

## REIMAGINING DESIGN STUDIOS AS ACTIVE WORKSPACES FOR EDUCATION 4.0: COLLABORATIVE AND FLEXIBLE LEARNING ENVIRONMENTS IN MALAYSIAN HIGHER EDUCATION

Arita Hanim Awang<sup>1</sup>, Rajabi Abdul Razak<sup>2</sup>, Nurlelawati Ab Jalil<sup>3</sup>, Syakir Amir Ab Rahman<sup>4</sup>, Zuraini Denan<sup>5</sup>

<sup>1,2,3</sup> Department of Applied Arts and Design, Kulliyah of Architecture and Environmental Design, International Islamic University Malaysia, Gombak, Malaysia.

<sup>4</sup> Department of Urban and Regional Planning, Kulliyah of Architecture and Environmental Design, International Islamic University Malaysia

<sup>5</sup>Department of Architecture, Kulliyah of Architecture and Environmental Design, International Islamic University Malaysia

\*Corresponding E-mail : [aritahanim@iium.edu.my](mailto:aritahanim@iium.edu.my)

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### ABSTRACT

**Objective:** The transformation of higher education in Malaysia towards Education 4.0 requires learning environments that foster creativity, collaboration, and adaptability. This study aims to reimagine the traditional design studio as an active workspace that integrates flexibility, inclusivity, and collaborative modes of learning.

**Research Method:** The research adopts a qualitative design-based approach using conceptual modeling and computer-generated interior proposals. The study explores multiple spatial configurations that integrate individual, group, and hybrid learning zones inspired by co-working and contemporary workplace models.

**Findings:** Findings reveal that reconfigurable studio layouts enhance collaboration and peer interaction while maintaining opportunities for focused individual work. Challenges include the potential loss of personalized space and the need for user adaptability to flexible layouts.

**Originality:** This research introduces a design framework that aligns interior design pedagogy with Education 4.0 principles, fostering student-centered, technology-supported, and collaborative learning environments. It contributes to Malaysia's Education 4.0 goals and supports SDG 4 (Quality Education), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 11 (Sustainable Cities and Communities).

**Keywords:** Education 4.0, Design Studio, Active Workspace, Collaborative Learning, Flexible Learning Environment, Higher Education, Sustainable Development Goals

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### 1. INTRODUCTION

Higher education in Malaysia is undergoing a profound transformation in response to the Fourth Industrial Revolution. The emergence of Education 4.0 challenges universities to rethink not only what they teach but how students learn. Instead of focusing purely on knowledge acquisition, the new paradigm emphasizes creativity, adaptability, and collaboration skills that mirror the expectations of an increasingly digital and interdisciplinary world (Hussin, 2018; Fisk, 2017).

Design education, particularly within architecture and interior design disciplines, faces a unique pressure to evolve. The traditional studio-based model, which has long served as the cornerstone of design learning, privileges individual exploration and instructor-led critique (Kuhn, 2001; Nicol & Pilling, 2005). While effective in nurturing self-expression, this model can unintentionally limit peer learning and collective innovation, two qualities central to Education 4.0's collaborative ethos (Brand & Radeloff, 2020).

Globally, learning environments are being reimagined to become more active, flexible, and technology-enriched (Christou et al., 2023). These “active workspaces” are inspired by co-working and innovation-lab typologies that merge physical flexibility with digital connectivity (Spinuzzi, 2012). Within this framework, the design studio is no longer seen as a fixed setting but as a living system, one that adapts to users’ changing needs, supports different modes of learning, and fosters interaction among students and educators.

In Malaysia, this rethinking of studio culture is also aligned with the Sustainable Development Goals (SDGs) specifically SDG 4 (Quality Education), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 11 (Sustainable Cities and Communities). By creating inclusive, adaptable spaces that promote collaboration and innovation, design schools can contribute meaningfully to national and global educational agendas.

