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Evaluation of Universal Design on Outdoor Environmental Design Features in HEI Residential Colleges

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Abstract

Outdoor environment campuses are essential for promoting spatial needs for the equitable use of students with different abilities in campus life. Since January 2025, UPM has had 63 disabled students, with 80% living on campus. However, a 49% increase in the number of these students over the three years indicates the need for a reassessment of the physical built environment surrounding the campus, especially in their residential colleges. This research will evaluate the requirements for ease of access in residential colleges with study cases Kolej Sepuluh (K-10) and Kolej Sultan Alaeddin Suleiman Shah (KOSASS), in accordance with the selected items of the Guidelines and Standards in Malaysia related to the outdoor environment as well as established design features. The results from the study identified that both residential colleges have not entirely fulfilled the standards of universal design in the outdoor environment in terms of connectivity and that the passageways have seamless routes for all within the building and from one building to another. From the 14 items of the universal design standard requirement, fifty-two (52) checkpoints were identified in both colleges. Seven (7) checkpoints require reconsideration regarding the provision of facilities, and five (5) checkpoints require refinement that leads to disconnected of travelling routes. As a way forward, the results of this research will contribute to developing a comprehensive model of evaluation for outdoor environmental design features in campus life.

Keywords: Outdoor Environment, Equitable Use, Residential Colleges, Students with Different Abilities (SWDs)

Introduction

Post-secondary education for students with disabilities (SWD) is an important issue that has gained attention and support at both national and international levels in providing equal

opportunities. Higher education institutions (HEI) lead to an increase in individuals' capabilities and their level of self-sufficiency, which in turn increases their quality of life (Colin Barnes, 2006). Apart from that, the author is aware that universities are viewed as pioneers within their communities, and contribute to social, cultural, economic, political, and technological developments, and that they are seen as driving forces in shaping the development of a nation. Universities should take a leading role in society in supporting the campus life of SWDs to ensure that the needs related to the everyday life patterns of students are fulfilled.

In Malaysia, the Higher Education Act 1996 is the main legislation governing the operation of HEI. The Act provides the framework for the establishment, administration, and development of HEIs in the country. However, this law does not specifically address the rights of students with disabilities in HEIs or the measures that HEIs should take to ensure equitable access to higher education for students with disabilities. Although building codes require significant elements of construction to be made barrier-free, it is much more difficult to legislate to make a more comprehensive and 'joined-up' environment overall. And yet the very real problem for many people is often that some of the important parts of the accessible environment may not connect at the interfaces; this may be because separate elements are provided by different agencies and are governed by different codes (Rahim et al., 2014).

The approach to design-built environment buildings that accommodate people with functional limitations has changed from narrow code compliance to meeting the basic usability in design. There are four characteristics of usable designs: make it easy to determine, make it things visible, make it easy to evaluate, and follow natural mappings between intentions and required actions. Apart from that, disabled students face obstacles to their participation in five areas: the physical environment, access to information, entrance to higher education, assumptions of normalities and levels of awareness (Tinklin & Hall, 1999). The universal design shall not exclude assistive devices for particular groups of persons with disabilities where needed. Universal design should be accepted as an approach that values and celebrates human diversity (Rangga F et al., 2020)

Hence, determining the area for outdoor environments can be challenging due to the complexity and dynamic nature of these spaces, as well as the different perspectives and factors that can influence the design features and use of circulation paths. This requires a holistic and interdisciplinary approach that considers the needs and perspectives of all stakeholders and prioritises the well-being, safety, and accessibility of the community. Furthermore, the planning and management of the university campus are strongly tied to its urban context, and knowledge cities provide the required physical infrastructure that influences its development.

Objectives

This study conducted to evaluate the current level of accessibility in all of design features related to outdoor environment, aiming to identify the spatial factors that influence the participants' access to spaces and buildings on their ability, or lack thereof, to participate in activities in the residential college's environment.

Methodology

The variables used to evaluate the design features were obtained in two predetermined samples, which underwent preliminary observation in the subsequent stage. Based on findings from the preliminary observations in previous studies, wheelchair users (manual) were selected as a primary space user category. The spatial focus of this study was the outdoor environment, encompassing four key areas: main entrance, bus stop, parking, and drop-off.

