

Biomorphic Design Approaches in Landscape Design and Construction Course Studio

Asst. Prof. Dr. **Emine Tarakçı Eren**¹, Assoc. Prof. Dr. **Elif Merve Alpak**² and Assoc. Prof. Dr. **Tuğba Düzenli**³
*Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, Trabzon, Turkey*¹
*Afyon Kocatepe University, Faculty of Fine Art, Department of Interior Architecture and Environmental Design, Afyon, Turkey*²
*Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, Trabzon, Turkey*³
E-mail¹: eminemtarakci@gmail.com, E-mail²: elifmervealpak@gmail.com, E-mail³: tugbaduzenli@gmail.com

Abstract

Due to increase in population density in cities, unplanned urbanization, where built areas proliferate and concrete and Due to the decline in open and green spaces in cities, designers have a higher responsibility in the design of these spaces and the furniture that would be utilized in these spaces. The furniture should not only be functional or ergonomic, but also aesthetic and original in these spaces. Thus, it is important to provide furniture that resemble nature or are part of the nature for urban residents instead of designing routine and ordinary spaces. Therefore, the furniture designed by 9 students with biomorphic design approach in senior class Landscape Design and Construction Course studio at Afyon Kocatepe University, Department of Interior Architecture and Environmental Design during the 2019-2020 academic year spring term.

Keywords: Landscape Design and Construction; Furniture; Afyon Kocatepe University.

Biyomorfik Tasarım Yaklaşımları; Peyzaj Tasarım Ve Konstrüksiyon Dersi Stüdyo Çalışmaları

Özet

Günümüz kentlerinde açık ve yeşil alanların azalması neticesinde hem bu alanların tasarımı hem de bu alanlarda kullanılacak tüm donatıların tasarımı konusunda tasarımcılara daha fazla görev düşmektedir. Bu alanlarda kullanılacak donatıların sadece işlevsel ya da ergonomik olması değil aynı zamanda estetik olması ve özgün tasarımlar olması gerekmektedir. Böylece alışlagelmiş ve sıradan mekânlar olmaktan çıkarak kullanıcıya, yani kent insanına yoğun koşuşturmaları içerisinde doğanın bir parçası gibi olan veya doğadan izler taşıyan donatılar sunmak önemlidir. Bu sebeple Afyon Kocatepe Üniversitesi, İç Mimarlık ve Çevre Tasarım Bölümü 2019-2020 bahar dönemi 4. Sınıf Peyzaj Tasarım ve Konstrüksiyon Dersi stüdyo çalışmalarında 9 öğrencinin biyomorfik tasarım yaklaşımları ile tasarladıkları donatı incelenmiştir.

Anahtar kelimeler: Peyzaj Tasarım ve Konstrüksiyon; Oturma Elemanı; AKÜ.

1. Introduction

The urban landscape furniture include seating, lighting, orientation, information, bus stop, and cover elements, and plastic objects. While these elements are generally designed or selected based on their functions and ergonomic properties, the aesthetic attributes are considered secondary. Furthermore, unoriginal and ordinary furniture are more preferred in urban landscapes due to their costs or durability, or due to the fact that they occupy less space, could be procured and produced easily. However, preferred furniture should be original, similar to structural or vegetal landscape design, and should be developed with scientific design approaches.

The urban landscape furniture improves the time spent by urban open space occupants in these areas and their quality of life (Çoban and Demir 2014). In urban spaces, availability of more comfortable living spaces is important for the development of urban landscape furniture industry, which has yet to reach significant levels in Turkey. Bulut et al. (2008) described furniture elements as various qualities and quantities of attributes or objects that facilitate individual and social urban life and communication among occupants, improve spatial functions and aesthetic attributes, and define and complement the space. The furniture designed as a spatial element should create a system. There should be a consistence among the space, activity, and furniture, all should move together. The furniture should meet occupant needs and be in adequate size and with adequate properties (Aksu 2012; Düzenli et al. 2018; Kahveci and Göker, 2020). Thus, it is also significant for furniture elements that are dynamic factors in urban landscape to reflect an aesthetic and original presence.

