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ANALYZING THE CRITERIA OF PLANTING DESIGN FOR VISUAL LANDSCAPE QUALITY IN CAMPUS

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Abstract

Planting design is the art of composing plants to create a campus landscape design. The composition may influence the students' preferences owned by the criteria of planting. This study aims to identify the planting design criteria towards enhancing visual landscape quality in campus environment. The photograph-based method used to collect the landscape planting images and compose it into a questionnaire. This photo-questionnaire design is mostly practiced by academicians in this research field. The question uses five Likert-scale format to analyse the preference rating. The descriptive and correlation analysis are used to quantify the mean results and the relationship between the criteria. The finding represents the most influencing factor in landscape planting preference is arrangement with a score 4.34 while texture is less considered with 3.71 rating score. Most of the attributes were significant except for attributes planting with variety of forms, texture intensity and different species arrangement. As a result, this research finding is able to guide designers to sensibly setting the planting design, particularly in the campus environment.

***Keyword**:* Planting composition, planting design, criteria, campus, landscape preferences, well-being

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INTRODUCTION

The artistic approach of planting design is developed through the plant compositional arrangements inspired by aesthetic principles groupings of plants. Some studies mentioned plants can stimulate the thinking process through regular interactions with students (Ali et al., 2020). Currently, several attempts have been made to corelate the relationships between planting in landscape and well-being. For example, Akhir et al. (2019) studied on planting design as influencing factors to visual landscape quality and well-being. At the same time, Liu and Schroth (2019) assessed the aesthetic preferences concerning vegetation in enclosed urban park. Hoyle et al. (2017) explored the wow factor in urban planting correlated with restorative effect and perceived biodiversity. These emphasize that landscape planting attributes have a significant impact on visual quality (Polat & Akay, 2015), and healing process as well as towards preventing mental disorder (Gerstenberg & Hofmann, 2016). However, there is a concern on the criteria for planting architecture are posed to enhance the quality of the visual environment and well-being. This research will discuss planting composition in the campus to identify the ranking of planting design criteria in which to increase students' well-being. It is crucial to understand that the planting criteria in constructing the campus landscape includes possessing high aesthetic quality and simultaneously possessing a stress relieving efficiency.

Planting Composition Attributes

The purpose of this research is to explore on how the criteria of planting composition and landscape preference can be brought together. In visual landscape quality, plant is an extremely powerful element in comparison to other variables in landscape. The existing studies on the relationship between green spaces and visual quality is emphasized (De La Fuente De Val & Mühlhauser, 2014; Ulrich, 1986) and certainly green is reflected to plant species. Jiang et al. (2014) determined that the amount or density of trees was a positive predictor of mental restoration or aesthetic. People feel calmer when they are round around plants (Kaplan & Kaplan, 1989). The residential area without trees resulted in a dramatic growth of stress and low preferences (Jiang et al., 2014). Still, planting that is too dense can undermine regeneration as well as increasing the feelings of insecurity (Van den Berg, Jorgensen & Wilson, 2014). Flowers, especially brightly coloured flowers, can develop higher rating of preferences (Hoyle et al., 2017). Their study also positively resulted contribution of flowering plants to the psychological well-being. Example in this case, planting with 27% or more of flower cover is much more eye-catching rather than lower floral cover. In general, areas with bundles of trees and shrubs are more preferable. Nowadays, brightly colour flowers are grown in many parks. Whether or not bright flowers are better suited to the development of visual appreciation and mental well-being instead of a more naturalistic atmosphere is a topic that needs to be explored further.

Therefore, the planting composition attributes should be measured, in identifying its reliability and influences on visual quality of landscape planting area. The criteria selected in this study are based on the formal aesthetic of plants such as size, colour, shape or form, texture, density, arrangement, vividness and naturalness. These eight attributes will be analysed to determine the ranking that mostly influence the landscape aesthetic planting scenes. The scenic beauty of landscapes has a direct influence on the aesthetic qualities of planting design, and is currently becoming an integral part in strategies of landscape planning and management (Daniel, 2001). Visual preference from highly beautiful and attractive landscape directly impacts public choice, perceptions and their activities (Daniel, 2001; Daniel & Vining, 1983). Therefore, visual quality is also a major purpose of landscape planting, as plants give pleasant sensory experiences and inspirational opportunities particularly within a campus.

RESEARCH METHODOLOGY

Research Design

Assessment of the visual quality of campus landscape planting areas used in this study was the psychophysical method (Zube et al., 1982). The study was based on the photograph-based method used by most academics in this research field (Daniel & Vining, 1983; Kaplan & Kaplan, 1989; Lothian, 2000; Polat & Akay, 2015; Ulrich, 1986). The technique used in this research are by taking planting pictures of the study area and by applying a statistical assessment into the photo-questionnaire that was designed according to the relevant pictures.

