

HARMONIZATION OF MAN-MADE LANDSCAPE ELEMENTS IN FORESTRY EDUCATIONAL CENTRES WITH EXISTING FOREST ENVIRONMENT

Nor Syuriaty Jaafar¹, Mohd Kher Hussein^{1*} and Mohd Johari Mohd Yusof¹

¹Department of Landscape Architecture, Faculty of Design and Architecture,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

Corresponding author:
mohdkher@upm.edu.my

ABSTRACT

The Forestry Educational Center is a place where the public can learn more about the forest environment, its importance and what people can do to help protect it. Thus, harmonizing design style to all man-made landscape elements in this site was necessary in order to respect the spectacular scenery and to conserve natural resources, as well as to deliver good education and experience to the user. However, how harmonized the man-made landscape elements are with forest environment in these centers is still in question. Therefore, the aim of this study is to gain people's perception towards forestry educational centers of man-made landscape elements from the aspect of harmonious designs. An objective of the study is to analyse the user's educational background on the harmonize design philosophy with regard to the man-made landscape elements of design harmonization towards the forestry educational center. The study is conducted at the Sultan Idris Shah Forestry Education Centre in Selangor, Malaysia, through a questionnaire with photograph surrogates. A total of 150 respondents participated in this study. Moreover, this study revealed that educational background had significantly affected the harmonise design perception that causes differences between education groups. However, results indicated that respondents perceived the present man-made landscape elements of these sites harmonized with the forest environment. As a consequence, harmonizing design approach in this center has enhanced the conservation efforts in protecting the forest destruction from harmful human activities. Indirectly, it helps in promoting the cultural identity of the locals while providing a better educational experience for the user and future generations.

Keywords: Forestry Educational Center, man-made landscape elements, educational background and harmonise design.

1. INTRODUCTION

Today, the world faces its biggest environmental problems where deforestation, air pollution, climate change, species extinction and soil degradation increases every year. This happened because of constant human action on the environment and the excessive demand of the planet's natural resources (Duodu, 2018). Therefore, we need to stop excessive human activity, especially in forest areas for the future generation. Forests provide fundamental life forms and contributes towards the continuity of the world's biodiversity which is necessary for economic development, diversity of life forms, human livelihood and environmental adaptive responses. Otherwise, the future generation will suffer from environmental adaptive responses such as landscape destruction, climate change and biodiversity losses. Hence, we need to continue in educating people on how important forests are in our lives.

Providing an environmental education space in a natural forest setting for the public is one of the better ways to educate people and protect our forests from further destruction. This space provides an outdoor classroom and immersive outdoor field experience for people learning about forestry, wildlife and natural resources management. They can gain first-hand experience in exploring its diverse ecosystems. But bear in mind, in developing this space, facility development such as buildings, shelters, benches, signage, information boards, bridges, walkways, and stairs should be in harmony with the existing forest environment. The design of those man-made landscape elements must combine a natural environment and architectural characteristics, such as the application of vernacular architecture and green technology. The designs should also be visually in harmony with the natural environment which includes concerns about form, color, materials, details, landscape degradation, preservation of natural processes, plus the protection of biological diversity.

Mohd Kher and Nor Syuriaty (2019) had mentioned that man-made harmonise design for forest education center is essential because:

i. Key to Sustainable Development Practices.

Man-made harmonize design is an effort to achieve a better balance between the function and beauty, while respecting the character of the landscape and its sensitivity. This brings balance and harmony to the living beings, suitable, proper and portraying the cultural value.

ii. To increase visual quality of the park.

What people see can influence how they feel about and behave in the forest education centre. They always expect to have quality experiences through seeing, hearing, touching, smelling, and even tasting. Therefore, having man-made elements such as buildings and structures blend in with the landscape is vital to help increase the visual quality of the park.

iii. Provide appropriate education and enjoyment to user.

Man-made harmony design provides information opportunities for the people where they can learn about cultural heritage and art that illustrates a genuine and symbiotic relationship with the spirit of the forest. They can learn a combination of values which includes aesthetic environmental, social, political, and moral in architectural. This could provide the users with a good learning environment and quality experiences. Furthermore, managers of forest education centres are often charged with protecting natural resources for future generations and providing appropriate user enjoyment.

iv. Keys to guiding the selection of the most appropriate management responses.

Proactive strategies that embrace users and their perceptions towards forests should be developed to improve the health of park systems, wilderness areas and recreation destinations, including forest education centres. Therefore, understanding the need of man-made harmonizing design and their own impacts on the environment is a key to guiding the best building or structure design, as well as the most appropriate management responses.

v. Approaches to conservation of cultural landscapes.

Implementing man-made harmony design in forest education centres could provide a special character in which the values of the park are clarified and reinforced with cultural landscapes. Then, environmental education in forest education centres could be more meaningful when it enables people to gain an understanding of how cultural values

affect the environment. Furthermore, cultural landscapes are a legacy for everyone. These special sites reveal aspects of our country's origins and development, as well as our evolving relationships with the natural world. They provide scenic, economic, ecological, social, recreational, and educational opportunities helping communities to better understand themselves.

However, how harmonized the man-made landscape elements are with the forest environment in the forestry educational centers today is still questioned. Does the design element fit together that contribute to a balanced and beautiful look, whether they're colors, forms, materials, style/concept or details that pull the look together which creates a sense of cohesion in the space? Otherwise, the effort to educate people will not reach to the standard aim and effort to protect the forest from destruction will be in vain.

Therefore, the aim of this study is to gain people's perception towards forestry educational centers of man-made landscape elements from the aspect of harmonious designs. An objective of the study is to analyst user's educational background on the harmonize design philosophy with regard to the man-made landscape elements of design harmonization in the forestry educational centers. How people perceive the landscape is highly influenced by the knowledge they have. Hence, this study focuses on the educational background of the respondents because many researchers had confirmed that perception is influenced by educational background (Lyons, 1983; Balling & Falk, 1982; Glyptis, 1991; Wherrett, 1994; Thapa, 1999; Betakova, Vojar, & Sklenicka, 2016; Hoyle, Jorgensen & Hitchmough, 2019). For example, Betakova, Vojar, and Sklenicka (2016) had highlighted that a study carried out by Svobodova et al. (2012) on the perception of post-mining areas, found that respondents with a professional focus on landscape ecology perceived post-mining landscapes differed markedly from the perceptions of respondents of other orientations. They further mentioned that a study done by De Feo and Williams (2013) on testing the opinion of university students on the placement waste dumps demonstrates the differing perceptions of respondents are influenced by their level of environmental knowledge.

Another study that can be referred to is about the human perception of in-channel wood showed that first year students perceived riverscapes with wood to be less aesthetic, more dangerous and needs improvement. However, many aspects of the riverscape perception are subject to changes as the student progresses in studying. Meanwhile, Wyzga et al. (2009) claimed that the negative perception of wood at the riverside is reduced after the education of geography and biology students but was enhanced after water engineering studies.