The data analysis comprised two important components. First, the evaluation examined the application of design features specifically for the wheelchair user category. Subsequently, the analysis of the travelling routes of students with different abilities and their facility needs was carried out using diagrammatic branched pattern analysis. This analysis was essential as it mapped the movement pattern of the SWDs along their travel paths from residential colleges to faculty buildings on campus.

The study case objects were chosen for the following reasons: 1) SWD population in UPM, 2) the classification of study objects as those most frequently utilized by SWDs, and 3) capacity usage exceeding 500 individuals and central location within UPM. Therefore, the case objects are relevant to be evaluated on a universal design features implementation.

Kolej Sepuluh, also known as K-10, was established on April 1, 1999, the college consists of two blocks comprising seven levels, each of which contains four wings labelled A, B, C, and D, an administrative office section, a cafeteria, and a multipurpose hall. Over time, the college has experienced several retrofittings to suit the needs of SWDs until its current appearance. The residential college is located far from the centre of UPM, requiring students to travel to the centre of the university using private or public transportation.

Meanwhile, KOSASS (Sultan Alaeddin Suleiman Shah College) is located at the centre of UPM, and students typically move to faculties or administrative offices by walking. On April 25, 1996, the name of the seventh Residential College (KK7) was officially changed to Sultan Alaeddin Suleiman Shah College (KOSASS). Currently, the premises are managed by Pejabat Pembangunan dan Pengurusan Aset (PPPA) UPM.

Findings

The population of disabled students was divided into two groups, those who travel using transportation (public/private); 79% and those who utilise pedestrian walkways to access faculty or administrative offices (remaining 21%). It is necessary for the Development Office and Asset Management, at UPM to pay more attention to implementing universal designs that can accommodate students with different abilities, enabling them to access and utilise the outdoor environment efficiently.

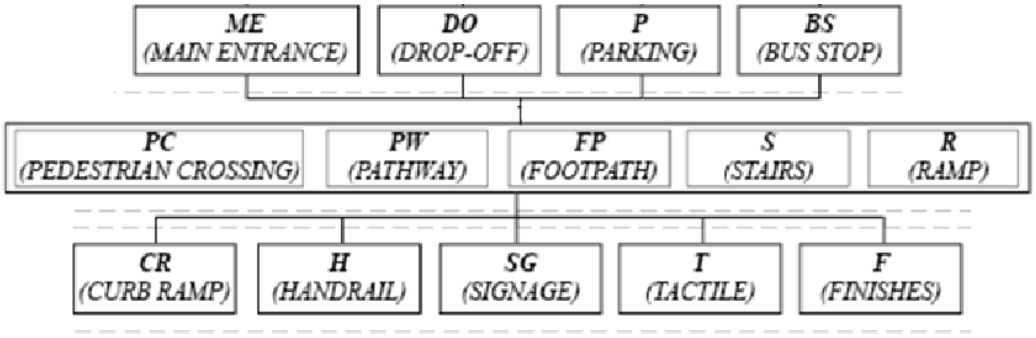
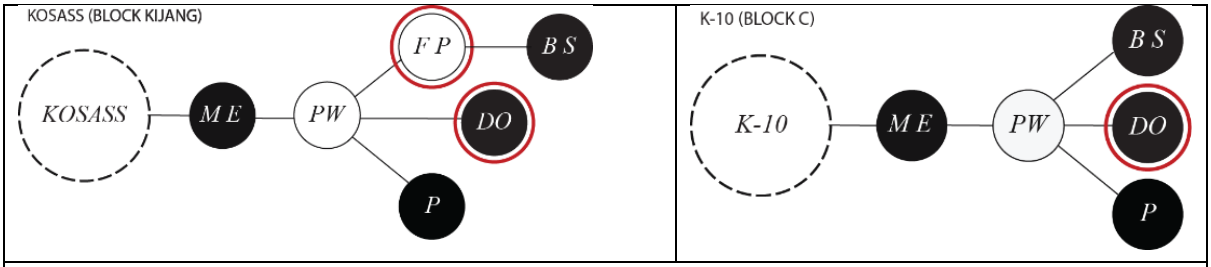


Figure 1: Checklist of equitable use of design features configuration (source: Ramli et al., 2023, modified)

The 14 items gathered from the previous study were arranged sequentially to examine their priority. However, the author determined that visualising the abundance of the items would be more effective through the creation a diagram. The observational stages of observation commenced with determining the central core. In this case, Kolej Sepuluh (K-10) and KOSASS were used for observation and documentation an outdoor environment. One of the most frequently used outdoor environmental facilities is the area related to approaching the building, which consists of the main entrance, drop-off, parking, and bus stops. As the majority of SWDs use transportation to go to the faculty, outdoor environmental design features constitute a crucial component connecting the entire environment which is most commonly used by regular students at all times. Figure 1 presents a translation from (Ramli et al., 2023) regarding to the checklist of design features configuration.

