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Enhancing Peer Learning, Design Processes and Real-World Skills in Architectural Education through Vertical Studio Model

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Abstract

The Vertical Studio model has gained recognition in architectural education for fostering peer learning, collaboration and creativity development. The approach brings together junior and senior students in a collaborative, cross-level learning environment to encourage design exploration and professional readiness. However, the application in Southeast Asia is presently limited, requiring further investigation into its effectiveness. This study evaluates the implementation of the Vertical Studio approach in the final year of the Master of Architecture programme at Universiti Teknologi MARA (UiTM), Puncak Alam, Selangor. It investigates student perceptions on collaborative learning, design process development, and the role of cluster placement, utilising a structured questionnaire survey. The findings show that the Vertical Studio promotes active peer mentorship and knowledge exchange, enabling students to gain from various viewpoints and skill sets. The Vertical Studio effectively integrates academic theory and real-world experience, equipping students with competencies that align with industry expectations. However, there are also challenges, including finding the right balance between mentoring responsibilities and individual project focus, as well as clarity within clusters or themes. This research contributes to the discourse on innovative pedagogical approaches in architectural education by endorsing the Vertical Studio, which enhances student performance and prepares them for professional endeavours.

1.0 INTRODUCTION

The Vertical Studio (hereafter referred to as VS) has emerged as an innovative pedagogical approach in architectural education. It offers a shared studio environment that brings together students from different academic levels. This approach encourages significant collaboration by enabling senior students to mentor the juniors and contribute fresh perspectives and creative approaches to the discussions. The resulting studio culture thrives on peer-to-peer learning, a range of opinions and ideas, and collaborative problem-solving (Giencke, 2021; Smatanová et al., 2020). The VS is recognised for promoting critical thinking, creativity, and adaptability, skills essential for contemporary architectural practice. It replicates the multidisciplinary and collaborative element of real-world design environments (Adigüzel Özbek et al., 2018; McLaughlan & Chatterjee, 2020).

Despite its benefits and increasing adoption in Western and other Asian countries, the VS remains under-implemented in Southeast Asia. Its integration is challenged by local cultural dynamics, institutional frameworks, and limited resources (Giencke, 2021). Furthermore, much of the existing literature is dominated by conceptual discussions, with a lack of empirical studies grounded in the Malaysian context. There is, therefore, a pressing need to investigate the influences of VS on the learning outcomes, particularly the design process development, critical thinking, communication, and professional readiness in Malaysian architectural education. Equally important is the need to explore how institutional support systems and teaching practices shape the effectiveness of the VS framework.

This study responds to these gaps by focusing on the implementation of the VS within the final year of the Master of Architecture programme at Universiti Teknologi MARA (UiTM), Puncak Alam, Selangor. The research aims to assess students' perceptions of the VS model by addressing the following research questions: How do students perceive the VS in terms of its core components, peer learning and collaboration, project and design process, skill development and real-world applications, and understanding of the cluster system for design thesis? Additionally, in what ways do male and female students view their respective roles and contributions within the VS model? By including gender as a comparative variable, this research also investigates whether the VS fosters an inclusive and equitable learning environment. It provides evidence-based insights and recommendations to help Malaysian architecture educators effectively use VS models. Finally, the study adds to the broader discussion of progressive teaching practices that foster academic success while preparing students for the challenges of professional practice.

2.0 LITERATURE REVIEW

In architectural education, VS is an innovative pedagogical model that brings together students from different academic levels in a shared design environment. Unlike conventional studios that group students based on the year or skill level, VS fosters a dynamic and collaborative learning culture through mentorship, peer interaction, and interdisciplinary dialogue (Barnes, 1993). In this setting, senior students frequently take mentorship roles, while junior students actively seek guidance, motivation and inspiration. This creates a mutually beneficial relationship that boosts student confidence and improves communication (Abdel-Hadi et al., 2020). The VS model reflects the iterative, collaborative, and reflective nature of architectural design practice. It blends foundational learning with advanced problem solving through projects that replicate real-world scenarios. This exposure prepares students to address complex design challenges and helps develop important skills such as adaptability, collaboration, teamwork and critical thinking (Francis & Garbarczyk, 2018). Junior students acquire knowledge in advanced design thinking, while senior students improve their leadership, communication, and mentoring skills (McLaughlan & Chatterjee, 2020).

VS fosters strong relationships between students and faculty, facilitating continuous engagement across different academic levels (Giencke, 2021). Salama (2015) also emphasises the pedagogical cohesion this model offers by bridging gaps between students with differing levels of experience. However, managing diverse skill sets within the same studio can be challenging for tutors and may lead to an imbalanced distribution of workload among students. The strength of the VS model lies in its focus on resource-sharing and reflective learning. The sharing of faculty expertise and knowledge, studio space and facilities, and design resources enriches the learning process and strengthens the sense of community and shared responsibility in the studio (Smatanová et al., 2020). Regular feedback sessions between students and tutors help students acquire critical and reflective habits that are important for their professional growth (Adigüzel Özbek et al., 2018). The VS approach effectively equips students for architectural practice by addressing real-world

challenges and teaching them how to solve problems in an interdisciplinary, flexible, and creative way (McLaughlan & Chatterjee, 2020).

The VS model in architectural education posits that students learn best through social interaction and collaboration. It embodies Vygotsky's (1978) notion of the Zone of Proximal Development (ZPD), where senior students assist junior students in executing activities, they may be incapable of performing independently. Similarly, Wenger's (1998) theory of Communities of Practice also views the studio as a place for social learning. Students work together, acquire new knowledge, and negotiate professional identity through engagement and discourse. These theories collectively position the VS not only as a physical space for design, but as a dynamic learning community shaped by peer support and shared experiences.