This clarified that differences in education will stimulate different views on the landscape. A person with a higher level of education who has gained knowledge and skills significantly would affect the perception of harmonizing design of man-made landscape elements in forestry education centers. They usually have great responsibility in raising awareness and providing knowledge to build a sustainable present and future (Karabašević, Petrović, & Maksimović, 2016).

2. THE IMPORTANCE OF THE STUDY

The main aim of forestry educational center establishment is to promote conservation of the landscapes, natural ecosystems, education focusing on forest stewardship, and research related to forest ecology and management. Thus, there is no doubt that all man-made landscape elements' development in this space should portray sensitivity to an existing environment when it is offered as a space for environmental education to the public. The designs must be in harmony with natural forest landscapes that considers their own unique features which highlights the forest's identity (Jacobs, 1993). The designs should also have a good combination between the natural environment and architectural aspects, such as application of vernacular architecture (Schmid, 1983). It must be visually in harmony with the surrounding natural environment (Schneider, 1981) and does not contradict the existing environment (Doczi, 1994). By fulfilling all those requirements or criteria, a forestry educational center would become a good space for the public to learn about design and environmental conservation. Therefore, this study is very important to help in increasing awareness to the related parties who are involved in forestry educational development especially the Forestry Department, Local Authority and University in providing a good environmental education.

There is also a noticeable relationship between early school education, later education, studies and the attitudes of parents towards the environment (Wolsink, 2016). This had shown that the perception of the environment and the landscape is influenced by people's strong mental attitude towards their environment. Furthermore, Seitamaa-Hakkarainen, Kangas, Raunio, and Viilo, (2012) had claimed that proper education can lead to a better understanding of the environment, its laws and functions and, consequently, to the development of an opinion on its optimum form. No wonder, people's attitudes result from education as well as many other vital factors concerning social matters and healthy behaviour (Andrzej Greinert & Maria Mrówczyńska, 2020). Thus, by focusing on educational background, the results of this study were more reliable.

3. LITERATURE REVIEW

Developing the forest as a part of the environmental education centre requires good planning and strategy, especially concerning man-made landscape elements such as buildings. This facility cannot be built on ad hoc basis and must be planned properly before implementation. Man-made landscape elements should respect nature and be visually in harmony with the surrounding forest environment and concerns involving design styles, form, color, materials or details. This is because a forest possesses its own nature, and characteristics in it are an infinite variety of shape, colors and species living to gather in a perfect, and logical, unquestionable way (Peter & Olukayode, 2017).

3.1 What does man-made landscape elements mean?

Man-made landscape elements are hard and static. These elements are built by humans within a specific landscape development area and arise as a result of human activities (Małgorzata, 2016). These elements will remain where it is placed unless it is changed or damaged. Examples of man-made landscape elements are buildings, pathway, patio, a stone wall, or a wood arbor. The purpose of man-made landscape elements in forestry educational centers is to support the human needs where the natural landscape cannot give the effects and to provide complimentary effects in enhancing the beauty of natural landscape. It provides comfort and ease to those who prefer a more leisurely education expedition through forests where it was designed to be in harmony with nature.

Man-made landscape harmonize design is the design that shows strong interdependency between the force of nature and the need for human habitation by considering the environment, the identity, the lifestyle and the uniqueness of the place. Harmonize design always pays attention to the ecological aspects during the planning stages which includes soil suitability, site selection, water resources and waste management. The design is based on local needs of a specific time and place, and is not replicated from elsewhere. Kırbaş and Hızlı (2016) emphasized that harmonize design is an inspiration for innovations in environmental and socio-economically sustainable design and planning. It applies a set of practice of constructing buildings or structures and using processes that are environmentally responsible and resource-efficient throughout a building's lifecycle from planning to design, construction, operation, maintenance, renovation and deconstruction.

Zube (1993), stated that Albert Good, defined harmonious relationships in natural park developments as the subordination of a structure to the environment and having buildings blend in with the landscape. His definition was based on the use of local materials and a scale and form that appeared fitting to the existing landscape context. Materials used for man-made elements in forests must reflect regional materials which are sympathetic with traditional forms and the existing landscape. To lead the harmonious design, the visible construction materials must relate to the surrounding landscape. It should also be a continuity of form, materials, colours and details among the structures within the forest area. Peter and Olukayode (2017) claimed that harmonizing buildings with physical surroundings, community awareness, and reduction of environmentally polluting substances in architectural design are major means of achieving a balance between man and the surrounding features.

3.2 Harmonize design philosophy

Designing a harmony man made landscape element was the goal of the Forestry Educational Center projects. It means that everything in the space must contribute to a balanced and beautiful look, otherwise the space will irritate rather than welcome those who use it. Harmony is the sense of all the design elements fit together, whether they're colors, form, materials, style/concept or details.

3.2.1 Color

Color has influence on the harmonious design in forestry educational centers because it can create physical/visual sensations, other than emotional ones. It can be used to simplify the forms, to break a building mass into smaller parts such as power stations (Bell, 1993). To lead towards harmonious design in forests, the man-made structures should be coloured using the colour that can be found in the forest landscape to create a palette. The colour treatment should be considered in such a way that fits comfortably with the surroundings to help the structures fit in with the landscape. The amounts of light, distance between object and observer must be considered when colouring the structures because these factors can affect the visual quality.

It's important to note that while color is global, different cultures have different connotations for colors. For example, in some cultures, white is associated with purity; in others, it's associated with death. Warm colors (red, orange, and yellow) give a feeling of warmth and excitement. Warm colors can make an object appear larger and closer to you. Cool colors (green and blue) are calming and make objects look smaller and farther away. Purple looks cool next to a warm color and looks warm next to a cool color. White is used for contrast and to separate conflicting colors. Dark colors seem to move away from the viewer, while bright colors jump out. Color can be used to direct the eye, but if used improperly, can also be distracting.

3.2.2 Form

There are two types of form: geometric (man-made) and natural (organic). A digital or physical form can be measured by height, width, and depth. A form can be created by combining shapes, and it can be enhanced by color or texture. Depending on their usage, they can also be ornate or utilitarian. Different forms evoke different feelings or emotions. Rectangular forms feel orderly and formal, circles are soft, triangles are strong and irregular shapes are casual and free. Form is one of the most important variables and has evocative effects on the way we perceive our surrounding as patterns. Normally, form is concerned with the variation of lines and the edges of planes and volumes. So, we need to use natural forms for inspiration to create harmonious design of man-made landscape elements. Understanding and feeling for the land on which a building or structure will stand is important to get a good visual quality. Thus, the best way to produce harmonized design in the forestry educational centre would be the integration of park development with landscape form, using native materials, textures, colours and respecting culturally significant resources. The most important thing that designers should do is take a walk-in nature, observe how nature has solved its problems and let it be an inspiration for their designs. Bell (1993) mentioned what Douglas Cardinal ('landscape-inspired' architect) remarked:

"Our buildings must be part of nature, must flow out of the land: the landscape must weave in and out of them so that, even in the harshness of winter, we are not deprived of our closeness with nature."