Therefore, this study aims to develop and conceptualize a flexible, collaborative, and digitally adaptive design framework for studio learning environments in Malaysian higher education, in line with Education 4.0 principles.

## **2. LITERATURE REVIEW**

While international research has explored flexible and co-working-inspired learning spaces, studies focusing on Malaysian design education remain limited and largely descriptive. This research addresses this gap by examining how active workspace concepts can be contextualized within Malaysia’s higher education design studios.

### **2.1 DESIGN STUDIOS AND PEDAGOGICAL TRANSFORMATION**

Design studios have long served as the intellectual and creative heart of architecture and design education. Traditionally, the studio model revolves around one-to-one critique and individual project work. This setup promotes autonomy and reflection but can also isolate learners and restrict opportunities for peer collaboration (Kuhn, 2001; Nicol & Pilling, 2005).

Over the past two decades, educators have begun questioning this individual-centric model and calling for more collective, interactive learning experiences. Brand and Radeloff (2020) observed that the re-shaping of design studios toward group-based engagement promotes a deeper exchange of ideas and mirrors the collaborative nature of professional design practice. Similarly, Kansal and Bassi (2023) argued that design schools must adapt their studio structures to support the interdisciplinary skills demanded by Education 4.0. The studio, therefore, is evolving into a pedagogical ecosystem that nurtures social learning and shared authorship, aligning with Malaysia’s collectivist learning culture.

Within this new paradigm, the studio is not only a physical setting for design production but also a pedagogical ecosystem that nurtures social learning, empathy, and shared authorship. These human-centered values are particularly relevant in Malaysian higher education, where collective work and community-oriented learning remain integral cultural traits.

### **2.2 EDUCATION 4.0 AND FLEXIBLE LEARNING**

The global transition toward Education 4.0 reflects a broader response to Industry 4.0, where emerging technologies reshape both work and education. According to Hussin (2018), Education 4.0 emphasizes learner autonomy, digital fluency, and creativity as essential attributes for future graduates. Learning environments must therefore evolve to support these outcomes through flexibility and adaptability.

Flexible learning spaces encourage students to take ownership of their learning process, whether through digital collaboration, independent research, or peer-led discussion (Christou, Parmaxi, & Pashia, 2023). A recent review by Springer Open

(2024) highlighted that flexibility is not limited to movable furniture or open layouts; it also encompasses temporal and technological dimensions, allowing students to transition fluidly between modes of learning. In architecture and design studios, this means integrating technology-enhanced areas, informal discussion corners, and reconfigurable furniture to support multiple teaching approaches.

Jamieson (2009) earlier described this shift as the move from “instruction spaces” to “learning spaces,” where the spatial design itself becomes an active participant in the educational process. When students can rearrange and reinterpret their surroundings, they engage more meaningfully with the material and with one another. This responsiveness strengthens agency, creativity, and a sense of belonging, qualities consistent with the humanistic values underpinning Education 4.0.

### **2.3 ACTIVE WORKSPACES AS EDUCATIONAL MODELS**

Recent studies on workspace design have provided valuable parallels for rethinking the design studio. The concept of the active workspace—originally derived from co-working and innovation-hub environments, offers a model for how physical space can foster both concentration and collaboration (Spinuzzi, 2012; Fisher, 2016). These spaces emphasize openness, accessibility, and the freedom to move between solitary focus and shared dialogue.

Neill and Etheridge (2014) demonstrated that reconfigurable learning spaces significantly enhance collaboration and engagement when pedagogy, technology, and physical design are integrated. Similarly, The Impact of Learning Space Design on Learner Experience and Collaboration (EDUCAUSE, 2021) found that students perceive flexibility and mobility as key contributors to motivation and social connection.

