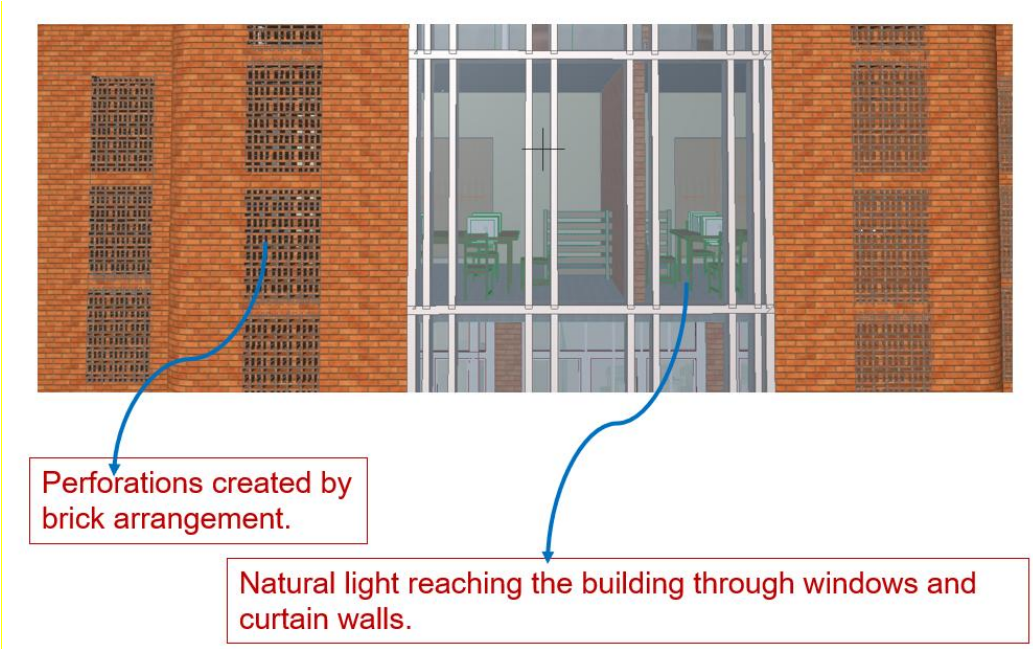


Sustainability Strategies

The use of daylighting and operable windows for natural ventilation decreases dependency on artificial lighting and mechanical cooling, thus decreasing initial expenditures (Iwuanyanwu et al., 2023). The design makes it possible to achieve the greatest amount of natural light entering all floors, creating an attractive interior space. The concept of thermal comfort, which refers to the state of human satisfaction with the indoor environment, has gained increasing importance for human health and well-being (Krawczyk & Zender, 2022). There are some factors that influence it individually and are regulated by the body's thermoregulatory mechanisms. Insufficient regulation

of the indoor climate conditions results in negative consequences, such as reduced productivity, ill health, tiredness, and reduced overall well-being. Thus, the maintenance of proper air conditions is important since thermal comfort impacts performance (Krawczyk, 2022). Ventilation in the proposed design is improved through the presence of perforations in the brickwork, which allows airflow without compromising the aesthetics of the structure (see Figure 13). Along with natural lighting, this contributes to the reduced dependence on mechanical equipment and ensures better indoor air quality. In addition to the environmental benefits, sustainable buildings provide certain intangible benefits, including improved health, comfort, well-being, and increased productivity (Iwuanyanwu et al., 2023)

Figure 13
Perforations and Natural lighting through Curtain walls



Active systems include solar photovoltaic panels that aid renewable energy production, as shown in Figure 14. Active systems include the use of renewable energy systems, including solar thermal, photovoltaic panels, and geothermal heat pumps, which, according to Morshed et al. (2024), serve as ways to reduce reliance on traditional energy and cut down operating expenses due to energy production at the site of construction. Water conservation involves collecting rainwater and utilizing water-efficient fixtures, green roofs, and the use of durable and locally sourced materials, which improve environmental sustainability and contextual appropriateness. Environmental ergonomics consists of thermal comfort, acoustic comfort, lighting comfort, visual comfort, indoor air quality (IAQ), and outdoor environmental quality (OOEQ), all affected by climatic conditions and passive design strategies (Díaz-López et al., 2022). Also, sustainable architecture significantly lowers carbon emissions since buildings contribute more than 30% of CO_2 emissions globally. Sustainable buildings are associated with lower lifecycle carbon emissions than traditional buildings, as sustainable design reduces environmental impact considerably (Barnaby et al., 2024).

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Figure 14
Solar Photovoltaic Panels

Conclusion

The current study provides evidence that the spatial design of studios plays a significant role in ensuring effective teaching and learning processes in the field of art and design education. Combining a literature review, case study analysis, site investigation, and user survey enabled the study to determine that contemporary studio spaces at Maseno University are limited by overcrowding, unfavorable environmental conditions, and lack of adequate technological and functional support. On the theoretical level, the study adds value to the discussion in terms of the relationship between spatial design, sustainable practices, and the philosophy of Ubuntu understood as an integrated framework for studio-based pedagogy in Africa. Moreover, the research contributes to the existing debate about learning environments as it conceptualizes spaces as agents of pedagogical processes that influence students' collaboration, creativity, and knowledge creation. Finally, on the policy level, the study indicates the need for investment in flexible digital studios that should become a part of higher education institutions and help meet the requirements of Competency-Based Education and industry needs. Furthermore, the study contributes to the development of African-centric pedagogy in relation to Ubuntu philosophy. This supports indigenous knowledge systems as sustainable models for current design education practices rather than complementary sources of information. In general, the results may have broader applications in higher education planning especially in educational institutions where practical subjects are offered. They indicate the need for coherence between spatial planning and teaching programs.

Recommendations

Based on the findings of this study, future design studios should have flexible spaces with flexible furniture and workstations to accommodate different types of learning. Studio development should also prioritize special digital laboratories, exhibition spaces, and advanced digital infrastructure, including reliable internet connectivity, contemporary design software, and digital fabrication technologies. In addition, sustainable design strategies, such as daylighting, passive ventilation, rainwater harvesting, and green roofing, can also be employed for better environmental performance. Lastly, studio environments should encourage Ubuntu principles, which embrace collaboration and mentorship learning.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

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Generative AI tools were used solely for language refinement, grammar improvement, organizational support, and assistance in the creation or refinement of illustrative figures during manuscript preparation. All text and figures were critically reviewed, edited, verified, and validated by the authors to ensure scientific accuracy, originality, and consistency with the study findings.The authors take full responsibility for the accuracy and integrity of the final submission.

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Authorship Contribution Statement

Hildah Koki Ndunda - conceptualization, data collection, analysis, design development, and writing of this manuscript.

Dr. Rose Achieng Oduho - Supervision and guidance.

Declaration of Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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