Form has always been closely related with shape that implies space; indeed, they cannot exist without space. Shapes also play an important role in design unity and are powerful with the way the surrounding environment was perceived in harmony. Basically, shapes refer to the variation of lines and the edges of planes and volumes. When designing the man-made landscape elements, particularly the buildings in forestry educational centers, factors that must be considered is the natural environment, normally they are not square or rounded, but irregular or organic. The designers should analyse the design of these shapes in relationships to the overall design. Every shape or form has a place in space. As an element of design, space refers to the area around, above, below, or behind an object. Objects in space can occur in both two and three dimensions. In a two-dimensional setting, space is about creating the illusion of a third dimension on a flat surface. Shadows, shading, overlap, and sizing can help define an object's place in space. For example, a button could have a shadow that makes it feel like it is closer to the user. Space, like color, is an element that does not have to be used. But when it is, it's a powerful way to add emphasis.

3.2.3 Materials

The ideal material to use in natural settings like a forest is materials indigenous to a setting. The careful selection of materials creates buildings that are more ecologically sound and harmonize as well as a better match for settings. Most importantly, materials that are sustainable would fulfil the needs of the users. It means that the materials respect the limitations of non-renewable resources, work within the pattern of nature's cycles and inter-relationships of ecosystems, are non-toxic, are energy and water efficient, are made from recycled materials and are themselves recyclable (Huberman & Pearlmutter, 2008). On the other hand, using green building materials and products promotes conservation of dwindling non-renewable resources (Geeta Mehta, Amit Mehta & Bidhan Sharma, 2014).

Moreover, materials create a texture of how a surface feels, or the way it's perceived to feel. It has the power to attract or detract a viewer's eyes and can be applied to lines, shapes, and forms. There are two types of texture: tactile and visual. Tactile textures are three-dimensional and can be touched. The easiest example is tree bark. When we touch bark, we can feel all the bumps and ridges, the roughness and smoothness. A photo of the same bark would be a visual texture. We can see it, not feel it. In digital design, there are currently no touch screens that emulate tactile textures—yet. So, we stick to visual textures.

According to ParthaSarathi Mishra and Aseema Das (2014), building materials help to:

- Establish a relationship between visual quality and structural stability
- Select the appropriate technique of construction
- Provide character and visual appeal to the structure
- Decipher the time and era of construction of a building
- Trace the evolution of the art of construction
- Mix aesthetic elements with practicality
- Highlight the theme and concept of design of the building project
- Determine the appropriate site for a project based on availability of material and suitability to the design
- Determine the budget of building projects
- Establish a relationship between quantity and quality

3.2.4 Style/Concept

An architectural style is characterized by the features that make a building or other structure notable or historically identifiable (Lang, 1987). A style may include such elements as form, method of construction, building materials, and regional character. Several harmonize design style/concept that can be applied for Forest Education Centers are Eco-architecture, Organic Architecture, and Vernacular Architecture. These design approaches are the labels of architectural style with the same objective to achieve a harmonize design goal. The harmonize design approach play a vital role in establishing a Forest Education Center for the function of environmental education and awareness to minimise the conflict between forest, urbanization and the environment for a sustainable development in the communities, region and the world.

Eco-Architecture means the application of ecological principal to architecture, typically in the design of building which promotes environmental conservation that harmonizes with their natural surroundings. Eco-Architecture pays attention to the ecological aspects during the planning stages which is soil suitability, site selection, water resources, and waste management. It also utilized the natural elements as to which one is biodegradable, renewable, and clean elements with low-embodied energy for building construction.

Meanwhile, organic architecture is a philosophy of architecture which emphasizes on the harmony between human habitation and the natural setting. It has a significant relationship between nature, and its understanding and appreciation, the use of horizontal expression, logical design, plus appropriate scale and equality in the construction of architectural components. Furthermore, the design style of organic architecture that is characterized by the suitability of the use of materials and structures will shape the identity of an Educational Forest. Hence, Organic Architecture was believed to also fit into the Forest Education Centers where the design that emphasizes simplicity, humility, and respect of nature will benefit the visitors, researchers and the management, as well as enduring in the forest environment.

Moving on, vernacular architecture is an approach of design of a building or structure by the skills and expertise of local people without any formal training in design. The design is based on local needs concerning a specific time and place which is not replicated from elsewhere. The expertise has been guided by a series of conventions built up in their locality where the consideration of functionality is the dominant factor and the use of local materials is the primary concern. The design tends to evolve over time to respond to the environmental, cultural, spiritual, technological, economical and historical context to become more refined. It is also synonymous with primitive, nomadic or traditional architecture, ethnic architecture and aboriginal architecture. Kırbas and Hızlı (2016) emphasized that Vernacular Architecture has been an inspiration for innovations in environmental and socio-economically sustainable design and planning.

3.2.5 Details

An architectural detail is a small piece of the whole, yet it has the power to characterize and define the entire building (Peter Dominic Weber, 1991). Details tell us what a building is; they are fundamental to the life and personality of a space. Moreover, the design of a simple connection can and should be indicative of the designer's attitude toward the building in general; indeed, detail is architecture at its smallest size. People usually remember the small details of buildings because that's how people can tell that the designer really put thought and time into it and made it into their work. When a person first walks up to a building, the first thing they see is the general exterior and the entrance, so it is a good idea to make sure you make these into memorable and thought out places.

Details play an important role in architectural design. Functionality depends on the choice of proper architectural details to meet the technical requirements of the design safely and economically. Aesthetics is influenced by the visual and tactile properties of the details to convey information and respond to user action. How a building comes together shapes the way people experience space, and in turn, the quality of a structure. Architecture begins at a material level, and from there we combine materials through detailing to control temperature and humidity, to create structural stability, or to simply shape an aesthetic. A project can be formally or spatially inspiring, but if it isn't detailed properly, things can literally fall apart at the seams.

3.3 Perception concept

Perception means the ability to perceive, understanding, and mental grasp of qualities by means of senses or awareness. Perception not only creates our experience of the world around us, but it allows us to act within our environment which includes the five senses; touch, sight, sound, smell, and taste. According to Mehdi Alyari (2018), perception is a process that is purposeful and very close to the attitudes and values that govern people's thoughts, and the perceptual process is associated with human recognition of the environment. Bell (1993) argued that perception refers to "the activity carried out by the brain by which we interpret what the senses receive. In Oxford dictionary (2013) perception definition was it wasn't merely a factual reporting, but tends to be referenced to associations and expectations already in the mind of the beholder" and is derived from the Latin perceptio, from the verb percipere 'seize, understand.'