In the context of Malaysian design education, adopting active workspace principles may help bridge the gap between studio culture and real-world practice. The ability to reorganize spatial layouts encourages teamwork, shared reflection, and cross-disciplinary dialogue, skills increasingly valued by employers. By embedding these spatial strategies, design studios can evolve into inclusive, dynamic environments that reflect both cultural values and contemporary educational aspirations.

## **3. METHODOLOGY**

This research adopts a design-based qualitative approach, integrating spatial analysis, conceptual modeling, and visual simulation. The goal is to translate Education 4.0 principles into tangible spatial strategies suitable for design studios within higher education institutions.

### **3.1 RESEARCH DESIGN**

The study followed the Design-Based Research (DBR) framework, which combines iterative design development with reflective analysis. This approach allows researchers to explore how educational theories can be materialized through spatial form and layout (Kansal & Bassi, 2023). Each iteration of the proposed design was assessed against three key criteria:

- Flexibility – the ability of the space to adapt to different learning activities.
- Collaboration – the degree to which the layout facilitates peer interaction and group work.
- Engagement – the extent to which users feel motivated and supported by their environment.

### **3.2 DATA COLLECTION AND DESIGN PROCESS**

Data collection involved a review of scholarly literature on flexible learning spaces, Education 4.0 pedagogy, and studio design. Observations from existing design studios

within Malaysian universities provided contextual insight into spatial limitations and cultural factors affecting learning behavior.

Based on this analysis, a series of computer-generated layout proposals were developed using 3D modeling software. A comparative analysis of traditional and new active workspace layout was designed to accommodate multiple learning modes:

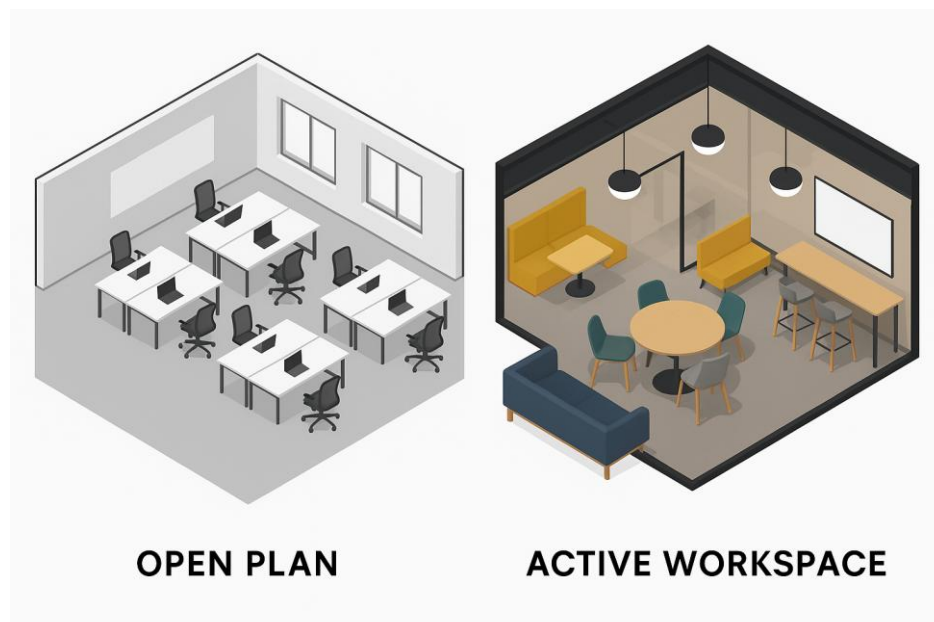
- Individual Focus Zones — equipped with ergonomic desks, task lighting, and partial partitions for concentration.
- Collaborative Hubs — open areas with modular furniture to encourage teamwork and peer critique.
- Digital Integration Zones — flexible sections featuring screens, smartboards, and VR or AR facilities to support technology-driven exploration.

