

## Evaluating Campus Outdoor Design Towards Students' Smart Space

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### **Article info:**

Submission Date: 16<sup>th</sup> May 2025

Acceptance Date: 17<sup>th</sup> September 2025

### **Keywords:**

Students Smart Space, Livable Campus, Sustainable Campus Index, Post-Occupational Feedback, Campus Outdoor Revitalisation

### **Abstract**

The user-friendly, comfortable campus, eco-friendly setting, high speed and connectivity of the online environment and green approach, often seen as a single entity in campus design projects, play a significant role in the design of built resources projects. Implementing the Livable Campus agenda in projects is advantageous, mainly when a team adopts a new design process to achieve design sustainability. This can lead to sustainable designs in the Students' Smart Space (SSS) outdoor design projects. Most studies have focused on identifying the essential criteria that lead to innovative future space design in new campus development settings. The *2024 Sustainable Campus for Index* discovery is limited to Campus Building design, interior design and it is found that does not cover the campus outdoors quality. This study aims to identify the outdoor intelligent space pattern in the occupied stages of the retrofit campus from the end-users' perspective for students' outdoor space in between campus buildings. A semi-structured questionnaires was distributed amongst students through the appointed lecturers as the researcher's representative in three campuses of the Faculty of Built Environment in Puncak Alam Selangor (PAC), Seri Iskandar Campus, Perak (SIC), and Kota Samarahan, Sarawak (KSC); to achieve the research aim. The Index Seven approach of SSS to analysis revealed the selected areas or clusters along with a critical supporting factor. The investigation revealed three ideas for the pre-study and study stages and one for the post-study stage. The findings unveiled that to provide a practical tool in measuring the quality of the outdoor students' space shall be made as a compulsory check on measuring feedback from students.

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## 1.0 INTRODUCTION

In the campus design setting for built environment education, the indoor and outdoor spaces are inspired by multiple levels of inspiration with a top-down approach. Many tertiary education leaders, administrators, and lecturers do not take the challenges faced by students seriously, as noted by Salazar-Granizo et al. (2024). The development project of any campus focuses on the brief developed by the university administration's high council with the designing architect.

The Green Building Index (GBI) and 2024 Sustainable Campus Index (SCI) were reviewed by Shishakly et al. (2024) in terms of responsiveness, enhancement of values, sustainable development in collaboration goal (SDG), universal design, end-user friendly, pedestrian-friendly, and passive design. This novelty focuses on the source of inspiration, the quality of the end product, and the construction of the "Ideal Indoor and Outdoor Campus Space. The influencing stimuli make it visually appealing in terms of both form and function in the end product. However, the main users' feedback within most campus settings is students and staff who spend most of their working hours and are not fairly evaluated.

Most research concentrated on identifying the essential building design criteria that led to the creative deployment of the Sustainable Campus Index (SCI). Even though campus setting attributes are applied, the design process is not a one-way route. To quantify the outdoors and indoors, architects must be involved in further detailing the three primary timelines: the preliminary design, on-site design implementation, and post-design, also known as the post-occupancy stage. The experience occupying the form generated at the design stage at the post-occupancy stage is considered a unique phase, too, since it is the reality of the outdoor space, especially for architects and urban designers in the construction industry field, who require indoor and outdoor planning skills (Samadi, Z. et al., 2024). Therefore, it is essential to identify the most critical phase based on students' feedback, as the end-users, where the impacts of the built environment within the campus setting are super-loaded for future endeavours.

The pre-entry accessibility experience during the journey encompasses several aspects, including the approach to campus and the welcoming space at the entrance. The permeability of the block massing of the design school, the legibility of the administrative and design school blocks, the visual appropriateness of the block's design development, and the visual richness of the construction detailing that offers the personalisation of space for users to reflect. Creating a place through the establishment of space quality in post-occupancy campus project deliverables and agreements made with the client. In the context of architectural school/faculty campus design, although students are exposed to the campus's outdoor and indoor settings, which are limited to three major phases: pre-design, as-built design, and post-occupancy design development, the end user must experience these phases to observe the quality of the space.

Elwy et al. (2024) extensively explore the potential of artificial intelligence for assisting architectural design processes in practice, as well as the benefits of the Sustainable Campus Index (SCI) in sharing the form-generating process through industry-university collaboration and among educational institutions worldwide. The direct relationship between the quality of physical facilities for indoor learning spaces is widely discussed, but its limitations are noted by Guo, W. et al. (2024). Still, there are low-budget specifications for the outdoor spaces in between buildings. Furthermore, neglect of outdoor space is even more critical, despite its visibility. Climatic protection also does not fully support campus walking, especially on sunny and rainy days. In-campus transportation systems also fail to be punctual and fully connect bus stops within the campus. Additionally, technological aid solutions for teaching and learning have limitations, including limited and slow Wi-Fi connections and coverage, which can hinder the downloading of information and systems. The student council often highlighted these issues, but most of the time, the reply and repair took a long time.

In reality, creating a building form in architecture and urban design is often overlooked, whether indoors or outdoors. A classic example is when the action research of the form-making process is practically unveiled, and the post-occupancy stage follows. It is recommended that the campus outdoors contributes to living projects and economic, social and environmental contexts to be more realistic than the ideal unreal. The similar form-making process for campus-outdoor settings plays a significant role for most multidisciplinary designers, including architects, town planners, engineers, and landscape architects in campus design, which is rarely revealed and discussed in terms of the influence and diversity of approaches and challenges in urban design exploration. Understanding the design expectation is the most significant influence on students' performance. The focus on the excellence of the outdoor space between buildings, including creative, innovative, cost-

saving, efficient, passive solar, and passive ventilation, is critical. Martin Haeger, the architect for The Campus Ampang, agreed that the space between buildings requires a careful climatic approach and connectivity. He is referring to the adaptive reuse project in 2025 for a project named *The Campus* in Ampang, Kuala Lumpur.