Clearly, perception is not just a matter of seeing things visually, but people develop their mental impressions based on an interpretation of all the stimuli they have received. Therefore, perceptions provided a major role in determining participation of an individual in environmental education

activities. Good man-made landscape elements provided in educational forestry centers may produce a positive perception. But it may also produce negative perceptions, for instance, poor maintenance services from education facilities, may produce unsatisfactory educational experience.

Subsequently, landscape perception is influenced by three factors which are individual factors, cultural factors and the physical landscape (Eugenie van Heijgen, 2013). The individual factor is about the personal backgrounds of an individual human being. It is about the inner, subjective intake of information such as individual values, judgements, feelings and meanings. Aspects that influence individual perception are academic background, hobbies, interest in the area, age and gender. Meanwhile, culture is about the social interaction between individuals in terms of shared values, shared interests and shared rules. Cultural aspects that influence perception are nationality, residential background of urbanization, politics, preparatory information, professional experience, and daily accessibility to the landscape, familiarity with the area, economics, religion, social values/rules, and class. The physical landscape plays an inferential role in the perception of a conscious being. The way people perceive the landscape is related to the properties of the physical landscape. Perception of the landscape is therefore influenced by the physical landscape which include ecology, geology, hydrology, soil science and environmental science.

3.4 The effect of educational background on perception

Kent (1993) had claimed that academic background influence landscape perception. His statement is how people perceive the landscape was highly influenced by the knowledge they had. Kent's study about human perception of in-channel wood found that first year students perceived river scapes with wood to be less aesthetic, more dangerous and needed improvement. However, many aspects of the river scape perception are subject to changes as the student progresses in studying. The negative perception of wood at the riverside is reduced after the education of geography and biology students, but enhanced after water engineering studies (Bartłomiej, Zawiejska, & Le Lay, 2009).

Thapa (1999) and Tehrani et al. (2009, 2010) found some changes in the environmental attitudes and behaviours perception of the students based on their educational background. They observed that students who had better education on the environment were more aware of environmental services than those with less or without education. Meanwhile, a study done by Mehreteab et al. (2016) relating to perceptions of secondary school students towards environmental services found the differences and commonalities among students differed according to gender, age, place of residence, educational level and specialization on environmental perceptions and factors which influenced their decision-making.

Based on Zheng, Jie and Yali (2020) study, they reported that the perceptions of spatial images by citizens differed significantly because of their individual characteristics, including gender, educational background, and income level. Thus, they suggested Beijing's urban forests should be constructed based on the specific needs of men and women, as well as the needs of citizens with different educational backgrounds and income levels.

Educational background was found to influence the perception of ordinary landscape in China. Results from a previous study indicated that there was a moderately patterned preference for natural landscape, together with a consistent dislike of artificial landscape which existed among the sample based on demographic characteristics, in particular, age and education showed significant influence on landscape preference; water elements and elements with large areas, regular shapes, and low axial ratios were more easily perceived and identified (Tao, Min, Jiang & Jin-qing, 2019).

A study carried out by Pinheiro et al. (2016) on perception of snakes' conservation in Brazil found that educational background influenced the respondent's perception. They claimed that it was due to the fact that an increase in knowledge of the respondents enabled them to dispel some myths related to snakes. They further explained that a better understanding of the biology of snakes, their ecological importance and a general knowledge of snake bites, which can be acquired through formal education had explained why people with higher levels of schooling tend to have fewer negative perceptions of the snakes.

4. CONCEPTUAL STUDY FRAMEWORK

The forestry educational center is a place where environmental outdoor learning is conducted to educate people about forests and nature. Thus, the man-made landscape elements in this center are the facilities to fulfil user needs. Those man-made landscape elements are built in harmony with the forest environment to offer a good educational experience to the user. User perception towards man-made landscape elements in the forestry educational centre is crucial for a better learning experience. Therefore, the Authors believe that educational background provides solid outcome because educational experience plays a distinctive role in our perceptions.

The framework of this study was based on literature, where the relevant theoretical concepts are reviewed. The topics of forestry educational centers, man-made landscape elements, harmonize design as well as educational background, is analyzed. Secondly, a questionnaire survey was conducted to investigate the current man-made landscape elements at Sultan Idris Shah Forest Education Centre (SIFEC) whether it harmonizes with the forest environment or not for a clearer picture of what is happening on site. It's also to ensure the man-made landscape elements of development is respecting, responding and recognizing the sensitivity, distinctiveness and uniqueness of natural forest environment. A documentary survey from published and unpublished sources such as maps was carried out for a more detailed information on the study area. Reports and papers on related studies available were also consulted for this purpose. Lastly, conclusions were formulated to conclude the findings. Figure 1 is a summarization of the study framework.

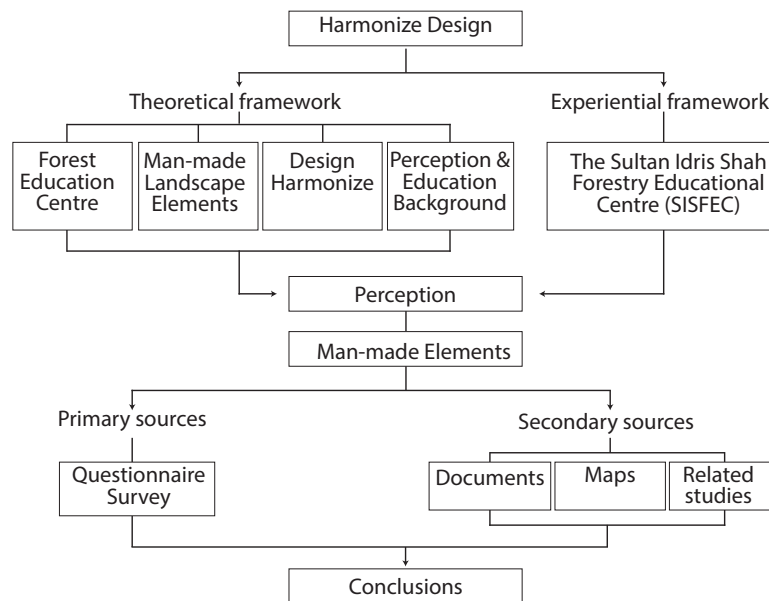


Figure 1: The study framework

5. RESEARCH METHODOLOGY

Data were gathered through a survey using a questionnaire with photographs as surrogates of the actual environment. One of the newest forest education centres in Malaysia is located in Ayer Hitam Forest Reserve, Puchong, Selangor, and was selected as the case study. This area is known as the Sultan Idris Shah Forestry Education Centre (SISFEC) (Figure 2). Moreover, this area was awarded to Universiti Putra Malaysia through a long-term agreement to conduct activities in relation to education, research and development in the field of forestry. SISFEC covers about 1, 1761.1 hectares and has become an educational reference centre, research and development centre for best practice in tropical forest management at national level and also globally. This centre acts as an outdoor laboratory for students in its efforts to develop their skills and knowledge in forest management especially for classifying trees and plants, learning soil science, tree inventory, silviculture, ecology, wildlife, outdoor recreation and eco-tourism.