The proposals were evaluated through informal focus group discussions with design educators and senior students. Selected through purposive sampling based on their direct involvement in studio-based teaching and learning activities. Educators were chosen for having more than five years of experience in design pedagogy and familiarity with Education 4.0 initiatives, while students were selected from final-year cohorts with prior exposure to collaborative studio projects. They participate voluntarily. Each session lasted approximately 60 minutes, recorded with consent and supported by field notes. Data were thematically analyzed to identify patterns in user perception and spatial preference. Their feedback guided refinements to ensure practicality, comfort, and cultural appropriateness.

## 4. RESULTS AND DISCUSSIONS

### 4.1 ANALYSIS OF FINDINGS

The comparative analysis between the traditional open-plan studio and the reimagined active workspace studio reveals significant contrasts in spatial behavior, learning interaction, and design adaptability.



**Figure 1:** Comparative interior setting of traditional studio with active workspace  
Source: (Author, 2025)



A: Traditional Open Plan Studio



B: New Active Workspace Studio Setting

**Figure 2:** Perspective view and realistic rendering of interior setting of traditional studio with active workspace

Source: (Author, 2025)

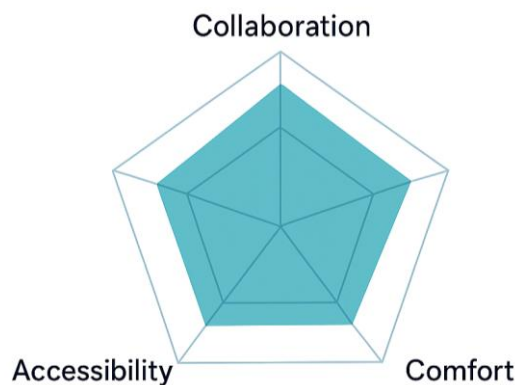
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**Table 1:** Comparative Analysis of Traditional Open Studio and Active Workspace Studio

Criteria	Traditional Open-Plan Studio	Reimagined Active Workspace Studio (Google-inspired)	Interpretation / Implication
Spatial Configuration	Fixed desk arrangement with uniform layout.	Reconfigurable zones with modular furniture allowing flexible arrangements.	Flexibility encourages students to adapt the space to different learning activities.
Learning Interaction	Primarily individual work; limited peer exchange.	Promotes collaborative learning, group discussions, and social engagement.	Supports Education 4.0's emphasis on teamwork and communication skills.
Instructor-Student Engagement	One-directional (instructor-led critiques).	Multi-directional; encourages peer-to-peer and instructor facilitation.	Enhances participatory and co-creative learning culture.
Technology Integration	Limited integration; focus on manual or physical outputs.	Embedded digital tools, wireless access, display screens, and charging stations.	Enables blended learning and supports digital fluency.

Acoustic & Visual Environment	Often noisy; minimal zoning for concentration.	Includes quiet zones, focus pods, and acoustic panels.	Balances collaboration with concentration, improving productivity.
Furniture & Ergonomics	Standardized tables and chairs, minimal adaptability.	Ergonomic, modular, and movable furniture catering to various postures.	Enhances comfort, accessibility, and inclusivity.
Aesthetic & Psychological Ambience	Institutional, neutral design; minimal personalization.	Vibrant, biophilic, and user-centred design inspired by creative offices.	Stimulates creativity, ownership, and well-being among users.
Space Utilization	Static; not easily reconfigurable for events or group tasks.	Dynamic; supports multiple spatial configurations (presentation, group work, reflection).	Optimizes use of limited institutional space for diverse activities.
Collaboration Opportunities	Limited to informal interactions during breaks.	Designed to foster spontaneous collaboration through mixed seating and shared spaces.	Encourages cross-disciplinary learning and collective creativity.
Cost and Maintenance	Lower initial cost but limited long-term adaptability.	Higher initial investment but supports sustainable long-term use and innovation.	Trade-off between cost and pedagogical effectiveness.