For daily lifestyle as students within the campus environment, the quality of space supports a study ambience. It includes seven urban design frameworks by Bentley, I. et al. (1996), grounded theory, highlighting accessibility, legibility, permeability, robustness, visual appropriateness, richness, and personalisation. In most urban contexts, the public realm is meant for the public, but in a campus setting, the targeted end users are students; therefore, the final touch of the space aims for a 'smart study space'. The abundance of tasks, projects, and assignments require various physical settings, indoors and outdoors, to meet job requirements. Most of the time, students are expected to excel despite the daily challenges they face. Generally, students' and campus citizens' psychologically in-depth reflections on the indoor and outdoor campus environmental quality are often overlooked. Nobody perceives them and asks how they manage their campus life and survive. Counselling sessions are available, and psychiatry is available but limited to those with emotional and mental health issues only. What about the perception of space among regular students? Their only providence is one-way instruction to complete detailed tasks in the classroom; the expectation is high for learners to perform well. The study assumes that all the information mentioned above is accurate. Still, it aims to identify and classify the most critical attributes that influence a student's performance, rather than innovative space-generating architectural built forms that support their performance and behaviour.

The conducive study environment highlighted the most and least impactful stimuli of a great outdoor space within a campus environment. Therefore, research drivers provide a comprehensive view with consideration on the existence of the urban design framework as a norm strategy for accessing public places in this research, where the public space here is referred to as the student's "public space" within the campus setting and not the public or real public within the city setting, the influencing stage in the post-design process, as experienced by students pursuing the learning process.

The uniqueness of any outdoor campus quality is not an impromptu ambience. It reflects the overall atmosphere, whether positive or negative, as perceived by users or visitors. The vibes should be viral or openly discussed with the end-users to meet the expectations and space requirements. Students' feedback towards the campus outdoor space is unlikely to be focused and prioritised. The quality of outdoor space within a campus setting is considered a rare research topic. The phases in the post-design stage retrospectively relate the counter-check and balance mechanism to the initial pre-design aim, objectives, project research exploration completeness, and personnel involved in the campus environment. At the post-occupancy stage, evaluating the success factors depends on real-time end-user feedback and the researcher's innovative approach in providing output for the university manager. Success is linked directly to the Students' Smart Space (SSS) input in the post-occupancy design. The cooperation of all leading designers and researchers is highly anticipated to ensure a favourable design outcome and enhance the happiness of campus citizens. Students' Smart Space (SSS) ideas vary at different levels of campus outdoor design and location.

Therefore, this research aims to offer insights into identifying the most influential outdoor attributes from the end-users' perception, rather than focusing on form generation towards neuro-aesthetic design, as proposed by Samadi, Z. et al. (2024). The first research question is, what is the most essential part of the post-design process? Therefore, identifying the greatest attributes towards a successful Students' Smart Space (SSS) in the post-occupancy design process.

The sources of inspiration in the design process originated from the multi-sensory human system, which sparked ideas and imagination. Economic, environmental, and social factors, as well as material availability, significantly impact innovation (Johannes, C. et al. 2024), highlighting the human senses and psychological sensitivity related to humans sensing seasons and exploring multisensory architecture as a tool for inspiration—the public realm within the campus environment rather than within the educational sphere. The design process and mind exploration vary among students as they have the freedom to articulate their backgrounds, experiences, and interests in response to their project brief. The most straightforward approach may be the best for improving the quality of outdoor spaces, as well as many post-occupancy process attributes, especially for campus buildings in actual university settings. The exact moment when the architects are triggered with the idea that generates the built form remains crucial. However, various physical and spiritual attributes influence the ambience of the students' space. The imagination related to the end products' space

quality is also in the minds of designers.

Additionally, the external relationships within the context of adjacent blocks are respected and evaluated. A similar approach applies to urban campus planning acts; internal-external space planning also contributed to the final built form. There is no magic, but the operation of internal and external systems must be workable and should be integrated into the post-occupant design process; the sectional and elevational views are also integral to the proposal. Therefore, there is no way that the students' innovative space created by the designer, can be replicated elsewhere, since each campus and building function is unique.

### **1.1 The Morphology of Campus Outdoor**

What is the attribute of a good outdoor campus? Various aspects and clues inspire outdoor building design and the arrangement of building blocks within the campus, shaping the built form that emerges. The evolution of the built form changed over time due to natural and cultural factors. Formiga, B., et al. (2023) highlighted how architectural forms can influence emotional reactions through human senses and vice versa in research involving computer stimulation related to human senses and space. The beauty and geometry of a flower, leaves, seashells, natural flora, and fauna may inspire a biophilic approach to generate a beautiful design process and form based on visual appreciation. The morphology evolution of built form is most dominant in each decade. Still, it requires a resilient planning system as proposed to be part of Urban Metabolism (UM) by Younan, M.N., et al. (2024). Unknown architects from Middle Eastern countries are also scholars in Islamic Civilisation, designing the University of Cairo as a 'living university.' That suggested the significance of openness to the knowledge boundary. Mansor, S., et al. (2023) emphasised that the sustainable planning and design of a campus should integrate various feedback to support students' well-being in achieving academic excellence.