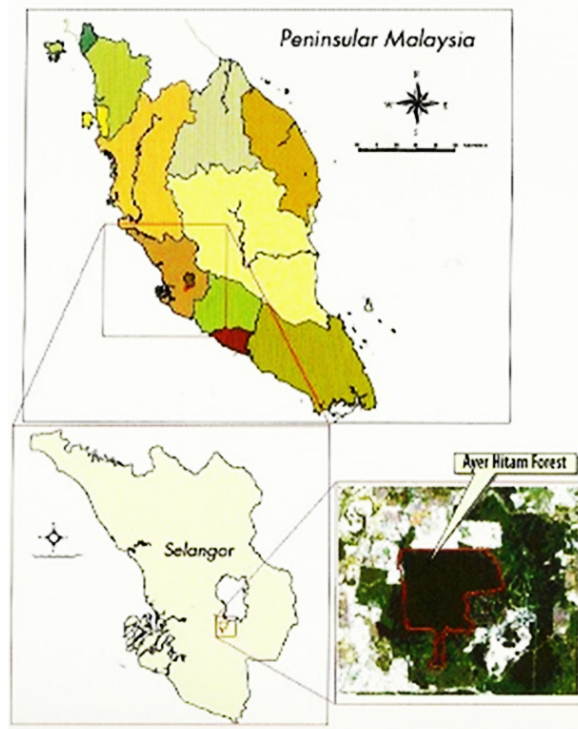


Figure 2: Location of SISFEC (Source: Faridah- Hanum, 2009)

To recognize the user's perception on how far the man-made landscape elements in SISFEC was harmonizing with the surrounding environment, a structured questionnaire was prepared. A set of photos that show the man-made landscape element in this park was attached to the questionnaire set. The man-made landscape elements were divided into two categories (Figure 3). The first include the buildings, administration block, lecture hall, laboratory and chalets, while the second category are other facilities consisting of a gazebo, walkway, boardwalk, outdoor toilets, guardhouse, signage, lighting, seating, railing and planter box. The man-made landscape elements are evaluated through the application of harmonize design philosophy namely form, colour, material, style/concept and details (façade, stairs, column, arts). With the support of photographs, the respondent was asked to answer on the level of harmonizing for each of the elements based on four (4) Likert Scale. The scales are 1 which is not harmonize, 2 is slightly harmonize, 3 is harmonize and 4 is well harmonize. Each level of answer has the guided description for easier understanding (Table 1).

The survey was conducted in September 2019 until November 2019, and was basically carried out on weekends to catch a higher number of respondents since most educational activities are held during this period. A total of 150 respondents participated in the study. Respondents were selected based on onsite availability and willingness to participate. With the help of SISFEC staff, groups of respondents were identified. Then, they were briefed on the procedure and supplied with self-administered photo-questionnaires. The researchers sat next to the respondent to offer help if they faced difficulties while filling in the questionnaire form.



Figure 3: Photos of man-made elements

Table 1: Likert scale of harmonize design

Harmonize Design Philosophy	Likert Scale	Explanation
Form	1	Form does not harmonize with natural character of forest environment.
	2	Form slightly harmonizes with natural character of forest environment.
	3	Form harmonizes with natural character of forest environment.
	4	Forms are well harmonizing with natural character of forest environment and enhance the identity of SISFEC.
Colour	1	Colours are too contrasted and not harmonize with natural character of forest environment.
	2	Colours slightly harmonize with natural character of forest environment.
	3	Colour is harmonized with natural character of forest environment.
	4	A colour is well harmonizing with natural character of forest environment and enhances the identity of SISFEC.
Material	1	Material does not harmonize with natural character of forest environment
	2	Material slightly harmonize with natural character of forest environment
	3	Material used is harmonized with natural character of forest environment.
	4	Material used is well harmonize with natural character of forest environment enhance the identity of SISFEC.
Style/Concept	1	Building design's Style/Concept does not harmonize with natural character of forest environment.
	2	Building design's Style/Concept slightly harmonize with natural character of forest environment.
	3	Building design's style/Concept harmonizes with natural character of forest environment.
	4	Building design's style/Concept well harmonize with natural character of forest environment and enhance the identity of SISFEC.
Details	1	A detail does not harmonize with natural character of forest environment.
	2	Details slightly harmonize with natural character of forest environment.
	3	Details are harmonizing with natural character of forest environment
	4	Details are well harmonizing with natural character of forest environment and enhance the identity of SISFEC.

6. RESULTS AND DISCUSSION

To provide a better understanding, this study had categorized the demography percentage of each item in a category of majority (80%-100%), more than half (60%-79%), half (40%-59%) and less than half (39% and below).

Table 2 : Respondents Demographic

No	Items	Frequency	Percentage (%)
1	Age: 20-29 years	78	53.1
	30-39 years	41	27.9
	40-49 years	18	12.2
	50 and above	10	6.8
2	Nationality:Malaysian	141	94.6
	Non-Malaysian	8	5.4
3	Gender: Male	89	60.5
	Female	58	39.5
4	Education Level: PhD	19	12.9
	Master	11	7.5
	Bachelor	78	53.1
	Diploma	16	10.9
	Certificate	4	2.7
	SPM	15	10.2
	PT3	1	0.7
Others	3	2.0	
5	Occupation: Academician	21	14.1
	Non-Academician	53	35.6
	Student	75	50.3
6	Living Area: Klang Valley	99	66.4
	Outside Klang Valley	43	28.9
	Oversea	7	4.7
7	Purpose in SISFEC:		
	Research from Local University	49	33.8
	Research from International University	3	2.1
	Seminar	17	11.7
	Camping	51	35.2
	Others	25	17.2

Table 2 above shows the overall demographic profile of the respondents. After the data was analysed, it displayed three incomplete survey forms by 3 respondents. Therefore, they were not counted and only 147 respondents were counted in the analyses out of the 150 respondents. Results had shown that

half (53.1%) of the respondents are aged between 20 and 29 years. Meanwhile, the majority (94.6%) of them are Malaysian, male participants were more than half (60.5%) than their female counterpart. Education levels of the respondents ranged from as low as PT3 to as high as PhD. As an educational forest site, it is obvious to see that students and academicians (64.4%) are the major visitors of the park, compared to 35.6% non-academicians. More than half of the respondents are from the Klang Valley area (66.4%) but there were also respondents from overseas (4.7%). In terms of the purpose to visit the park, research activities from local and international universities are the main purpose of the respondents (36%), followed by camping (35.2%) and other activities (17.2%).