In evaluating the universal design of the outdoor environment in residential colleges, the primary concerns addressed were the accessibility and usability of design features provided for students in these outdoor spaces. Previous research has predominantly focused on universal design (UD) for interior spaces. However, there is a notable gap in studies examining the accessibility of outdoor environments on campuses, which this study aims to address. According to observations through spatial-temporal mapping in two study objects, KOSASS and K10 of residential colleges, it was found that the number of SWDs was dominant because KOSASS's proximity to the UPM centre and faculties. K10, however, is at residential colleges situated in the university periphery. These residential colleges can serve as examples of facilities that emphasise travel via transportation and pedestrian infrastructure, respectively. Apart from that, HEI buildings under the category of public buildings that must be accessible to all types of students, including students with disabilities. Based on the results of periodic observations by taking two samples of residential colleges, the main movement pattern of SWDs is the travelling for daily classes.

Table 1
Diagrammatic Branched Pattern of Outdoor Environmental Design Features for Kolej Sepuluh and KOSASS



K-10: Kolej Sepuluh, KOSASS: Kolej Sultan Alaeddin Suleiman Shah
ME: Main Entrance, BS: Bus stop, P: Parking, DO: Drop-off, PW: Pathway
○: Unavailable

Table 1 illustrates the relationship between items in examining the presence of the items mentioned in the outdoor campus environment. This branched pattern also aids in identifying the related design features to ensure efficient coherence with the environment. The observations highlighted in the Kosass diagram shows that there is no footpath from the main entrance to the bus stop due to distance from the building. In contrast, K10 has direct access from the main entrance through a pathway to the bus stop located within the college campus area. Regarding parking conditions, both colleges have satisfactory OKU parking with appropriate dimensions and clear signage. However, the provision of shelters is necessary.

Furthermore, neither residential college provided specific drop-offs for all users or SWDs. Nevertheless, one of the colleges has established an alternative for drop-off point, which is a bus stop area that can serve as a temporary drop-off with a shelter provided. The diagram in Table 3 provides a complete visualisation to ensure that the connectivity along the travel route is seamless. To aid readability, the author highlighted items and checkpoints in different colours. The red circle indicates items that are not provided, while the yellow circles indicate the need for refinement regarding these matters.

Table 2
Comparison of Design Features at Main Entrance, Parking Areas, Bus Stop and Drop-Off Across Residential Colleges

KOSASS	***K-10***
Main Entrance	
	
Does not have an automatic door. Fully functional considering that the height of the lock of the door is suitable for wheelchair users.	Does have an access card for automatic door but difficulties in entering due to a tiny curb ramp that disallowed flexibility for wheelchair users.

KOSASS	***K-10***
Parking OKU	
	
Designated accessible parking space is located in front of the pathway. The size of the parking is sufficient. Does have a signage for OKU parking.	Parking space provided and complied with the minimum width of 3600mm and a minimum length of 5400mm.