2.1 Benefits and Challenges of the Vertical Studio

The pedagogical benefits of the VS are significant, especially in fostering mentorship, peer learning and the exchanges of technical and conceptual knowledge across academic levels. This environment supports the development of design thinking, communication, and analytical skills essential to architectural education (Adigüzel Özbek et al., 2018; Francis & Garbarczyk, 2018). Wong (2023) highlighted that VS also embrace complexity, cultural inclusivity, and creative flexibility, encouraging continuous intellectual and professional growth through collaborative learning. VS settings also emulate professional practice, characterised by routine multidisciplinary collaboration. Mixed-level teams provide students real-life experiences in teamwork, adaptability, resolving conflict, and cross-disciplinary communication (Liem, 2010; McLaughlan & Chatterjee, 2020). These settings create a robust academic community, with interactions among faculty, students, and peers frequently transcending the studio (Giencke, 2021).

Vertical Studio enables students from various educational levels to share a studio space. Peterson and Tober (2014) explained this initiative in the Graphic Design department at the University of Illinois by consolidating students from three separate studios into two. The objective of this spatial reconfiguration was to embody the fundamental principles of the VS model by promoting collaboration among students and fostering interpersonal connections. Meanwhile, Tuztasi and Koc (2022) conducted a study on the implementation of VS at Sivas Cumhuriyet University in Turkey, highlighting how the dissolution of conventional class divisions promoted a more inclusive studio culture. Students were most engaged in digital software applications, which surpassed both conceptual and technical components in motivating participation. This shows that the model can improve digital literacy and student motivation.

Nevertheless, implementing the VS model into action presents several challenges. Effective interaction between junior and senior students requires careful facilitation to prevent power imbalances or feelings of intimidation. While senior students are encouraged to mentor juniors, doing so while also managing a complex final-year project can stretch their focus and energy (Adigüzel Özbek et al., 2018). Also, designing studio projects that work for students with different skill levels requires thoughtful instructional strategies that balance group collaboration with individual learning needs. This is to ensure inclusivity and equitable engagement (Liem, 2010). Institutional and logistical limitations complicate the implementation of VS, especially in educational settings with rigid curricula and hierarchical teaching models, as observed in parts of Southeast Asia (Giencke, 2021). Successful integration necessitates meticulous attention to faculty availability, space management, and time distribution to facilitate collaborative learning while maintaining academic rigour.

2.2 Applications and Contextual Adaptation of the Vertical Studio in Architectural Education

The VS has demonstrated its transformative potential in various educational contexts, greatly enhancing student collaboration, digital fluency, and professional readiness. The Environmental and Interior Design program at the Hong Kong Polytechnic University has adopted the VS since 2016, reporting notable improvements in peer-to-peer learning and digital literacy (Giencke, 2021). Similarly, Smatanová et al. (2020) discovered that the VS model at the Slovak University of Technology enhanced design discourse through cognitive diversity. They underscored the significance of horizontal studios in facilitating early-stage students' acquisition of fundamental design skills, proposing that both vertical and horizontal models can synergistically enhance assistance for students at all levels of their architectural education.

In postgraduate settings, the VS offers even greater potential. Francis and Garbarczyk (2018) examined a hybrid studio model that brought together final-year undergraduate and first-year Master of Architecture students. Such arrangements promote collaborative problem solving, peer evaluation, and adaptive teaching

strategies. The study emphasised the mutual advantages for both students and educators derived from the exchange of knowledge and practices.

The VS, however, remains underexplored in Southeast Asia, especially in Malaysia. Introducing the VS at the postgraduate level, particularly in the Master of Architecture programs, could bridge the gap between academic training and professional realities. However, institutional inertia, curriculum rigidity, and limited resources are significant barriers to its integration. To maximise the potential of the VS in this regional context, subsequent research should explore culturally responsive adaptations of the model, addressing specific institutional, logistical, and pedagogical limitations. Incorporating industry collaboration and practical projects into the VS framework could further enhance students' preparedness for professional practice, improving essential abilities in leadership, multidisciplinary communication, and strategic problem solving.

3.0 CASE STUDY: MASTER OF ARCHITECTURE PROGRAMME, UiTM PUNCAK ALAM

The Faculty of Built Environment at Universiti Teknologi MARA (UiTM) has undergone several transformations since its establishment. It was first established in 1967 as the School of Applied Arts, later evolving into the Faculty of Architecture, Planning & Surveying (FSPU) in 1997. It was then restructured as the College of Built Environment in 2022. Most recently, in May 2025, it underwent another restructuring, becoming the present-day Faculty of Built Environment. Architectural education at UiTM began with the introduction of the Diploma in Architecture in 1967, followed by the Advanced Diploma in 1972. With UiTM achieving full university status in 1999, the program transitioned into the Bachelor of Architecture (B.Arch.) degree. The programme was upgraded to the Master of Architecture (M.Arch) in 2011. The two-year program is designed to prepare students to qualify as Graduate Architects through a balanced combination of formal and informal teaching methods. These consist of studio-based learning, lectures, design critiques, site visits, and tutorials. The curriculum is subject to continuous review and enhancement to meet evolving professional requirements and industry demands, with the most recent revision put into effect in October 2021.

In their final year, students undertake a comprehensive Design Thesis, structured into two parts: Design Thesis I and Design Thesis II. In 2022, the program introduced a shift in its supervision paradigm, moving from one-on-one supervision to a cluster-based system. This restructure corresponded with the implementation of the VS model, which integrates Semester 03 and Semester 04 studios within a shared academic framework. Each student undertakes an individual design thesis and is supervised by a panel of lecturers (supervisory panels) who specialise in specific thematic or disciplinary clusters. This collaborative supervision is intended to foster multidisciplinary thinking, encourage critical discourse, and support students in addressing complex design challenges through integrated and holistic solutions, principles that are strongly aligned with the VS model.