### **1.2 Post-occupational Feedback**

Upon completing any building, a significant session is scheduled to discuss the weekly testing and commissioning activities in project management, with a focus on the building's indoor aspects only. Typically, there are four comprehensive sessions to verify that the entire operation meets the client's requirements. The designers, team leaders, and the client shared the experience, session date, and panels. During the sessions, the end users are the consultant's team and the clients only. They can check around during day and night sessions during the testing and commissioning session and highlight directly to the consultant team any defects and comments. After that, the consultant team conducts the defect checking individually without the client's presence. The end users' students do not benefit from this T&C session because they arrive at the last minute, during full occupancy, after the handover of vacant possession.

However, the two-year defect liability period is not advantageous for them since the end-users are trying to familiarise themselves with the campus space setting. Since they are anonymous, they experience self-orientation sessions during the first two years and do not notice any defects that will affect their future study performance. In other cases, students highlighted the defects, but they were only found within the indoor area. The image and identity of the building in Western countries, particularly in relation to its campus transformational process, are fully documented in various books and journals. Berker T. et al. (2024) discussed the importance of significant decision-making, as it alters the campus characteristics in Norwegian universities. The new setting challenges the sense of space and place. Whether the in-campus citizen feedback is considered or not, the impact of the new campus character still leaves a nostalgic memory for alumni and current citizens.

Beatini V. et al. (2024) discussed extensive research on the adaptive façade, which provides a visually in-depth meaning and impacts the emotional connection with users, relating them to a specific memory. This concern about human sensory perception through visual enrichment and the sense of personalisation often enhances the urban space way-finding or legibility during mobility or walking exercises for first-time tourists accessing the city. That is why the transformation rate in any campus context should not be too drastic to consider the mental balance of the urban citizen when navigating the given setting.

### **1.3 Lack of Post-Occupancy Design**

An accessible, legible, permeable, and robustly functional design, with a harmonious balance and visual richness, fulfils the "student's smart space" as a personally appealing design that incorporates contemplative neuro-aesthetics and architecture, evoking sensorimotor exploratory vibes, as concluded by Djebbara Z. et al. (2024). Another term is neuroaesthetics and multisensory assessment, a recently coined term that refers to the

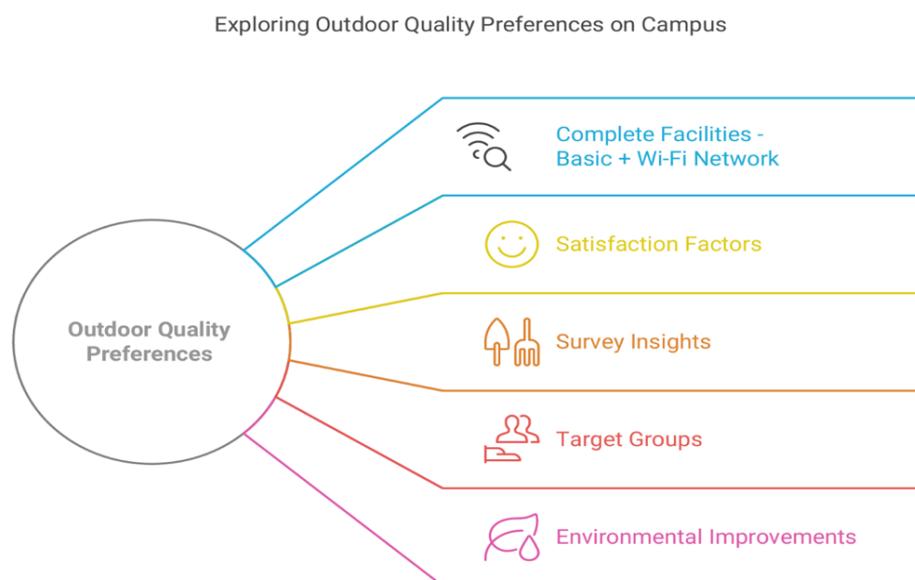
scientific study of the neural consequences of contemplating a creative work of art, such as the involvement of the prefrontal cortex (in ideal thinking) and limbic systems (for emotional touch and sense of space). The psychological reflection of the three-dimensional vibes of space reflects the human sensory-motor ambience resulting from the materials' pattern and texture, creating tectonic excitement and entertainment.

Berman, D. B. (2008) had a firm idea that the design of a building, with a careful selection of materials, could change the world in terms of quality of life. The highest ranks are given to innovative designs that fulfil the functionality, tectonic buildability, efficiency, and practicality criteria. The main criteria for an excellent building are based on progress marks as stipulated in the critique session. In this research, the term "Ideal Outdoor Campus Design" is derived from the Sustainable Urban Outdoor Campus Index (SUOCI), which is the suggested terminology to describe the ultimate best design, as moderated by the experiences of internal and external users during the POD design review session. Implicitly treat the physical model development from the massing to the particular models at the early stage to the final stage as a reflection of the designer's thinking process, as discussed earlier. The expected quality by designers is based on innovative criteria: the rationale of the idea, the intricacy of the design, problem-solving skills in addressing the highlighted issues, responsiveness to the environment in the site context, universal design compliance, and ground-zero user-friendliness. Saroglou, S. T. (2024) highlighted that architectural building design concepts and challenges, as part of the design process, promote sustainability in design development. However, that strategy only covers the conceptual and construction design framework. The actual 'dream space -imaginative space' has yet to be tested and experienced by end-users.