Wherefore, since this study focuses on educational background, only results and discussions related to education were presented. This study had grouped respondent's educational background into three groups which include postgraduate, undergraduate and sijil. The postgraduate group consist of Doctor of Philosophy (Ph.D. & Master holder), Undergraduate (Bachelor holder) and Sijil (Diploma, Sijil Tinggi Pelajaran Malaysia, Sijil Pelajaran Malaysia, PT3 and other). Undergraduate was the biggest group because they are students of the Faculty of Forestry who carried out their practical and learning process in SISFEC. Respondents from the category Postgraduate and Sijil were considered as equal. Table 3 shows the breakdown of the respondent's education category.

Table 3 : Respondent's education category

Category	No.	Total
Postgraduate:		30
PhD.	19	
Master	11	
Undergraduate:		78
Bachelor	78	
Sijil:		39
Diploma	16	
Sijil Tinggi Pelajaran Malaysia	4	
Sijil Pelajaran Malaysia	15	
Pentaksiran Tingkatan 3 (PT3)	1	
Others	3	
Total	147	147

Analysis of variance (ANOVA) was used to analyse the differences among group means in a sample for harmonize design philosophy. Results revealed that there are perception differences between the education groups in this study. The differences occurred on harmonize design philosophy which are form, material, style/concept and details of the buildings at the $p \leq 0.05$ level. The groups' differences were shown in Table 4.

The differences were observed on building form: [F (2,144) = 9.97, $p \leq 0.00$]; building material: [F (2,144) = 6.83, $p \leq 0.01$] and building style/concept: [F (2,143) = 9.01, $p \leq 0.00$]. However, there is no significant difference among the education groups on the color of the buildings [F (2,144) = 2.61, $p \geq 0.08$]. Results in Table 4 also indicate that groups of respondents also had differences of perception on the harmonize design philosophy for other facilities [form: F (2,144) = 10.47, $p \leq 0.00$), color: [F (2,141) = 6.52, $p \leq 0.02$), material: [F (2,141) = 8.96, $p \leq 0.00$) and style/concept: [F (2,141) = 9.34, $p \leq 0.00$]]. On the other hand, there is a significant difference on building details [F (2,144) = 16.90, $p \leq 0.00$]].

Table 4 : Analysis of variance (ANOVA) on elements of design

Harmonize design philosophy		df	F	Sig.	
BUILDING	Form	1. Between groups	2	9.97	0.00**
		2. Within groups	144		
	Color	1. Between groups	2	2.61	0.08ns
		2. Within groups	144		
Material	1. Between groups	2	6.83	0.01**	
	2. Within groups	144			
Style/Concept	1. Between groups	2	9.01	0.00**	
	2. Within groups	143			
OTHER FACILITY	Form	1. Between groups	2	10.47	0.00**
		2. Within groups	144		
	Color	1. Between groups	2	6.52	0.02**
		2. Within groups	141		
Material	1. Between groups	2	8.96	0.00**	
	2. Within groups	141			
Style/Concept	1. Between groups	2	9.34	0.00**	
	2. Within groups	141			
DETAILS	1. Between groups	144	16.90	0.00**	
	2. Within groups				

Notes: ** - significance at the 5% level; ns – not significance at the 5% level

Because this study has found a statistically significant result, a post hoc test using the Duncan test was carried out to indicate which groups have different perceptions between them. Table 5 shows the result of post hoc test using the Duncan test. It indicates that the mean score for the undergraduate (M = 2.82, SD = 0.82) on buildings form was significantly different than the postgraduate (M = 2.13, SD = 0.90) and sijil (M = 2.28, SD = 0.79) groups. The significant difference was also observed on building materials where undergraduate (M = 2.77, SD = 0.91) had different perceptions with postgraduate (M = 2.17, SD = 0.87) and sijil (M = 2.28, SD = 0.86) groups. Undergraduate (M = 2.95, SD = 0.83) also had different perceptions with postgraduate (M = 2.27, SD = 1.08) and sijil groups (M = 2.33, SD = 0.96) on building style/concept. However, education groups did not significantly differ on buildings color (M = 3.01, SD = 0.90).

Results also shows that education have effect on harmonize design perception on other facilities. It was observed that postgraduate (M = 2.37, SD = 0.89) have different perception on other facilities form with sijil (M = 2.82, SD = 0.76) and undergraduate (M = 3.10, SD = 0.70) groups. Postgraduate (M = 2.40, SD = 0.86) group also has different perception with sijil (M = 2.78, SD = 0.85) and undergraduate (M = 3.09, SD = 0.69) groups on other facilities material element. Meanwhile, on other facilities color, undergraduate (M = 2.37, SD = 0.72) group have different perception with sijil (M = 2.54, SD = 0.93) and postgraduate (M = 2.53, SD = 0.78) groups. Furthermore, undergraduate (M = 3.08, SD = 0.77) group also have different perception with sijil (M = 2.54, SD = 0.84) and postgraduate (M = 2.43, SD = 0.90) groups on facilities style/concept item. Table 5 also reveals that each education group have different perceptions on the details part of the building [sijil (M = 2.64, SD = 0.87); undergraduate (M = 3.10, SD = 0.77); postgraduate (M = 2.10, SD = 0.89)].

Taken together, these results suggests that all levels of education have agreed that man-made landscape elements in SISFEC mostly harmonizes with the surrounding forest environment. Even though there are different perceptions among them based on the Likert scale, the range is still in harmonize levels (M = 2.10 to 3.10). Consequently, the results have portrayed that man-made landscape elements of the Forestry Educational Centres is in harmony with the forest environment. These results can be trusted because education covers several elements of life, not only what we generally think of as the progress through school and college but it includes attitudes of various people, peer behaviour and cultural expectations, among others. Furthermore, all the respondents have received a formal education that can be of great benefit in accelerating knowledge of self and self in relationship to the Spirit and Universe.