At the start of each semester, studio leaders and tutors from both studios work together to align the academic schedule, synchronise learning expectations and standards, and finalise the composition of supervisory panels. This early planning ensures smooth studio operations, an equitable distribution of supervisory roles, and a clear academic direction. Most lectures are conducted jointly to reinforce cohesion between both semesters. Design tutorials are held on designated studio days with all tutors present. This arrangement allows students to gain diverse feedback and perspectives. Studio spaces are often combined to create an open, collaborative environment. Joint critique sessions allow junior and senior students to learn from each other through critical observation and discussion. Weekly or biweekly supervisory tutorials offer targeted and sustained feedback, while the sharing of learning materials, design references, and studio tools helps build a collaborative, resource-rich culture that supports academic development at all levels.

4.0 METHODOLOGY

This study adopts a single case study, focusing on Master of Architecture students at UiTM Puncak Alam. The recent introduction of the VS model offers an opportunity to examine its early implementation and potential for future development in Malaysian architecture education. The study prioritises context-specific insights over statistically generalizable results, intending to provide significant views for curriculum innovation and pedagogical enhancement that may be relevant to different institutional settings.

4.1 Research Design

A mixed-methods research design was adopted, combining quantitative and qualitative approaches to comprehensively understand the VS's implementation. The quantitative component consists of a structured questionnaire survey administered to students, while the qualitative aspect involves open-ended responses from the questionnaire. The questionnaire focused on key components: Peer Learning and Collaboration, Project and Design Process, Skill Development and Real World Applications, Understanding of Cluster for Design Thesis, and Overall Perceptions. Responses for the quantitative items were measured using a five-point Likert scale (Likert, 1932), ranging from *Strongly Disagree (1)* to *Strongly Agree (5)*, allowing for the assessment of participants' attitudes and perceptions in a structured and comparable manner.

4.2 Participants

The participants were Master of Architecture students at UiTM Puncak Alam who had undertaken their Design Thesis using the VS approach, spanning from the Oct 2022 – Feb 2023 semester to the Oct 2024 – Feb 2025 semester. The sample represents a cross-section of final-year students from both Semester 03 (juniors) and Semester 04 (seniors). Students were grouped into three thematic clusters, namely Speculative, Reimagination, and Regeneration, based on the focus of their design thesis projects. Each cluster was further divided into smaller groups of three to four students, mentored by panels consisting of two to three lecturers.

4.3 Data Collection

4.3.1 Questionnaire Survey

Data were collected through a structured questionnaire distributed via Google Forms over two weeks in March 2025. The questionnaire consisted of both closed and open-ended questions, designed to capture demographic details (e.g. age, academic level, and prior experience with VS) and students' perceptions of the effectiveness of peer learning, mentorship, and resource sharing. In addition, it explored the impact of the VS on students' design processes, critical thinking skills, and overall satisfaction with the learning experience. Participation was voluntary, and responses were anonymised to ensure confidentiality and encourage honest feedback. This study includes open-ended responses from the questionnaire to gather qualitative data. The inclusion of the open-ended question allowed respondents to freely express their opinions, experiences, and suggestions in their own words. Given the sufficient number of responses and the richness of the data collected, these open-ended responses provided valuable insights that support and strengthen the quantitative findings.

To ensure the instrument's reliability, Cronbach's Alpha was calculated for each component of the questionnaire. The results indicate high internal consistency across all categories, with values ranging from 0.840 to 0.941**.** The Skill Development and Real World Applications component exhibited the highest reliability ($\alpha = 0.941$). In contrast, the Overall Perceptions and Understanding of Cluster for Design Thesis component had the lowest but still acceptable reliability ($\alpha = 0.840$ and $\alpha = 0.8407$). Other components - Peer Learning and Collaboration ($\alpha = 0.926$) also demonstrated strong reliability. These values confirm that the questionnaire provides a robust and reliable measure of students' perceptions of the VS.

4.3.2 Data Analysis

The collected data were analysed using both descriptive and inferential statistical methods. Descriptive statistics were used to summarise demographic information and key perceptions, including frequencies, percentages, mean values, and standard deviations. A Mann-Whitney U Test was performed to determine whether there were statistically significant differences between male and female students' perceptions of the VS. Given the ordinal nature of the Likert-scale responses and the relatively small sample size, this non-parametric test was chosen over parametric alternatives. Qualitative data from the open-ended question were thematically analysed to identify recurring patterns, notable insights, and areas for improvement. The findings were then contextualised to inform recommendations for enhancing cluster management and supporting student outcomes within the VS framework.

5.0 RESULT AND DISCUSSION

The findings are structured around key themes aligned with the research objectives, incorporating quantitative and qualitative data analysis.

5.1 General Information and Demographics

The distribution of respondents by studio and gender is presented in Table 1. This study collected responses from 67 students out of 71 students, representing a 94.4% response rate from the targeted cohort. The participants were distributed across four different studio batches, with 16.4% from Studio D, 29.9% from Studio C, 35.8% from Studio B, and 17.9% from Studio A. The gender composition of respondents shows moderate male dominance, with 59.7% male and 40.3% female participants. The slightly higher male participation reflects a larger male student population in the Master of Architecture programme. Studio C had the highest male representation (80%), whereas Studio D recorded more female participants (63.6%). Studio A and Studio B demonstrated a more balanced gender distribution. These gender patterns across studios suggest that cluster characteristics and demographic factors may influence perceptions and experiences of the VS. Therefore, subsequent analysis will include gender-based comparisons to determine whether male and female students perceive the effectiveness of the VS. Participants were categorised into three thesis clusters based on the thematic focus of their design work: Speculative cluster (20.9%), Regenerative cluster (47.8%) and Reimagination cluster (31.3%).