#### 1.4 Livable Campus

The ideal term "Livable Campus" was first introduced in this research by? Still, livable campuses are standard and widely applied in other venues. Livability refers to the number of students occupying the space within the university, allowing for management and operational time. (Ruta, M. et al. 2024) Highlighted the significance of a study conducted in Milan, Italy, where students proposed a design for students' innovative spaces. The battle over the hierarchy between developers, end-users, and policyholders is a story that depends on where the giant stands in determining the winner.

Most importantly, the end users should not become victims, as they are human beings who live, work, study, and play within the campus setting. The student population is based on the total number of students in the data collection year. A livable campus provides a healing space for students to complete their academic tasks. Social interaction among students increases peer learning. Hence, the space's function is to provide outdoor space for such an active landscape, a pocket landscape with supportive climatic elements, to revitalise and support the ecosystem and infrastructure around campus for students.



**Figure 1.** Outdoor Quality Preference on Campus (source: <https://www.napkin.ai/>)

### 1.5 Campus Outdoor Revitalisation

The main environmental characteristics of campus outdoor public spaces may comprise functions, location and distribution, size and scale, form and layout, naturalness/greenness, furniture and facilities, access and lines, boundaries, and the surrounding environment (building form, enclosure, visual nodes, edges, landmark and façade characters, street detailing such as materials and signage, or other landscape elements). A well-balanced lifestyle among students fosters leadership talents, accompanied by a revitalised indoor and outdoor environment.

### 1.6 Towards Sustainable Campus Outdoor Index (SCOI)

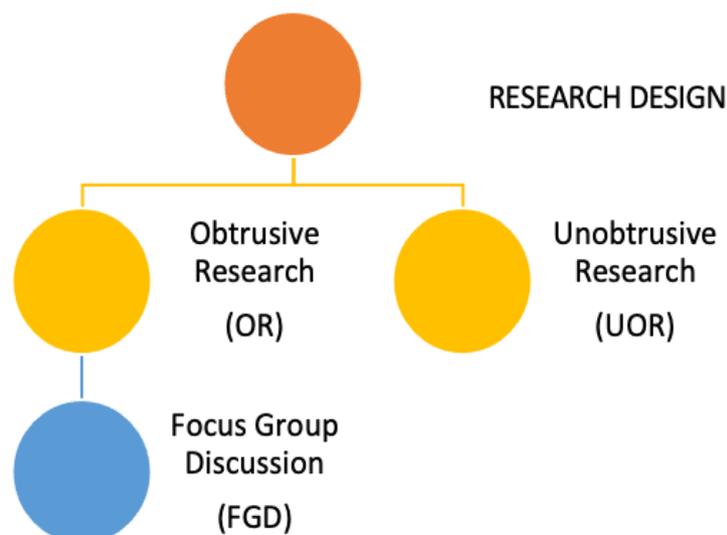
The Sustainable Campus Index (SCI) was introduced in 2024. However, the index measurement is limited to the indoor environmental characteristics of campus settings, including functions, location, distribution, size, and scale. The project's motivation is to achieve time, space, and cost savings by working concurrently. Creative ideas and concepts touch the heart and soul of the university's aspirations and inspiration, especially when the proposal and presentation demonstrate an in-depth understanding of the end-users' issues and the current needs of the indoor and outdoor spaces within the campus. Applying innovative theory and campus principles will hopefully lead to the establishment of the SCOI (Sustainable Campus Outdoor Index) in the future.

## 2.0 THE MATERIALS AND METHODS

The classic method of campus outdoor design began with face-to-face interaction, encompassing both formal and informal learning environments. The fundamental principle in architectural teaching and learning is that the conduct is considered action research, and the design assessment complies with the "open house concept" where practitioners collaborate in grooming architectural students. There is no way a building can be replicated, and each building form is unique. Every time a design is created, it is a life experiment; the fact is that learners must realise that end users will live inside the building and perceive it individually. However, for public and urban buildings, the case is different.

The research design is inspired by the objectives of identifying the most significant attributes in the post-design process, regardless of the student's background. To achieve this objective, the end-users of the campus outdoor space are senior students (two to two years more occupying the campus outdoor space).

**Figure 1.** Summary of research design employed to analyse the Students' Smart Space (SSS)



The above figure illustrates the research design, where Unobtrusive Research (UOR) involves the researcher obtaining only the SSS Attributes, and Obtrusive Research (OR) employs semi-structured questionnaires in the Focus Group Discussion (FGD).

The responses regarding background experience vary from student to student, and the design preferences for aspects of outdoor space quality perceptions. Still, this research is limited to students' reflections on their

outdoor experiences on campus during the selected study period, from October 2022 to October 2023. This research analysed the students' reflections on the essential attributes and post-design process of excellent buildings in their design subject, using feedback from Focus Group Discussion (FGD) only. In the FGD, the reflection or the input of final-year students was conducted with a total number of 300 students across three campuses. The justification for selecting students involves categorising them into two groups: Group 1, undergraduate students in their fourth year. And the postgraduate group (Group 2).