Table 1 synthesizes the comparative outcomes. Overall, the active workspace model significantly enhances flexibility, collaboration, and engagement but requires higher initial investment and institutional commitment. The findings confirm that spatial design directly influences students' learning behaviour and the effectiveness of studio pedagogy in Malaysian higher education.



**Figure 3:** Data visualisation of the perception from informal focus group discussion. Source: (Author, 2025)

The Figure 3 visualizes the qualitative and perceptual differences in spatial experience between the traditional studio and the reimagined active workspace studio based on user feedback gathered during participatory workshops.

The radar chart visually summarizes this feedback across three key experiential dimensions — Collaboration, Comfort, and Accessibility. The expanded outer shape represents user perceptions of the active workspace, indicating stronger performance in all dimensions compared to the smaller inner area representing the traditional studio.

This visualization reinforces the analytical finding that spatial reconfiguration may significantly enhance student satisfaction and collaborative engagement.

## **4.2 RESULTS AND DISCUSSIONS**

### **4.2.1 Spatial and Functional Differences**

The traditional studio adopts a fixed, open-plan arrangement with repetitive desk rows resembling a typical office layout. While this configuration supports supervision and order, it limits spatial flexibility and restricts diverse learning activities. In contrast, the proposed active workspace introduces multiple functional zones—such as collaborative hubs, focus pods, informal discussion corners, and digital workstations—mirroring the versatility of creative industry environments such as Google’s office model. The flexibility of layout encourages students to rearrange furniture to suit group or individual work needs.

### **4.2.2 Collaboration and Interaction**

Observations and user feedback indicate that the open-plan layout often results in passive learning and limited peer exchange. Students tend to occupy fixed positions, minimizing spontaneous collaboration. Conversely, the active workspace stimulates interaction through its varied seating configurations and shared areas. The inclusion of soft seating, writable walls, and open circulation pathways encourages discussion and collective critique. This aligns with Education 4.0’s emphasis on teamwork, creativity, and interdisciplinary learning.

### **4.2.3 Learning Engagement and Technology Integration**

The reimagined active workspace demonstrates improved technological readiness through the integration of digital displays, charging points, and movable screens that facilitate blended learning activities. Students perceived these enhancements as motivating and supportive of self-directed and collaborative tasks. In contrast, traditional studios were found to have limited access to technology, often relying on manual drawing and static presentation boards.

The findings resonate with active learning and constructivist theories, where space acts as a mediator of engagement, collaboration, and reflection. Students’ increased interaction and mobility within the reconfigured layout support the notion that physical design can shape learning behavior. However, issues such as noise, lack of personal storage, and the need for clear usage guidelines suggest that flexible studios require both physical and pedagogical adaptation to be effective.

## **5. CONCLUSIONS**

This study contributes a conceptual design framework and spatial prototype for transforming traditional studios into active, flexible learning environments aligned with Education 4.0. This study determines that reimagining design studios as active workspaces provides a viable pathway for aligning design education with the aspirations of Education 4.0. The findings demonstrate that flexible, technology-enabled, and human-centered environments foster collaboration, inclusivity, and creativity qualities are essential for future-ready graduates. The active workspace

model transforms the studio from a static instructional setting into a dynamic ecosystem for innovation. By integrating physical flexibility with digital tools and social interaction, it bridges the gap between academic learning and real-world design practice.

However, challenges remain in implementation. Institutions must consider issues of cost, maintenance, and user adaptation to ensure long-term sustainability. Educators also need to shift pedagogical practices from teacher-centered critique to facilitative, peer-based learning modes. Overall, the reimagined studio supports Malaysia's higher education transformation agenda and contributes to the United Nations' Sustainable Development Goals (SDG 4, SDG 9, and SDG 11) by promoting quality education, innovation-driven environments, and sustainable urban design principles.

By embedding flexibility and collaboration into design studio environments, Malaysian higher education can nurture innovative and adaptable graduates equipped for the interdisciplinary demands of Industry 4.0.

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