KOSASS	***K-10***
Bus Stop	
	

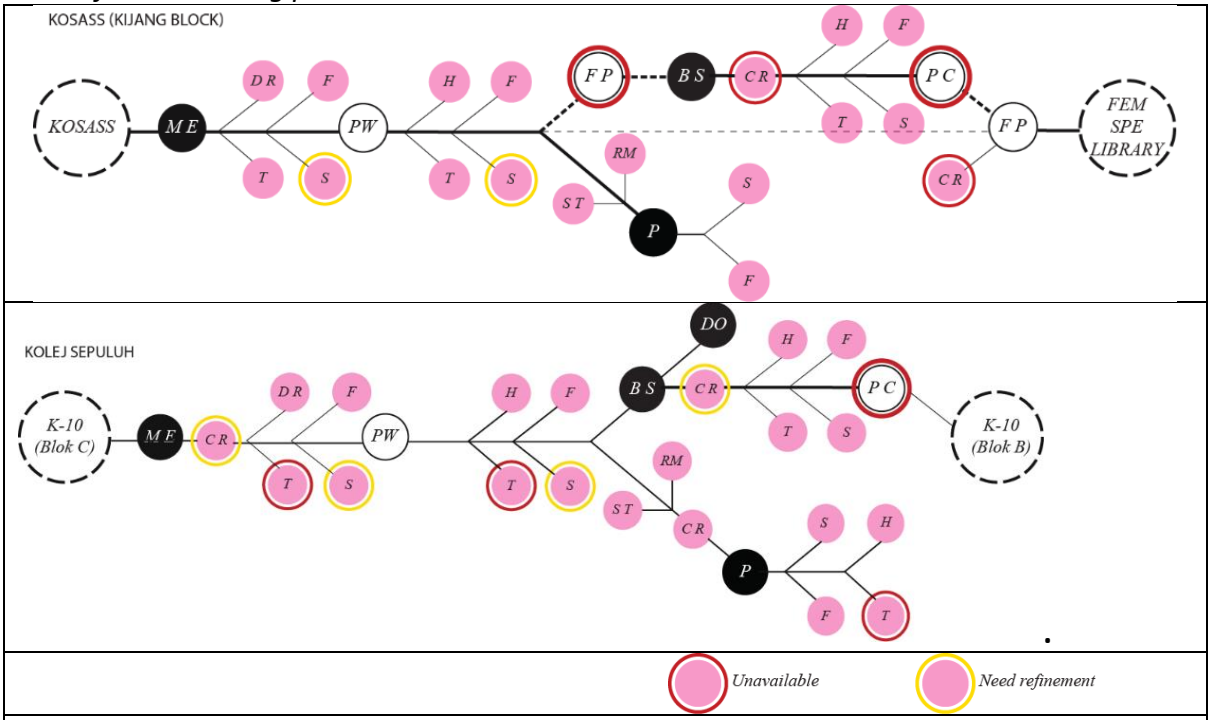
Sharing bus stop with other buildings. Bus stop has no curb ramp to access.	K-10 allow buses to get into and out of stops without difficulty

KOSASS	***K-10***
Drop-off	
	
There is no drop-off point available. The parking area is used as an alternative for drop-off purposes.	There is a drop-off area, but it lacks the desired design criteria. The bus stop area is used as an alternative for drop-off purposes.

Access to facilitate SWDs inclusion on the outdoor environment campuses should ideally discuss in the spatial configuration of travelling routes. For KOSASS, the author selected the travelling route from the KOSASS (Kijang block) to the Faculty of Ecology area. From the diagram on table 3, three (3) checkpoints of the twenty-five (25) checkpoints identified, require reconsideration regarding the provision of facilities, and two (2) checkpoints require refinement. Apart from that, For K-10, the author chose the travelling route from K10 (Block B) to (Block C), which includes a bus stop in between the blocks. As shown from the diagram, four (4) checkpoints from the twenty-seven (27) checkpoints identified require reconsideration regarding the provision of facilities, and three (3) checkpoints require refinement.

Table 3

Completed Diagrammatic branched pattern of the problematic checkpoint within the selected route of the travelling path



ME: Main Entrance, **BS**: Bus stop, **P**: Parking, **DO**: Drop-off, **PW**: Pathway, **DR**: Door, **CR**: Curb ramp,-
F: finishing, **T**: Tactile, **S**: signage, **PC**: Pedestrian crossing, **ST**: staircase, **RM**: Ramp, **FP**: Footpath, **H**: handrail

Conclusions

This research offers valuable knowledge on how to assess the outdoor environment within the spatial needs of travelling routes that influence the behaviour of SWDs while they use the facilities. Both the diagrammatic visual and the connectivity assessments focused on objectively evaluating the physical aspects that affect SWD experiences in terms of equitable use of outdoor environmental design features. According to the checklist analysis, it is evident that each selected item must be arranged according to the hierarchy from broader items to highly crucial checkpoints to ensure that the connection of design features is achievable overall. The diverse characteristics necessitate design decisions across various spatial dimensions, and all of these factors should be considered by those working to create inclusive campuses for all users. In conclusion, improvements and refinements are needed at both colleges to provide seamless routes within the building and from one building to another.

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