### 2.1 The Research Methodology for Identifying the Attributes of SSS

The methods were employed due to their efficiency in gauging the learners' experience in the design studio. The following research methodology, as presented in Figure 1, is the first research method (RM1): Document analysis from the literature review to identify the successful attributes of SSS. The following step was the second research method (RM2). The study of characteristics from the literature was categorised and coded into three design stages. Kowaltowski, D. C. et al. (2020) have practised action research and architectural sustainable design in the studio since 2018 and found that students sometimes get stuck and need an outdoor space to express their opinions. Therefore, a focus group discussion (FGD) as the third method is recommended to obtain students' feedback based on the post-occupancy. However, in addition to FGD, it is suggested that the practical work methods for refining and managing data in design proposals include digital tools to evaluate feedback in future research. At this stage, students discussed the research with the researcher, and semi-structured questionnaires were used in the debate. RM3: Establish the performance of SSS based on the post-design stages by testing the set of successful attributes extracted from research, resulting in RR1 and RR2. The following table is a summary of the research methodology.

**Table 1.** Research Material and Employed Methods.

Item	Research Methodology	Research Tools
RM1	Document Analysis Attributes of Students' Smart Space	SSS Attributes
RM2	Manual Category and Coding of Attributes and Development of Toolkit Score	Coding Toolkit
RM3	Testing of the Toolkit Score Focus Group Discussion	Score

The second objective (RO2) is a method centred around reading activities involving a structured coding approach during desktop activity from various sources (books, journal articles, published documents from the local authorities and the Ministry of Education that employs Jabatan Kerja Raya and the University development department on campus design—starting with Research Methods Number One (RM1) as Document Analysis and the output of the findings (RR1) is actually named as SSS Attributes. This attribute's input from RR1 provides evidence throughout the entire literature review process.

The second objective, or Research Objective Two, aims to prioritise the most significant Students' Smart Space (SSS) attributes by ranking and coding to accomplish. To achieve Research Objective Three. Research Method Three employed a Focus Group Discussion (FGD) conducted on the selected campuses, namely PAC, SIC, and KSC, which primarily used semi-structured questionnaires to obtain feedback from end-users. The FGD is based on the toolkit score, developed from the attributes, and is ranked accordingly. The results highlight the SSS toolkit score for the chosen campus, emphasising the importance of teaching and learning activities in the built environment. This initiative aims to showcase the essential skills required for creating high-quality outdoor spaces, referred to as the Students' Smart Space (SSS). The innovative features of the SSS are designed to serve as a model that can be replicated at other campuses, promoting enhanced educational environments on campus. The buildings themselves are open for public debate.

**Table 2.** The Manual Procedure of Category and Coding of Attributes.

<b>CATEGORY</b>	<b>DESCRIPTION OF ATTRIBUTES</b>
<b>Students Smart Space Aspiration and Inspiration</b>	The creation of the SSS inspiration—The aim of the designated space allows all physical needs of students. Students have their dream outdoor functional space for them to accomplish their studio projects and group assignments that functioned for discussion, task accomplishment, work, rest, relief, and recreation.
<b>Targetted End-Users Profile</b>	The project research evaluates the end-users from students' perception only, using the urban design strategies. The study delimits the input or perception of (university's manager as the clients in terms prediction of the future market + return of investment and creation of a new magnet/landmark as a reflection of the university's projection.
<b>Age-factors and Duration</b>	The age factors is not limited but the duration of stay within the campus setting was set to be above 2 years. The optimization of two years duration is to allow maturity of students occupying the outdoor space within the campus setting. The outdoor physical setting also supposed to be part of their routine activity and accessibility for them to reflect and perceive by the end users.
<b>Campus-Site Profile</b>	The selection of site setting context is within urban and sub urban. The size (location: natural and cultural strengths— heritage + economic activity) of the campus is unlimited since certain universities are not set with a specific boundary such as Oxford University and Harvard University which both campuses set within the relative of Oxford and Harvard respectively.
<b>The Location + Accessibility</b>	The locality and proximity by the users especially during healing time in between learning slot able to optimize the timeline management for them.
<b>Urban Design Strategy</b>	The site issues (accessibility, legibility (way finding), permeability, robustness, visual richness, and the personalisation).
<b>Innovative - Principles</b>	The project's motivation will be cutting time, space, and cost savings. Creative ideas + concepts touch the heart and soul from the university aspiration and inspiration, especially when the proposal and presentation show an in-depth study of the end users' issues and current needs.
<b>Revitalisation Level</b>	The occupancy also covers the number of users, frequency of visit and duration of occupationing the space. For instance, the highest revitalisation of outdoor space is the highest if it hits 24 hours duration of function even if it is use by different group of users.
<b>Micro-Cimatic Factors</b>	Thermal Comfort, air quality, a good cross-ventilation, acoustic environment – noise free, accessible, openness and aesthetic within campus will attract the campus citizens. The locality and proximity by the users especially during healing time in between learning slot able to optimize the timeline management for them.

### 3.0 RESULTS

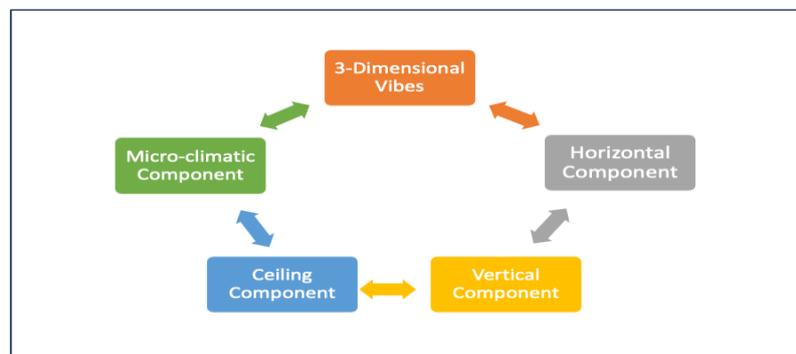
Based on the literature review and the practice of urban design, the document analysis suggested that the assessment of post-occupancy outdoor space design stages revealed a close relationship between the quality of outdoor space and students' performance. Even in the occupancy design of the SSS, the phases involved required special attention from the university managers, especially the campus outdoor space, which does not include building construction costs. The physical relationship between users and the campus involves how the campus design, layout, and accessibility affect users' ability to navigate and interact with the environment. A well-designed campus provides clear signage for legibility, interconnected pathways for highly accessible, permeable and robust buildings, and secure spaces. Such design elements enable users to feel physically comfortable and oriented, thereby promoting a positive experience within the campus environment.