Table 5 : Descriptive of mean and standard deviation

Item	Harmonize Design Philosophy	Education Group	Mean	Std. Deviation	Std. Error	Sig.	
Buildings	Form	Sijil	2.28	0.79	0.13	0.00**	
		Undergraduate	2.82	0.82	0.09		
		Postgraduate	2.13	0.90	0.16		
			Total	2.54	0.88	0.07	
	Color	Sijil	2.49	0.91	0.15	0.08 ^{ns}	
		Undergraduate	2.69	0.90	0.10		
		Postgraduate	2.27	0.83	0.15		
			Total	2.55	0.90	0.07	
	Material	Sijil	2.28	0.86	0.14	0.00**	
		Undergraduate	2.77	0.91	0.10		
		Postgraduate	2.17	0.87	0.16		
			Total	2.52	0.92	0.08	
	Style/Concept	Sijil	2.33	0.96	0.15	0.00**	
		Undergraduate	2.95	0.83	0.09		
		Postgraduate	2.27	1.08	0.20		
		Total	2.64	0.97	0.08		
Other Facility	Form	Sijil	2.82	0.76	0.12	0.00**	
		Undergraduate	3.10	0.70	0.08		
		Postgraduate	2.37	0.89	0.16		
			Total	2.88	0.80	0.07	
	Color	Sijil	2.54	0.93	0.15	0.00**	
		Undergraduate	3.01	0.72	0.08		
		Postgraduate	2.53	0.78	0.14		
			Total	2.79	0.82	0.07	
	Material	Sijil	2.78	0.85	0.14	0.00**	
		Undergraduate	3.09	0.69	0.08		
		Postgraduate	2.40	0.86	0.16		
			Total	2.87	0.81	0.07	
	Style/Concept	Sijil	2.54	0.84	0.14	0.00**	
		Undergraduate	3.08	0.77	0.09		
		Postgraduate	2.43	0.90	0.16		
		Total	2.81	0.86	0.07		
Details		Sijil	2.64	0.87	0.14	0.00**	
		Undergraduate	3.10	0.77	0.09		
		Postgraduate	2.10	0.89	0.16		
		Total	2.78	0.91	0.08		

Notes: ** - significance at the 5% level; ns – not significance at the 5% level

7. CONCLUSION

Harmonization of man-made landscape elements in Forestry Educational Centres with existing forest environment is crucial. How far are man-made landscape elements in Forestry Educational Centres harmonize with forest environment has been answered in this study, which is harmony. However, further improvement needs to be taken to increase harmonize levels into strongly harmonize. The responsible party such as the Forestry Department, University and Municipal Council must improve the image, aesthetics, sustainability, and overall quality of the Center consistent with the agency's role as leaders in land stewardship. This is very important to ensure visitor experience are at the higher level and public perception towards Forestry Educational Centres is always positive as well as fulfilling the mission of stewardship.

This study revealed that an educational background can help in empowering the significant of producing harmonize landscape design elements in forestry educational center because education is always associated with the process of delivering skill, disseminating knowledge and internalizing value (Fazilah et al., 2012). An individual who equipped with knowledge can be able to internalize and apply the knowledge in design process. Furthermore, authors believe that with the knowledge individual have, he/she would dare to voice out their views, expose to them their real potential, lead them to become a better person and widen their views in certain area like harmonize landscape design for forestry educational center.

All man-made landscape elements should relate within a design "philosophy." This philosophy of designs derives from characteristics unique to that area while complementing the surrounding landscape. Harmonious design can be created by studying the landscape and then relating the form, color, materials, style/concept and details of all buildings and structures to an architectural design theme. The designer can consistently apply this design theme to everything from trash receptacles, fences, and water fountains to trails, campgrounds, chalets and visitor centers. Each element of the man-made landscape contributes to the identity of the park as well as to the positive image of the Forestry Education Center as stewards of the land.

The result of this study also has a significant plan for improving future development such as in developing appropriate sensitive development techniques and activities accordingly for the optimum benefit of forestry educational centers. Furthermore, it also contributes a new point for harmonizing design man-made landscape elements in a natural setting. Besides that, it will help the related professional such as landscape architects, architects and forest officers to better promote and teach techniques and skills to the public, marking their significant importance in the overall environmental education.

Acknowledgement

This study is sponsored by Universiti Putra Malaysia under the Geran Putra 2018 (GP/2018/9652800).

REFERENCES

- Andrzej Greinert & Maria Mrówczyńska. (2020). The impact of the process of academic education on differences in landscape perception between the students of environmental engineering and civil engineering. *Land* 2020, 9(6), 188. <https://doi.org/10.3390/land9060188>
- Balling, J. D., & Falk, J. H. (1982). Development of visual preference for natural environments. *Environment and Behaviour*, 14(1), 5–28. <https://doi.org/10.1177/0013916582141001>
- Bartłomiej Wyżga, Joanna Zawiejska, & Yves-François Le Lay. (2009). Influence of academic education on the perception of wood in watercourses. *Journal of Environmental Management*, 90(1), 586-603. <https://doi.org/10.1016/j.jenvman.2007.12.013>
- Bell, S. (1993). *Elements of Visual Design in the Landscape*. Spon press.
- Betakova, V., Vojar, J. & Sklenicka, P. (2016). How education orientation affects attitudes toward wind energy and wind farms: implications for the planning process. *Energy Sustainability and Society*, 6, 31(2016). <https://doi.org/10.1186/s13705-016-0096-6>
- De Feo, G. & Williams, I.D. (2013). Siting landfills and incinerators in areas of historic unpopularity: surveying the views of the next generation. *Waste Management*, 33(12), 2798–2810. <https://doi.org/10.1016/j.wasman.2013.08.019>.
- Doczi, G. (1994). *The power of limits - proportional harmonies in nature, art and architecture*. Shambala.
- Duodu, Frederick. (2018, February). *Global environmental problems and politics. An analysis on why global environmental problems are difficult to address through political solutions*. <https://www.researchgate.net/publication/331165206>
- Eugenie van Heijgen. (2013). *Human landscape perception: Report on understanding human landscape perception and how to integrate and implement this in current policy strategies*. Wageningen University.
- Faridah-Hanum Ibrahim. (2009). *Ayer Hitam Forest: The green lung of Klang Valley*. Universiti Putra Malaysia Press, ISBN 9789675026720.
- Fazilah, Idris, Zaharah Hassan, Azizah Ya'acob, Saran Kaur Gill & Noor Aziah Mohd Awal. (2012). The role of education in shaping youth's national identity. *Procedia - Social and Behavioral Sciences*, 59(2012), 443 – 450. <https://doi.org/10.1016/j.sbspro.2012.09.299>