Study Area

Human interrelationship dimensions with the environment refers to areas where human interrelationship variables with the environment are manifested (Bakar et al., 2017). Therefore, the study area was chosen based on similar settings or situations in which students and campus environment interactions take place. The campus of Universiti Putra Malaysia (UPM) was selected as the research area. This campus is located in Serdang, Selangor (Figure 1). The scale, structure and distribution within the faculties of the campus is taken into account for the site selected. UPM has a land area of 1245.056 hectares, consists of 15 faculties and has about 25,000 of students. The survey areas chosen were those with green spaces with accessible landscape planting scene in each faculty where places that can be physically and visually assessed by students.

Figure 1: The UPM Serdang in Selangor
Source: Google satellite image

Photography

For photography, the researchers used a digital single-lens reflex (DSLR) camera with a 12.3-megapixel resolution, the lens has an18x optical zoom and the panoramic shooting mode was chosen. The panoramic photograph field method was employed by Sevenant and Antrop's (2009) to capture the entire environment. Photographs were taken over the weekends of May 2019 to reduce human inclusion within the area. The images were taken in between 8am to 11am as it is an ideal time to take outdoor photos (Firmansyah et al., 2017). Photographs shot in different angles of panoramas mode which reflected the whole landscapes of planting design areas. The images taken reaching 95 landscape planting scenes from the whole area of each faculty. Following this, only 51 photographs were chosen with the assistance of subject experts from academicians in the field of landscape architecture. The selection performed based on the main elements on planting design which accurately reflected the composition. Then, each image was grouped into seven criteria which defined accordingly in Table 1.

Photo-Questionnaire

A total of 51 number of landscape planting photographs was placed on A4 size paper. The photo-questionnaire contained the questions on the demographic profile of respondents such as gender, age, race, level of education, semester, and faculties. Second, the respondents were questioned to evaluate the visual quality of each landscape planting photograph on a five Likert scale. The respondents can choose between 'strongly disagree', 'disagree' at the negative end of the box while at the positive end, they can choose wither 'agree' or 'strongly agree'

(Kaplan & Kaplan, 1989). The survey was conducted to assess whether the planting composition attributes affects the respondents' preferences.

Sampling Strategies

In this study, the sampling method used was the purposive sampling. The purposive sampling was used as it focuses on a characteristic of a population which enable researcher to answer their chosen research questions. Hence, to ensure this study can represent the population of samples from UPM, 319 responses among students of different faculties were collected.

Research Procedures

The collected data were arranged in the SPSS software version 23.0. The averages visual quality score of each photograph and attributes of the planting composition were then calculated. Spearman's rho correlation analysis was used to analyse the significant relationship between landscape planting preference and factors or attributes that influence respondents' preferences.

RESULT

Visual Quality Scores of Photographs and Attributes

In the photo-questionnaire result, the average respondent scores on the visual quality of each image were determined. Beforehand, 51 images were grouped using factor analysis in SPSS. There were seven groups divided with criteria explained in Table 1. The table also shows the mean values for the landscape planting preferences. An observation was done and it revealed that the characteristics of visual quality preferences were higher for B1 (balance with plant species diversity) that is most preferred and appreciated photographs with scores of 4.18. The B7 group of photographs were the least appreciated photograph, with a score of 3.26.

Table 1: The criteria from landscape planting images

Code	Criteria	Photo's No.	Mean score
B1	Balance with plant species diversity	6	4.18
B2	Street planting with coherence design	7	3.94
B3	Complexity with coherence composition	7	3.85
B4	Dense tree form with clean base	7	3.73
B5	Planting with variety of forms	8	3.61

B6	Planting with texture intensity	8	3.45
B7	Different plants species arrangement	8	3.26

Source: Author (2020)

The result for planting composition attributes which represent the most influencing factor in landscape planting preference is reflected in Table 2. Attributes that are ranked with the highest influence is A6 (Arrangement) with a score of 4.34, by comparison, planting composition of A3 (texture) has the least influence, scoring 3.71.

Table 2: The planting composition attributes score ranking

Code	Attributes/ Factors influence preferences	Mean score
A1	Size	4.02
A2	Colour	4.15
A3	Texture	3.71
A4	Shape	4.10
A5	Density	4.19
A6	Arrangement	4.34
A7	Vividness	4.01
A8	Naturalness	4.18

Source: Author (2020)

Relationship between the Visual Quality of Photographs and Attributes

Tables 3 shows the Spearman's rho correlation analysis results. The findings ascertain the relationship between the visual qualities of photographs and planting composition attributes. Based on the results, it was determined that most of the attributes were significant but certain attributes were not significant for photographs groups in B5, B6 and B7. B5 is a group of photographs reflected planting design with a variety of forms. However, this B5 group of photographs were not significant with attribute A4 (shape). B6 and B7 were also not correlated with A4 (shape) and A2 (colour). It is shown that, B7 was identified as not correlated with A6 (arrangement).