### 3.1 The Identified Attributes of SSS developed from the Document Analysis

The post-design stage involves a self-check by designers closely related to the preliminary intention of the design, including its aims, issues, objectives, and methods. In contrast, the design development injected the project research exploration. Architects shall not act like arrogant people due to the completeness of the designated building by the client (university's decision maker), designers, and architects. The outdoor space quality that was previously planned is tested by the end users, allowing them to experience the space in terms of three-dimensional effects, which has a positive campus impact.

**Table 3.** Coding of SSS [Description of Students' Smart Space].

Coding	Components	Description of SSS
<b>C1</b>	<b>Horizontal Component</b>	The design expression by students' representation reflects their backgrounds, unique identity, personalization of space for tasks verbal and graphic communication at this space. A complete horizontal components are normally has tiles, (cobble stone – to represent natural or cultural heritage style of specific age of identity).The floor pattern material and style primarily reflects the power of influencing the visual richness in convincing people found who is at the setting. In- depth detail richness and intricacy of detailed wood craftsmanship applied to the outdoor furniture and has more chances to influence people to 'feel' the style of cottage or medieval architecture.
<b>C2</b>	<b>Vertical Component</b>	The freedom to express ideas and style at the façade characteristic play an important roles and identity to the outdoor setting. The learning style for andragogy is supposed to be very close to the campus lifestyle, where they are more independent and technologically ever-ready for discussion and presentation either indoor or outdoor setting. The intricate detail which normally found in the heritage conservation building is visually compounded through the façade treatment of the surrounding building. The visual richness at the façade speaks on its own local or colonial, the age identity either it belongs to the modern movement, pre-independent façade or art-deco style.
<b>C3</b>	<b>Ceiling Component</b>	The degree of enclosure, semi-enclosure of roofing on imposing architecture style. Internal tutors and External panels either throw in ideas and leave designers to absorb professional advice or leave them room for self-decision-making. This style of grooming offers a quick and mature andragogy style.
<b>C4</b>	<b>Microclimate Component</b>	The local climate physical condition with the shade pattern and the natural wind flow and sun orientation and radiation have influenced the comfort of the end users. The presence of complete amenities with green pockets allows a breathable space, breezy setting. The component is significant because the physical condition able to maintain the number of users to conduct the learning activity with high happiness and support their wellbeing (Li, H., et al.(2024).
<b>C5</b>	<b>The Campus Outdoor Vibes. Three-Dimensional Vibes</b>	The outdoor vibes shall be felt in terms of the accessibility and its contents of the space. The more comfort and the more complete amenity as if the feeling as if the end users are located indoors. The outdoor furniture is set for specific functions of activity. For example, the outdoor discussion space for 10 number of students, so the furniture is arranged appropriately within campus setting. The general vibes are to promote students' gathering for group discussion. The enhancement of the activity depends on the vibes or ambience shared among students.



**Figure 3.** The Built-Form Configuration Study

Regarding space planning, the relationships between indoor and outdoor spaces depend on the operational function and accessibility, considering both human and vehicular circulation. The end users follow the path between indoor-indoor, indoor-outdoor, and outdoor-indoor experiences as proposed by the architect. The design team is led by the team leader (architect), interior architect, landscape architect, urban planners, and designers, as well as the team's innovation, the decision-making process before and after design completion in the post-occupancy design stage.

### 3.2 The Coding in Students' Smart Space

The results are based on a document analysis exploring the research topic. The identification of ideal attributes of SSS was conducted based on a multi-sourced analysis of documents from Google Scholar and ChatGPT search engines. In this finding, four principal components were identified as promoting the students' well-being and happiness index among campus citizens, with the most significant influence being the creation of an ideal student innovative space. The following design components are identified as the physical components in evaluating the campus outdoor spaces.

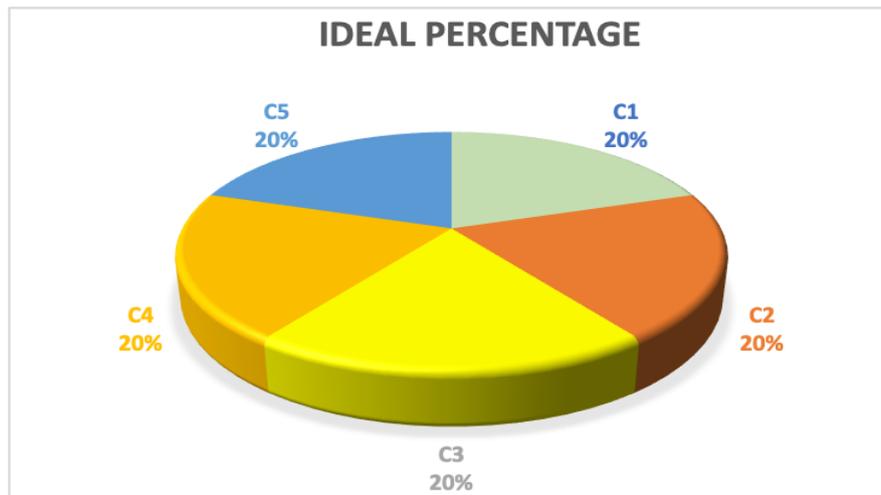
- a. C1: Horizontal Components
- b. C2: Vertical Component
- c. C3: Ceiling Component
- d. C4: Microclimatic Component
- e. C5: 3-D Vibes Component