- Geeta Mehta, Amit Mehta & Bidhan Sharma. (2014). Selection of materials for green construction: A review. *IOSR Journal of Mechanical and Civil Engineering*, 11(6), III (Nov- Dec. 2014), pp. 80-83. <https://www.iosrjournals.org/iosr-jmce/papers/vol11-issue6/Version-3/L011638083.pdf>.
- Glyptis, S. (1991). *Countryside Recreation*. Longman.
- Huberman, N. & Pearlmutter, D. (2008). A life cycle energy analysis of building materials in the Negev desert. *Energy and Buildings*, 40(5), 837–848. <https://doi.org/10.1016/j.enbuild.2007.06.002>.
- Hoyle H., Jorgensen, A., & Hitchmough, J.D. (2019). What determines how we see nature? Perceptions of naturalness in designed urban green spaces. *People and Nature*, 1(2019), 167–180. <https://doi.org/10.1002/pan3.19>
- Jacobs, A.B. (1993). *Great Streets*. The MIT Press.
- Karabašević, D., Petrović, G. & Maksimović, M. (2016). The impact of the levels of education on the perception of corporate social responsibility. *Poslovna ekonomija*, 10(2), 106-117. <http://dx.doi.org/10.5937%2Fposeko10-12322>
- Kent, R.L. (1993). Attributes, features and reasons for enjoyment of scenic routes: a comparison of experts, residents, and citizens. *Landscape Research*, 18(2), 92-102. <https://doi.org/10.1080/01426399308706398>
- Kırbaş, B., & Hızlı, N. (2016). Learning from vernacular architecture: ecological solutions in traditional erzurum houses. *Procedia - Social and Behavioural Sciences*, 216(2016), 788-799. <https://doi.org/10.1016/j.sbspro.2015.12.076>
- Lang, B. (Ed.). (1987). *The Concept of Style*. Cornell University Press.
- Lyons, E. (1983). Demographic correlates of landscape preference. *Environment and Behaviour*, 15(4), 487-511. <https://doi.org/10.1177/0013916583154005>
- Małgorzata Zofia Wilczkiewicz. (2016). The role of artificial landscape in recreational parks – selected examples. *Geomatics, Land management and Landscape*, 1(2016), 105–117. <http://dx.doi.org/10.15576/GLL/2016.1.105>
- Mehdi Alyari. (2018). Role of environmental psychology in strategic development of urban public spaces based on aesthetic needs of citizens. *Journal of Urban Design and Mental Health*, 2018(5), 12. <https://www.urbandesignmentalhealth.com/journal-5---urban-visual-perception.html>
- Mehreteab Tesfai, Udaya Sekhar Nagothu, Josef Šimek, & Petr Fučík. (2016). Perceptions of secondary school students' towards environmental services: a case study from Czechia. *International journal of environmental & science education*, 11(12), 5533-5553. <https://files.eric.ed.gov/fulltext/EJ1115680.pdf>
- Mohd Kher Hussein & Nor Syuriati Jaafar. (2019). Understanding how important is harmonized landscape design for forest education centre in Malaysia's. *Proceedings of Future Smart Cities (FSC) 2nd Edition & Resilient and Responsible Architecture and Urbanism (RRAU) 2nd Edition*, Xiamen University, Sepang, Malaysia 2019. IEREK Press. ISBN:978/977-85525-3-9. https://expert.taylors.edu.my/file/remis/publication/109381_6365_2.pdf
- Oxford dictionary. (2013). *Perception*. Retrieved from <http://oxforddictionaries.com/definition/perception>.
- Partha Sarathi Mishra & Aseema Das. (2014, September). Building material: significance and impact on architecture. *Architecture - Time Space & People*, 32-36. https://www.coa.gov.in/show_img.php?fid=181
- Peter Dominic Weber. (1991). *Beyond Bolts: Architectural Details, Construction, Meaning*. [Unpublished Master of Architecture Thesis]. Massachusetts Institute of Technology.
- Peter, A. & Olukayode, O. F. (2017). Architectural design harmonising with the surrounding features. *International Journal of Research - Granthaalayah*, 5(11), 102-108. <https://doi.org/10.5281/zenodo.1069176>.
- Pinheiro, L.T., Rodrigues, J.F.M., & Borges-Nojosa, D.M. (2016). Formal education, previous interaction and perception influence the attitudes of people toward the conservation of snakes in a large urban center of northeastern Brazil. *Journal Ethnobiology Ethnomedicine*, 12, 25(2016). <https://doi.org/10.1186/s13002-016-0096-9>
- Schmid, P. (1983). *Bio-logis architectur*, 2nd ed. Rudolf Muller.
- Schneider, R. (1981). *Natural building*. Institut für leichten Flächen tragwerke.
- Seitamaa-Hakkarainen, P., Kangas, K., Raunio, A.M., & Viilo, M. (2012). Architecture project: city plan, home and users children as architects. *Procedia Social Behavioral Sciences*. 45(2012), 21–31. <https://doi.org/10.1016/j.sbspro.2012.06.539>
- Svobodova, K., Sklenicka, P., Molnarova, K., & Salek, M. (2012). Visual preferences for physical attributes of mining and post-mining landscapes with respect to the sociodemographic characteristics of respondents. *Ecological Engineering* 43(2012), 34–44. <https://doi.org/10.1016/j.ecoleng.2011.08.007>

- Tao Luo, Min Xu, Jiang Liu & Jin-qing Zhang. (2019). Measuring and understanding public perception of preference for ordinary landscape in the chinese context: case study from Wuhan. *Journal of Urban Planning and Development*, 145(1), March 2019. [https://doi.org/10.1061/\(ASCE\)UP.1943-5444.0000492](https://doi.org/10.1061/(ASCE)UP.1943-5444.0000492)
- Tehrani, S. M., Karbassi, A. R., Ghoddosi J., Monavvari, S. M. & Mirbagheri, S. A. (2009). Prediction of energy consumption and urban air pollution reduction in e-shopping adoption. *Journal of Food Agriculture and Environment*, 7(3):898-903. https://www.researchgate.net/publication/233794816_Prediction_of_energy_consumption_and_urban_air_pollution_reduction_in_e-shopping_adoption
- Tehrani, S., Karbassi, A., Monavari, S., & Mirbagheri, S. (2010). Role of e-shopping management strategy in urban environment. *International Journal of Environmental Research*, 4(4), 681-690. <https://doi.org/10.22059/ijer.2010.254>
- Thapa, B. (1999). Environmentalism: A study of undergraduate students. In *Proceedings of the North-eastern recreation research symposium*. (1999). The Pennsylvania State University. <https://doi.org/10.2737/NE-GTR-269>
- Wherrett, J.R. (1994). *A study of recreation at Loch an Eilein, Rothiemurchus*. [Unpublished M.Sc. Thesis], University College of North Wales, Bangor.
- Wolsink, M. (2016). ‘Sustainable City’ requires ‘recognition’—The example of environmental education under pressure from the compact city. *Land Use Policy*, 52(2016), 174–180. <https://doi.org/10.1016/j.landusepol.2015.12.018>
- Wyzga, B., Zawiejska, J., & Le Lay, Y. (2009). Influence of academic education on the perception of wood in watercourses. *Journal of Environmental Management*, 90(1), 586-603. <https://doi.org/10.1016/j.jenvman.2007.12.013>
- Zheng Zhao, Jie Ren & Yali Wen. (2020). Spatial perception of urban forests by citizens based on semantic differences and cognitive maps. *Forests* 2020, 11, 64 <https://doi.org/10.3390/f11010064>
- Zube, E.H. (1993). *The search for harmony in park development. Visual quality of built environments in national parks*. University of Arizona, US.