Table 1. Demographic data of the respondents

Studio	Semester	Number of students	The number of students who participated in the survey	Participation rate
Studio A	20224 (Oct 2022 – Feb 2023) 20232 (Mac 2023 – Aug 2023)	12	12 (6 males & 6 females)	100%
Studio B	20232 (Mac 2023 – Aug 2023) 20234 (Oct 2023 – Feb 2024)	24	24 (14 males & 10 females)	100%
Studio C	20234 (Oct 2023 – Feb 2024) 20242 (Mac 2024 – Aug 2024)	22	20 (16 males & 4 females)	90.9%
Studio D	20242 (Mac 2024 – Aug 2024) 20244 (Oct 2024 – Feb 2025)	13	11 (4 males & 7 females)	84.6%
Total		**71**	**67 (40 male & 27 female)**	**94.4%**

Source: Authors, 2025

5.2 Peer Learning and Collaboration

Table 2 reveals that the VS operates as a vibrant and collaborative hub where knowledge-sharing thrives. Most students reported feeling encouraged to exchange ideas and skills, with a strong mean (M) score of 4.45, reflecting a dynamic and supportive studio culture. Peer-to-peer learning has emerged as a cornerstone of the VS experience, with a mean score of 4.33, demonstrating that students actively learn from one another beyond formal lectures and tutorials.

Collaboration across academic levels between juniors (Semester 03) and seniors (Semester 04) is both present and enriching. Senior students play a pivotal mentoring role (M = 4.09), guiding juniors by sharing technical knowledge, design strategies, and practical insights. Conversely, junior students contribute fresh, innovative ideas and new perspectives (M = 4.18), invigorating the design conversations within the studio. The interactions create a balanced, stimulating learning environment, fostering creativity and intellectual growth. These findings are supported by the work of McLaughlan and Chatterjee (2020), who observed that VS promote a symbiotic relationship between students of different academic levels, enhancing leadership among seniors and critical engagement among juniors. Francis and Garbarczyk (2018) similarly noted that mentorship in the studio context develops both social capital and collaborative competence, which is vital for architectural education.

While collaboration frequency was reported positively (M = 4.12), some students expressed a desire for more structured opportunities for interaction, particularly across academic levels. This suggests that while informal collaboration is thriving, its full potential could be further amplified through the intentional design of

collaborative activities. This aligns with the view of Salama (2015), who recommended that structured pedagogical interventions, such as co-design challenges and group critiques, could significantly enhance peer engagement and collaborative problem-solving.

Table 2. Level of Agreement on Peer Learning and Collaboration

Statement	Strongly Disagree (1)		Disagree (2)		Neutral (3)		Agree (4)		Strongly Agree (5)		M	SD
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
The Vertical Studio encourages the sharing of knowledge and skills.	0	0	1	1.5	13	19.4	8	11.9	45	67.2	4.45	0.85
Peer-to-peer learning in the Vertical Studio is highly effective.	1	1.5	2	3	7	10.4	21	31.3	36	53.7	4.33	0.89
I frequently collaborate with students from other academic levels in the Vertical Studio.	1	1.5	5	7.5	13	19.4	20	29.9	28	41.8	4.03	1.02
Senior students effectively guide junior students during projects.	1	1.5	5	7.5	10	14.9	22	32.8	29	43.3	4.09	1.00
Juniors contribute fresh perspectives to the studio environment.	0	0	3	4.5	10	14.9	26	38.8	28	41.8	4.18	0.85
I regularly interact and collaborate with students from different academic levels in the Vertical Studio.	0	0	4	6	13	19.4	21	31.3	29	43.3	4.12	0.92
Peer learning through group tutoring is beneficial in improving my design skills.	0	0	2	3	7	10.4	17	25.4	41	61.2	4.45	0.80
Senior/junior students significantly contribute to my learning experience.	0	0	5	7.5	5	7.5	27	40.3	30	44.8	4.22	0.88
The tutor effectively facilitates discussions that promote knowledge-sharing and critical thinking.	1	1.5	4	6.1	4	6.1	18	26.9	40	60.6	4.37	0.94

**M = Mean, SD= Standard Deviation,* Source: Authors, 2025

Group tutoring sessions were highlighted as a significant driver of design skill improvement (M = 4.45), underscoring the importance of structured peer learning and collective critique sessions. Tutors are widely recognised as facilitators of meaningful discussions and critical thinking (M = 4.37), creating an environment where students are encouraged to question, reflect, and refine their ideas within a supportive framework. As highlighted by Adigüzel Özbek et al. (2018), such collective critique environments mirror professional design practices and offer valuable opportunities for students to articulate, defend, and refine their ideas in a constructive and inclusive setting.

Qualitative feedback reveals certain limitations. Participant F2 highlighted time constraints as a significant limitation, stating:

"It [the VS approach] is good, but students did not have much time to discuss with their peers."

This response underscores a key challenge- while the VS facilitates peer learning, time constraints and competing academic demands may hinder the frequency and depth of peer interactions. Similar concerns are echoed in the literature; Giencke (2021) observed that institutional time structures often constrain opportunities for informal learning in studio environments, limiting the potential of peer learning.

Participant M3 stressed the importance of informal interaction, suggesting that:

"Encourage more relaxed activities in the vertical studio to nurture bonds and a sense of belonging between seniors and juniors."

This observation aligns with the findings of Tuztasi and Koc (2022), which highlight the significance of social cohesion and informal peer interactions in strengthening the studio learning community. Encouraging informal yet purposeful interactions could foster a sense of belonging and enhance the inclusivity within the VS environment.

In addition, Participant F9 reflected on how important it is for students to have control over their learning for peer learning to work, stating:

"The vertical studio is a good initiative for collaboration and knowledge sharing. However, it still depends on the students themselves . . . it will be more impactful if there is a compulsory feedback/Q&A session during tutorials/critique sessions in the assigned cluster where it encourages the students to talk among themselves & provide inputs."