At this stage, students agreed that the more profound the research, the stronger the opportunities to experience spaces through day and night ambience. The best attributes for students when choosing the best SSS are related to the sense of space and place from the cultural and natural strengths. The best-selected coding is the one that self-motivates students in terms of high interest and engagement towards the space. The physical indicator is the frequency and duration (Student Learning Time-SLT) of occupying the SSS. The assessment of the PDS during the semester evaluation session requires the following details from students, as outlined in the following section.

### 3.3 Focus Group Discussion on Students' Smart Space Toolkit

**Table 3.** Ideal Components

Component	Description of Component	Ideal Percentage
C1	Horizontal Component	20
C2	Vertical Component	20
C3	Ceiling Component	20
C4	Microclimatic Component	20
C5	3-D Vibes Component	20
	Total / Overall Components	100



### 3.4 The RR4: Focus Group Discussion on Students' Smart Space (SSS) Reflection

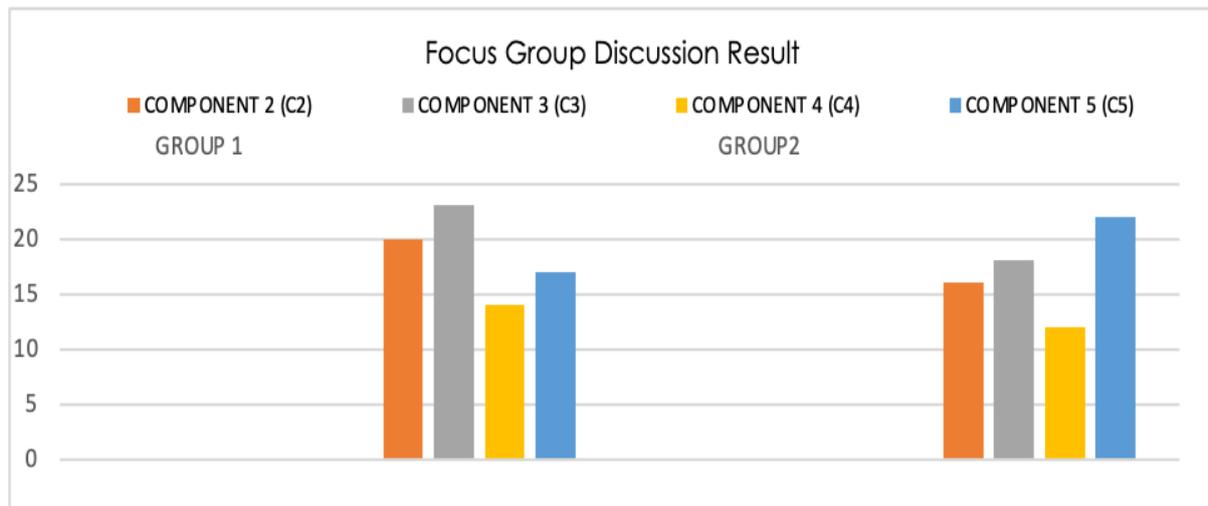
The results are based on the students' reflections during FGD. All codes exploring the document analysis, based on the research topic of the ideal SSS, were used as SSS tools. The following stage, after identifying attributes, is the coding of attributes. In this finding, four major components are used to assess the significant influence of creating an ideal innovative student space. The following list of elements in design is identified as the perfect SSS.

#### 3.4.1 Description of Students' Profile

**Demographic Data:** The minimum age and year of campus citizenship required to study within the campus. According to the enrolment records, the study duration is final years for Group 1 (Undergraduate students) and Group 2 (Post Graduate students) in their 4-5 years only. Based on the research, three primary stages in the design process significantly influence the creation of the built form. The identified results are based on the response practised by students in perceiving the outdoor space component. The following table illustrates the elements identified by students, categorised into two major groups based on the duration of their study period on campus (Group 1 and Group 2). The study was conducted at the College of Built Environment, later known as the Faculty of Built Environment, UiTM Campus of Kota Samarahan, Sarawak.

**Table 4.** Focus Group Discussion Result by SSS Components.

STUDENT'S GROUP	Horizontal Component [%]	Vertical Component [%]	Ceiling Components [%]	Microclimate Components [%]	3-D Vibes [%]
<b>GROUP 1 (4th years / final year Degree) Undergraduate</b> (n=257 for Group 1)	26	20	23	14	17
<b>GROUP 2 (5-6) years Master Degree) Postgraduate</b> (n=34 for Group 1) For PAC and SIC only)	32	16	18	12	22



**Figure 5.** The Histogram on the comparison result is in percentage values.

#### 4.0 DISCUSSIONS

Based on the research, three post-occupancy stages in which the feedback of end users, especially students, significantly affects the happiness index of the building form. The most significant is the Post Occupancy Stage (POS), concerning the above score, where students are most active in their outdoor space experience. At this stage, students explore various outdoor furniture, technology-led and service tools, including physical study furniture, Wi-Fi connection, coverage, and artificial intelligence (AI) access generation tools, design software for indoor and outdoor end-user circulation, and traffic circulation. The previous study identified traditional, future, and digital tools in architectural exploration. Students can explore various architectural and urban design tools as part of their research experience and experiment to achieve their research objectives. The physical model was discussed in depth as a three-dimensional study of external and internal space planning. Digital software applications and physical tools (such as manual and three-dimensional 3-D print models) were both applied by students in both spaces. They agreed that the façade of any building is the character identity's branding that stands as a university's building as seen by the public.