Table 3: The relationship between visual landscape images and attributes in planting composition

Spearman's rho	Correlation coefficient sig. (2-tailed)														
	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	B7
A1	.														
A2	.350**														
	0.00	.													
A3	.165**	.308**													
	0.003	0.00	.												
A4	.155**	.213**	.326**												
	0.005	0.00	0.00	.											
A5	.341**	.167**	.171**	.317**											
	0.00	0.003	0.002	0.00	.										
A6	.244**	.326**	.145**	.410**	.414**										
	0.00	0.00	0.01	0.00	0.00	.									
A7	0.091	.231**	0.107	.277**	.199**	.377**									
	0.103	0.00	0.055	0.00	0.00	0.00	.								
A8	.257**	.350**	.173**	.273**	.275**	.324**	.327**								
	0.00	0.00	0.002	0.00	0.00	0.00	0.00	.							
B1	.197**	.234**	.202**	.165**	.240**	.255**	.156**	.289**							
	0.00	0.00	0.00	0.003	0.00	0.00	0.005	0.00	.						
B2	.251**	.220**	.159**	.135*	.215**	.259**	.207**	.272**	.696**						
	0.00	0.00	0.005	0.016	0.00	0.00	0.00	0.00	0.00	.					
B3	.210**	.235**	.176**	.146**	.224**	.217**	.237**	.287**	.693**	.735**					
	0.00	0.00	0.002	0.009	0.00	0.00	0.00	0.00	0.00	0.00	.				
B4	.203**	.196**	.178**	.143*	.250**	.259**	.181**	.239**	.681**	.791**	.793**				
	0.00	0.00	0.001	0.011	0.00	0.00	0.001	0.00	0.00	0.00	0.00	.			
B5	.179**	.184**	.178**	0.106	.182**	.175**	.232**	.242**	.683**	.812**	.813**	.835**			
	0.001	0.001	0.001	0.059	0.001	0.002	0.00	0.00	0.00	0.00	0.00	0.00	.		
B6	.130*	0.065	.143*	0.06	.168**	.116*	.185**	.197**	.617**	.702**	.802**	.788**	.778**		
	0.02	0.248	0.011	0.288	0.003	0.039	0.001	0.00	0.00	0.00	0.00	0.00	0.00	.	
B7	.114*	0.044	.189**	0.073	.136*	0.094	.153**	.151**	.581**	.671**	.703**	.728**	.795**	.764**	
	0.041	0.438	0.001	0.191	0.015	0.094	0.006	0.007	0.00	0.00	0.00	0.00	0.00	0.00	.

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Source: Author (2020)

DISCUSSION

Factors affecting aesthetic preferences are the features of the landscape (Sevenant & Antrop, 2009) and how the interaction occurs in the different situation (Bakar et al., 2017). Thus, it was ensured that the characteristics of the planting displayed a distribution that represent of the landscape planting on the campus. As a result, plant structure, plant density and naturalness of plants were all related to visual consistency in planting design among different planting composition attributes. The highest ranking of planting criteria is a balanced arrangement of planting design with species diversity. This happens due the coherence design that is correlated with balanced characteristics of planting design based on the survey. Although the variety of plant species is one of the key visual quality requirements in campus landscape planting, it can also decrease the visual appearance of

landscape quality if the arrangement, density and naturalness of the plants are not carefully composed. Therefore, for B5 (planting with various forms) group of photographs were not parallel with the attribute in A4 (shape). Hence, the relationship is not significant. This is because, the group of photographs in B5 is does not the variety of forms with balance arrangement. The public may not be aware of principles context relation to planting, but their preference is essential in order to assist designer in order to understand the principles of planting to allow the merge of design idea with public preferences, for example, landscapes with a suitable plant balance have exceptionally high appreciation rates. In line with the findings, it was previously claimed that the planting structures with magnificent beautiful features consist of a wide variety of plants with well-organized layout (Akhir et al., 2019).

CONCLUSION

The main contributions of planting design to the visual quality of landscapes have been revealed in several literature. Therefore, results of this study can potentially be used for the purpose of designing, planning, as well as managing the landscape on campus. These findings should be taken into consideration for any landscape campus initiatives that aim to improve the visual and aesthetic quality of campus areas. Further focus and consideration should be paid to the arrangement of plant patterns, density, naturalness and variety of plants when planning green space areas on campus. A similar study could be beneficially carried out in other universities or programs and courses in particular concerning planting, taking into account the above-mentioned data in order to explore other significant relationship.

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