This insight highlights the need for structured mechanisms to ensure equitable participation. In this context, the VS functions not as a conventional classroom. Instead, it works as a creative ecosystem, an active, multi-layered space where collaboration, mentorship, and knowledge sharing thrive. The findings affirm the value of the VS in cultivating professional competencies such as teamwork, leadership, and critical thinking. However, they also emphasise the necessity for improved time management, organised collaboration opportunities, and social cohesion to fully realise its educational potential.

5.3 Project and Design Process

Table 3. Level of Agreement on Project and Design Process

Statement	Strongly Disagree (1)		Disagree (2)		Neutral (3)		Agree (4)		Strongly Agree (5)		M	SD
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
The Vertical Studio has positively influenced my design process.	0	0	4	6	10	14.9	22	32.8	31	46.3	4.19	0.90
The feedback I receive from my peers is of high quality.	2	3	1	1.5	9	13.4	24	35.8	31	46.3	4.21	0.94
I have adequate access to resources and mentoring in the Vertical Studio	0	0	3	4.5	10	14.9	22	32.8	32	47.8	4.24	0.87
There is a diversity of ideas in studio projects.	0	0	1	1.5	4	6	17	25.4	45	67.2	4.58	0.67
I frequently discuss my design ideas with peers from different academic levels.	2	3	5	7.5	9	13.4	24	35.8	27	40.3	4.03	1.05
The tutor provides clear and constructive feedback on my design progress.	0	0	3	4.5	5	7.5	18	26.9	41	61.2	4.45	0.82

**M = Mean, SD= Standard Deviation,* Source: Authors, 2025

Table 3 illustrates how well the VS model fosters a supportive and intellectually engaging design environment. The diversity of ideas showcased in studio projects received the highest mean score (M = 4.58, SD = 0.67), suggesting that the VS setting truly nurtures creativity, encourages interdisciplinary thinking, and promotes innovative culture. Students also valued the delivery of clear and constructive feedback from tutors, which received a strong mean score (M = 4.45, SD = 0.82). Many shared that timely and thoughtful feedback not only helped them refine their design ideas but also pushed them to think more critically and reflect deeply throughout their design journey. This reinforces the crucial role tutors play in guiding and shaping student development.

Peer interaction **st**ood out as another key strength of the VS**.** High-quality peer input and feedback (M = 4.21, SD = 0.94), along with regular design discussions across academic levels (M = 4.03, SD = 1.05), were seen as important parts of a collaborative and rewarding learning environment. The findings suggest that students appreciate both the guidance of tutors and the insights offered by their peers. In this setting, students are not just producing designs, but they are also acquiring skills in idea exchange, constructive critique and synthesising feedback effectively. These are all important skills for success in both academic and professional contexts (Francis & Garbarczyk, 2018). Access to resources and mentorship was positively received (M = 4.24, SD = 0.87), reflecting that they appreciate the support they got, both in terms of access to material and academic guidance. Many noted that the right mix between independent exploration and structured mentorship helped them become more responsible and independent, which are important qualities in professional architectural practice (McLaughlan & Chatterjee, 2020).

The VS model was found to influence students' design processes, receiving strong endorsement (M = 4.19, SD = 0.90). It helped them be more innovative, make better decisions, and solve problems better. While the

quantitative results affirm the effectiveness of the VS, qualitative insights provide important areas for improvement. There remains an opportunity to improve the design process orientation by encouraging more sharing of knowledge between academic levels. Participant M11 suggested that more insights from Part 04 students could help Part 03 students better prepare for the transition, saying:

"More sharing from the Part 04 students to Part 03 about what to expect when entering Part 04"

This statement highlights a gap in how knowledge is shared between levels, suggesting that students would benefit from organised mentorship mechanisms that go beyond design critiques. Structured peer mentoring could assist juniors in understanding thesis expectations and requirements, managing their workload, and preparing for specific tasks. Such initiatives are supported by Tuztasi and Koc (2022), who argue that vertically integrated studio models should include deliberate mentorship scaffolds to ensure continuity and alignment with learning objectives.

Participant F14 further pointed to the need for increased flexibility in tutorial scheduling**,** stating:

"The Vertical Studio model can be enhanced by allowing flexible participation from both tutors and students, ensuring that no tutoring sessions are missed if they are unable to meet on the scheduled day."

This feedback shows that the design process is naturally iterative, which might not always fit with strict scheduling. It shows how important it is to go to feedback sessions regularly, because doing so keeps the project moving forward and makes the studio a more supportive and collaborative place to work. As suggested by Giencke (2021), integrating flexibility into studio structures, such as asynchronous critique opportunities or make-up sessions, could improve the studio's inclusivity while still keeping the academic standards high.

5.4 Skill Development and Real-world Applications

Table 4 reveals a positive perception of the VS's ability to help students in fostering a wide range of critical skills. The highest mean score (M = 4.40, SD = 0.81) was for the enhancement of communication and presentation skills. This shows that the studio provides student a strong platform to articulate and express their design ideas with clarity and confidence. It reflects how well the studio's culture of critique and presentation helps people communicate convincingly. The VS also received favourable evaluations for helping students improve their problem-solving skills (M = 4.31, SD = 0.83). This shows that it was good at getting students to think critically, respond innovatively to the tasks, and develop design solutions based on analytical reasoning. Simultaneously, students acknowledged the studio's role in fostering professional development and adaptability (M = 4.30, SD = 0.86), particularly through vertical interactions across academic levels that emulate real-world collaborative environments.

Additionally, the incorporation of real-world applications facilitated by tutor guidance received a significant response (M = 4.33, SD = 0.85), highlighting the studio's capacity to connect academic learning with practical industrial relevance. Students acknowledged the importance of tutors integrating assignments with current architectural trends and practical design scenarios, hence enhancing the relevance of academic work to professional practice. This alignment between studio pedagogy and industry demands is important for preparing students to transition effectively into the field.