Basu et al. (2023) highlighted that the urban context, especially the accessibility and links, allows for a significant image during both day and night vision, mainly applied to public buildings and public places. Still, this research is limited to campus design. Finally, only end users will qualify for the best experience as they occupy the designed building, even though stimulation is done before the end product is finalised at the design stage. These are the visionary and imaginary skills required of an architect, with the ability to have high imagination skills to visualise (based on good imagination) the future space and create a cheerful ambience within the building and external urban neighbourhood context and advised that the built environment and spatial form require analytical skills. The skills in manipulating form (basic form and combination) and transformation are supposed to be mastered at this stage. The skills and the current information need both intellectual and emotional intelligence to produce a good design with a sense of place.

The outdoor campus space will promote happiness and creativity, helping to prevent mental illness. Jean-Berluche, D. (2024) researched the close relationship between creative thinking and mental health, accessibility, well-being, and neurodevelopment. Belferman, E., et al. (2022) suggested that the participatory experience of play, planning, and service enables future designers to experience themselves in the created outdoor spaces. Berawi M. A. et al. (2019) strongly promoted a self-inclination towards the conceptual future development trend. The creative behaviours and output prove self-efficacy, self-discipline, and self-belief in specific architectural principles and concepts. Clow, L. T. (2024) supported the interactive community, such as the microgrid model, which is intended to aid in the design exploration of the reciprocal relationship between creativity and technology—genius invention and talent in the excellent space between building designs.

This is where the ideas from the peer learning process have the most decisive influence on their excellence due to the need for more leadership and technological skill characteristics and students. This peer learning

typically occurs in an outdoor space with an informal environment, rather than indoors, which is naturally more formal and under the lecturer's surveillance. The limitation of the study is that it is conducted for students with a longer duration, between 3 and 4 years. Alnusairat S. et al. (2021) and Agrawal, P., & Yadav, M. (2021) suggested that an interactive space is preferred and is translated through positive behaviour, frequency of occupying the space, and spatial analysis through visual observation in the designated outdoor space. They could develop their ideas in design development within the stipulated time frame, regardless of their level of experience and background.

Finally, the efficacy of spatial planning and architecture is not an isolated entity. Mahgoub, Y. (2024) amplified responsible urban development by integrating ideas from post-occupancy, which will be incorporated into future campus designs as part of the "campuscape" to create a responsive campus environment. Social interaction plays a crucial role in developing a sense of place attachment and community. Communal spaces, such as cafeterias, libraries, lounges, and recreational areas, facilitate connections among students, faculty, and staff, creating opportunities for academic collaboration and social engagement. Socially Interactive campus environments foster a sense of belonging and attachment as students build relationships, enhance the peer learning process outside studios and create lasting memories.

## 5.0 CONCLUSIONS

The most significant influence of outdoor design is the happiness behaviours of the end users. The initial objectives are to identify students' innovative space attributes, then categorise them, and establish which phase influences mental health and happiness, increasing students' performance and creativity in a campus environment. The methods employed were document analysis, semi-structured questionnaires distributed to students and focus group discussions involving students. Jiang, F. et al. (2023) suggest that generative urban design is necessary for students in terms of their perception of outdoor design generation within the existing campus outdoor space, and recommendations are also needed. For this research, students from selected campuses were selected as respondents and underwent a series of focus group discussions (FGDs) during studio hours. In the FGD, semi-structured questionnaires were administered by the researcher in the focus group discussions. The session was conducted without them realising their response was evaluated. Ultimately, the critical output is proof of self-efficacy, self-discipline, and self-belief in specific perceptions of space quality. The reciprocal relationship between the quality of outdoor space and happiness adds value to self-development and motivation to innovate outdoor spaces. Establishing the post-design development phase is a space for students to showcase their innovative design.

In conclusion, the results reflected that the respondents agreed that the highest percentage identified the design development stage as the most influential stimulus, rather than the pre-design stage, and the grooming stage indicated that students' self-design exploration journey was the most influential stimulus stage. Each student personalises the entire design exploration according to their interests and inclination toward leadership and the decision-making process. The outcome of becoming a graduate architect and later a professional architect is that they will be more responsible, creative, and brave in facing millennial challenges. In order to support their well-being and excellence in design with high awareness of the knowledge that outdoor space in between building blocks shall be revitalised and rhythmically orchestrated to allow students a smart space.

## ACKNOWLEDGEMENT

The authors wish to acknowledge the support of the Center of Study for Architecture, Built Environment Research and Innovation (BERI) at Universiti Teknologi MARA, Puncak Alam Campus, for the success of this research and a series of writing workshops that guided its publication. Their support, positive attitude in celebrating research, and guidance through the stages of workshops led to this publication. Thanks to the current technology for the application of AI, as demonstrated by <https://www.napkin.ai/>, is illustrated in the figure.

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