The enhancement of design and creativity skills also received a favourable response (M = 4.25, SD = 0.90), reinforcing the studio's function as a venue for exploration and innovation. Nonetheless, technical and digital proficiency, although still positively rated (M = 4.12, SD = 0.92), received a marginally lower score. This suggests a potential area for future improvement, particularly in terms of providing more assistance for digital tools and technological competencies. The relatively low standard deviations across all items suggest a consistent student experience and a collective recognition of the VS model's significance in both academic and professional development. These results confirm that the VS is a strong pedagogical framework in architecture, producing graduates who are both creatively confident and professionally competent.

Table 4. Level of Agreement on Skill Development and Real-World Applications

Statement	Strongly Disagree (1)		Disagree (2)		Neutral (3)		Agree (4)		Strongly Agree (5)		M	SD
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
The Vertical Studio is effective in helping me develop design and creativity skills.	0	0	4	6	9	13.4	20	29.9	34	50.7	4.25	0.90
The Vertical Studio is effective in helping me develop technical and digital proficiency.	1	1.5	3	4.5	10	14.9	26	38.8	27	40.3	4.12	0.92
The Vertical Studio is effective in helping me develop communication and presentation skills.	0	0	3	4.5	5	7.5	21	31.3	38	56.7	4.40	0.81
The Vertical Studio is effective in helping me develop problem-solving skills.	0	0	3	4.5	7	10.4	23	34.3	34	50.7	4.31	0.83
Working with students at different academic levels has enhanced my professional growth and nurtured adaptability.	0	0	3	4.5	9	13.4	20	29.9	35	52.2	4.30	0.86
The tutor integrates real-world applications into teaching, making the learning experience more practical.	1	1.5	2	3	5	7.5	25	37.3	34	50.7	4.33	0.85

**M = Mean, SD= Standard Deviation,* Source: Authors, 2025

Students stressed how important it is to have structured peer interactions, regular critiques, and exposure to different viewpoints in developing soft skills such as confidence, adaptability, and teamwork. These qualities are essential for dealing with interdisciplinary and collaborative aspects of architectural practice. A key aspect of skill development in the VS model is that it focuses on real-world experience. Student stresses how site visits, external critique panels, and industry engagement helped in enhancing their design thinking. Participant M28 made this point clear:

"Lecturers (related to the clusters) can guide students in specialised modules or units with subject expertise, while industry external panels (related to the units) can provide real-world insights. Together, they bridge the gap between academic learning and professional practice, offering personalised feedback and fostering interdisciplinary collaboration. All in all, Vertical Studio promotes a more holistic understanding of architecture, especially for design theses that relate to the units."

This perspective emphasises the opportunity to improve the VS model by strengthening collaborations between academic faculty and industry professionals. The dual approach can greatly improve the depth, relevance, and real-world usefulness of students' design work by combining the academic knowledge of tutors with the practical knowledge of professionals. Formalising industry involvement through guest critiques, mentorship initiatives, and real-world project collaborations can enhance students' design, technical, and problem-solving skills, while also ensuring relevance to contemporary professional contexts.

The VS model not only cultivates basic design competencies but also the soft and professional skills needed to succeed in the architectural field. By providing structured learning, encouraging interdisciplinary collaboration, and offering direct engagement with real-world challenges, the VS model prepares students to

enter the profession with confidence, flexibility, and a comprehensive understanding of their future roles as architects.

5.5 Understanding of Cluster for Design Thesis

The implementation of VS has significantly shaped students' understanding and experience of the design thesis cluster system, both in its thematic focus and its function as a guiding framework for project development. Table 5 reveals a strong and positive perception of the cluster system, with consistently high mean scores across multiple indicators. The highest mean score (M = 4.43, SD = 0.67) was recorded for the statement, *"The cluster system could be improved to better support students' needs."* This finding suggests students generally view the system favourably while remaining open to refinements that would enhance their academic and creative experiences.

These findings align with Giencke (2021) assertion that vertical studio structures support collaborative and advanced learning, allowing students to navigate design problems through shared thematic frameworks. Students in this study recognised the clusters as curated intellectual spaces, organised around specific themes or areas of expertise. This organisation enabled alignment between students' design interests and supervisors' academic strengths, which many found beneficial. Satisfaction with cluster placement was also high (M = 4.24, SD = 0.99), reinforcing the idea that clusters effectively supported personalised research trajectories and facilitated relevant mentorship, echoing Barnes' (1993) view that vertical studios allow students to observe diverse, yet coherent, design logics that enrich their approaches.

Table 5. Understanding of Cluster for Design Thesis

Statement	**Strongly Disagree (1)**		**Disagree (2)**		**Neutral (3)**		**Agree (4)**		**Strongly Agree (5)**		**M**	**SD**
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
I clearly understand the differences between the clusters.	3	4.5	3	4.5	6	9	25	37.3	30	44.8	4.13	1.05
The process of assigning students to clusters was transparent and well-explained.	2	3	5	7.5	13	19.4	23	34.3	24	35.8	3.93	1.06
Being placed in my assigned cluster has been beneficial to my design approach and development.	0	0	5	7.5	9	13.4	21	31.3	32	47.8	4.19	0.93
The cluster structure encourages meaningful discussions and collaboration among students.	1	1.5	5	7.5	10	14.9	20	29.9	31	46.3	4.12	1.02
I feel that my cluster provides sufficient flexibility for my thesis development.	0	0	5	7.5	9	13.4	21	31.3	32	47.8	4.19	0.93
I am satisfied with my placement in the assigned cluster.	0	0	3	4.5	8	12.1	21	31.8	34	51.5	4.24	0.99
The cluster system could be improved to better support students' needs.	0	0	0	0	7	10.4	24	35.8	36	53.7	4.43	0.67

**M = Mean, SD= Standard Deviation,* Source: Authors, 2025

The high mean score for how cluster placement contributed to design development and allowed flexibility for thesis exploration (M = 4.19, SD = 0.93) further supports Francis and Garbarczyk (2018) argument that horizontal openness and discursive spaces created by VS promote deeper engagement and individualised learning. Students reported that thematic clarity within clusters provided meaningful direction and that the opportunity for peer learning and collaboration fostered a sense of shared purpose. This was evident in the relatively high score regarding the system's ability to foster collaborative and meaningful peer discussion (M = 4.12, SD = 1.02), although the wider SD suggests some inconsistency in experiences across different clusters.

However, challenges were also noted. Students' understanding of the distinctions between clusters recorded a slightly lower mean score (M = 4.13, SD = 1.05), indicating general clarity but also highlighting a need for better communication**.** Several students expressed during the cluster selection phase, pointing out insufficient briefings and a lack of clear guidance. This echoes Smatanová et al. (2020) concern that, in the absence of structured orientation, students may find it challenging to navigate the thematic differentiation among clusters.

Participant M21 noted:

"Clarity on each cluster should be defined well and cannot be compared with other clusters, as the gist of the study is different, and maybe the output might be different as well. Lecturers should be in a well-placed group, depending on which cluster is their expertise."

This statement underscores the necessity of offering clearer thematic definitions and strategic faculty positioning. Students appreciated regular supervision and acknowledged the potential of faculty expertise to enhance their understanding of the themes, supporting the pedagogical emphasis on independent, reflective learning promoted by Abdel-Hadi et al. (2020). A further layer of improvement was suggested regarding flexibility and creative freedom. Participant M24 stressed:

"Each cluster should have its freedom to produce project substance"

This aligns with what Adigüzel Özbek et al. (2018) said about comparative and context-sensitive learning in vertical studios. Allowing clusters to grow naturally through student-supervisor interaction might encourage new ideas while maintaining academic coherence. Another recommendation involved the strategic placement of lecturers. As mentioned by Participant F11:

"The assignment of lecturers to each group can be improved by matching their expertise with the students' (thesis) topic."

This suggests the need for a more intentional faculty-cluster alignment. This will ensure that students are mentored by academics whose research interests and professional backgrounds help in their thesis development, which will make it more relevant and in-depth. Overall, the results suggest that the cluster system is widely valued and effectively contributes to students' design thesis progress. However, the findings also point to opportunities for refinement, particularly in communication clarity, supervisory alignment, and autonomy within clusters. By addressing these aspects, the Vertical Studio can further evolve into a responsive and student-centred learning environment, in line with contemporary pedagogical goals.

5.6 Overall Perception

The findings present a strong and encouraging overall perception of the VS experience. As shown in Table 6, a significant majority of students (83.6%) either *"agree"* or *"strongly agree"* that their overall experience with the VS was positive, resulting in a high mean score (M = 4.36, SD = 0.93). This suggests that, for most students, the VS represents more than a formal academic structure; it offers a memorable, enriching, and professionally relevant learning journey. The model's ability to meet academic needs and enhance learning received an even higher rating (M = 4.40, SD = 0.77), with 56.7% of respondents strongly agreeing and 28.4% agreeing. This widespread endorsement reflects strong confidence in the VS's capacity to foster not only academic development but also personal growth, interdisciplinary dialogue, and real-world readiness, core goals advocated by Adigüzel Özbek et al. (2018), who highlighted VS as catalysts for comparative, reflective, and independent learning. The near absence of negative responses further underscores the model's acceptance and effectiveness, with only one student disagreeing and none strongly disagreeing.

Table 6. Overall perception of VS

Statement	Strongly Disagree (1)		Disagree (2)		Neutral (3)		Agree (4)		Strongly Agree (5)		M	SD
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
Overall, my experience with the Vertical Studio has been positive.	2	3	0	0	9	13.4	17	25.4	39	58.2	4.36	0.93
The Vertical Studio model is effective in enhancing my learning experience and meets my academic needs.	0	0	1	1.5	9	13.4	19	28.4	38	56.7	4.40	0.77

**M = Mean, SD= Standard Deviation,* Source: Authors, 2025

Qualitative feedback supports this positive sentiment. Students appreciated the collaborative environment, continuity in supervision, and the theme-based structure of the clusters. These features collectively nurtured a sense of academic belonging and purpose, aligning with Francis and Garbarczyk (2018) observation that vertical studios thrive when they offer discursive, inclusive spaces that embrace open-ended exploration and iterative feedback. The peer learning dynamic, praised by many participants, echoed Barnes' (1993) advocacy for structured diversity in studio environments that allow students to learn from varied design logics and approaches across year levels. This also resonates strongly with Vygotsky's (1978) Zone of Proximal Development, wherein students benefit from the guidance of more knowledgeable peers to tackle complex tasks they might not achieve independently. Similarly, Wenger (1998) theory of Communities of Practice is reflected in the studio's structure as a collaborative environment in which knowledge is co-constructed, shared, and embedded through repeated interactions within a shared practice. However, the findings also suggest that all students, highlighting the gap between theoretical ideals and studio realities, do not uniformly experience this collaborative dynamic, while present.

Yet, despite the overwhelmingly positive responses, 13.4% of students remained neutral regarding both the overall experience and the studio's learning effectiveness. This group, while small, signals a need for deeper reflection on inclusivity, adaptability, and individualised support. As Giencke (2021) noted, vertical studio models may benefit from careful tuning to ensure that all students, regardless of background or learning style, feel equally engaged and empowered. These neutral responses may indicate issues such as limited connection with cluster themes, insufficient clarity in the early briefing stages, or mismatches in supervisor alignment. This echoes earlier concerns in Sub-heading 5.5 regarding cluster clarity and student autonomy, as well as calls for improved strategic lecturer placement (as suggested by Participants M21 and F11). Therefore, further inquiry into this group's experiences could yield critical insights for enhancing the VS's inclusivity, particularly for those who feel disconnected or uncertain about their place within the model.

5.7 Gender-based differences in perceptions of VS

The analysis of gender-based responses (refer to Table 7) reveals that both male and female students reported overall positive perceptions of the VS. However, male students consistently demonstrated higher levels of satisfaction across all categories, suggesting a more intuitive alignment between their learning preferences and the collaborative, project-based studio model. Quantitative scores highlight these differences: male students reported slightly higher mean values, Peer Learning and Collaboration at (M = 4.39) compared to female students (M = 4.05), as well as Project and Design Process (M = 4.42 vs. 4.08), and Skill Development and Real-World Applications (M = 4.40 vs. 4.12). Similar gaps emerged in perceptions of Understanding of the Cluster for Design Thesis (M = 4.31 vs. 4.01). Although both genders evaluated the VS positively, these differences suggest that female students may face subtle challenges related to confidence in participation, access to mentorship, and clarity in the expectations surrounding design projects.

Table 7. Comparison of response based on gender

Gender	**Number of participants**	**Peer Learning and Collaboration**		**Project and Design Process**		**Skill Development and Real-world Applications**		**Understanding of Cluster for Design Thesis**		**Overall perception**	
		Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Male	40	4.39	0.73	4.42	0.71	4.40	0.71	4.31	0.69	4.41	0.82
Female	27	4.05	0.70	4.08	0.71	4.12	0.82	4.01	0.64	4.33	0.78
Total	67	4.25	0.73	4.28	0.72	4.29	0.77	4.19	0.68	4.38	0.80

**Standard Deviation (SD),* Source: Authors, 2025

The Mann-Whitney U Test results in Table 8 further confirmed that gender differences were statistically significant in three key areas: Peer Learning and Collaboration (U = 365.500, Z = -2.252, $p = 0.024$), Project and Design Process (U = 368.500, Z = -2.218, $p = 0.027$), and Understanding of Cluster for Design Thesis (U = 383.000, Z = -2.016, $p = 0.044$). No significant differences were observed in Skill Development and Real-World Applications (U = 432.500, $p = 0.160$) or Overall Perception (U = 503.500, $p = 0.614$), indicating a broadly shared appreciation of the VS's overall goals and outcomes. These findings mirror concerns raised by Francis and Garbarczyk (2018), who noted that the openness and flexibility of VS might inadvertently favour students who are already confident and well-versed in self-directed learning, traits more often observed among male participants in traditional studio cultures. Furthermore, Giencke (2021) and Barnes (1993) argue that the VS model risks reproducing existing inequalities without careful instructional scaffolding and equitable access to mentorship, especially among students who may require more structured guidance or clearer expectations.

Some female students expressed uncertainty in navigating the cluster system or how to fit their thesis into it. Some pointed to a need for more organised collaboration and clearer ways to give input. This includes improving the mentorship structure, making the cluster selection process more open and helpful, and incorporating collaborative learning activities that balance independence with structured assistance.

Table 8. Mann-Whitney U Test Results

Components of VS	**U Value**	**Z Score**	***p-value (Sig.)***	**Interpretation**
Peer Learning and Collaboration	365.500	-2.252	0.024	Significant difference
Project and Design Process	368.500	-2.218	0.027	Significant difference
Skill Development and Real-world Applications	432.500	-1.405	0.160	No significant difference
Understanding of Cluster for Design Thesis	383.000	-2.016	0.044	Significant difference
Overall perception	503.500	-0.504	0.614	No significant difference

Source: Authors, 2025

6.0 CONCLUSIONS

This study offers strong evidence in favour of adopting the Vertical Studio (VS) model in Malaysian architectural education, highlighting its dynamic, collaborative, and flexible nature as a pedagogical framework. The results reveal that generally students have a positive perspective of the VS model. The results underscore the efficacy of the VS in fostering essential skills, including creativity, problem solving, adaptability, and interdisciplinary collaboration. Students reported significant satisfaction with the studio's effectiveness in connecting theoretical concepts with practical application, especially through real-world engagement, industry participation, and tutor guidance.

The study, however, shows important nuances, notably gender-based differences in student experiences. Male students reported slightly greater satisfaction in areas such as peer collaboration and cluster navigation, suggesting the need for more inclusive instructional approaches. Tailored mentorship, clearer communication, and fair studio practices are crucial to guarantee that every student, irrespective of gender, feels equally supported and empowered. Future iterations of the VS must actively engage with these gendered dynamics to enhance inclusivity and foster equitable learning outcomes. The cluster system garnered positive feedback for its ability to offer intellectual structure and thematic focus. Yet, some areas need improvements, particularly in cluster assignment, scheduling constraints, faculty allocation, and clearer orientation during the selection phase. Students articulated a wish for increased autonomy within clusters and enhanced opportunities for interdisciplinary engagement, highlighting a necessity for a more adaptable and responsive studio framework.

Students identified several operational issues with the VS model, including time constraints, schedule conflicts, and insufficient integration between semesters, which may hinder its optimal effectiveness. These findings present opportunities for enhancement. Enhancing scheduling flexibility, incorporating planned cross-semester events, and optimising workload distribution could significantly improve the student experience and exert a greater impact on the studio overall. The VS model demonstrates great potential as a dynamic, progressive educational approach that corresponds with educational theory and professional preparedness. The effectiveness, however, relies on ongoing development, guided by student feedback, inclusive policies, and robust institutional commitment. By refining mentorship structures, enhancing clarity, and embedding flexibility into studio operations, the VS can better accommodate the diverse learning needs of architecture students in Malaysia and comparable contexts.

This study contributes regionally grounded insights to a largely Western-dominated discourse, demonstrating that Malaysian architectural education is well positioned to embrace such innovations, provided institutional support mechanisms are strengthened. Future research should expand the scope by conducting comparative studies across institutions and exploring vertical studio at the undergraduate level, where peer mentorship and design maturity may operate under different dynamics. Such research would shed light on the VS model's adaptability and inform more equitable and successful design studio pedagogies across educational levels and cultural contexts.

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