The concept of design has been defined based on various approaches. According to several authors, design is a problem-solving process, others described it as a decision-making or a trial-error process (Önel, 2011). Thus, design is generally defined as a process where diagrams or plans that are required for an activity are developed or a creative process. Design entails a continuous problem solving process (Newel and Simon, 1972). Therefore, design could be considered as "decision-making in the presence of uncertainties" (Asimow, 1962), "deduction of diversity" (Best, 1969), "finding the right components of a physical structure" (Alexander, 1964). Bayazit (1994) stated that design is simply an imagination or formation process to sketch or plan, or a plan or a thing imagined for production (Önal, 2011). It entails a mental project or

diagram where the steps that reach a goal are planned. A process is required to implement these steps. This design process entails the perception, thought, expression activities conducted by the designer with visual/verbal tools. The tools employed in this process affect the process, the product that is the expression of an idea, and the perception of this product (Anderson et. al. 2011). Thus, the design process is an activity where the mental thinking power, the data collected by all senses, and innate abilities are synthesized.

Landscape design aims to design open spaces based on occupant requirements and desires. In the design of outdoor spaces, the designers initially aim to come up with user-friendly, original and creative designs. Therefore, landscape design and construction course aim to teach approaches that allow the students to acquire design and creativity skills.

In the biomorphic design approach, designers mimic nature. The designers create an artificial environment by interpreting the sensory input that originated in nature. Universally individuals enjoy nature and experiences in nature (Bayazit, 2008). The nature was initially considered as a formal imitation element in architecture and landscape architecture. Today, due to technological advances, the biological form and even biological structures and functions of the nature are imitated. Particularly, since 2000, the rapid aggregation of ecological problems reshaped the method of learning from the nature in landscape architecture into a very different dimension. The creation and processes of living forms have been used in the design of the relationship between the form, structure, plastic object, furniture and material in environmental design. What is meant here entails particularly living organisms and their systems. In the analysis of the relationship between the nature and humans, the architectural perception of the nature, and the employment of nature and living forms as a resource in search for a form were scrutinized. The conversion of alive or nature-specific forms that are inspirational sources into a seating furniture in urban landscapes was addressed.

Bio-morphology is a basic concept with subtopics. These are anthropomorphology, zoo-morphology, phyto-morphology and micro-morphology. The employment of zoomorphic animal forms, the employment of anthropomorphic human body, the employment of phytomorphic branching flowering plants and other physiological attributes of the plants is among these applications. Furthermore, since the science that investigates the formation of living environments of all living creatures is ecology, the methodology of those who employ these as an inspiration is called eco-morphology.

Nature inspired formations (Yeler, 2012)	
Vegetal formations	Phytomorphic
Zoologic formations	Zoomorphic
Human-inspired formations	Anthropomorphic
Microscopic formations	Micromorphic
Habitat-inspired formations	Ecomorphic

Micromorphic formations include the designs inspired by microscopic organisms such as viruses, cells and DNA. Nano-biomedical Technology and Membrane Biology Institute in Chengdu in Southwest China is an example for a cell-like building. The building aimed to look like a cell from the outside and include various cellular forms inspired by molecular biology. For example, the garden pools are in the form of endosome with a single-cell organelle and mitochondria. Furthermore, bridges in the inner courtyard are also look like X and Y chromosomes (Yeler, 2012).

In forms that imitate habitats, in other words ecomorphic forms, spider web forms are used in structure and cover design, and termite towers are used in multistorey buildings. Also, Beijing Olympic Stadium, known as the "Bird Nest" could be given as an additional example (Yeler, 2012).

In the present study, the furniture designs and design approaches developed by the students in the 8th semester elective 'Landscape Design and Construction Course' at Afyon Kocatepe University Interior Architecture and Environmental Design Department were analyzed. In addition to other goals, the course aims to teach the students that there are an infinite number of guiding perfect designs in nature, and they could create functional and creative designs inspired by these. Thus, the students are also instructed about one of the most significant problems of the current era that similar and unoriginal furniture have led to open spaces without an identity and disqualification of the limited number of urban open and green spaces. Thus, the furniture designs and design approaches of the 9 students who attended the elective 'Landscape Design and Construction' course were scrutinized.

2. Material and Method

The study material included selected furniture designs created by the 8th semester students in the interior architecture and environmental design department landscape design and construction course during the 2019-2020 academic year. The study aimed to determine which biomorphic design approaches were employed in the design of these furniture. In other words, it aimed to determine the anthropomorphic, zoomorphic, phytomorphic and micromorphic approaches that were adopted by the students.

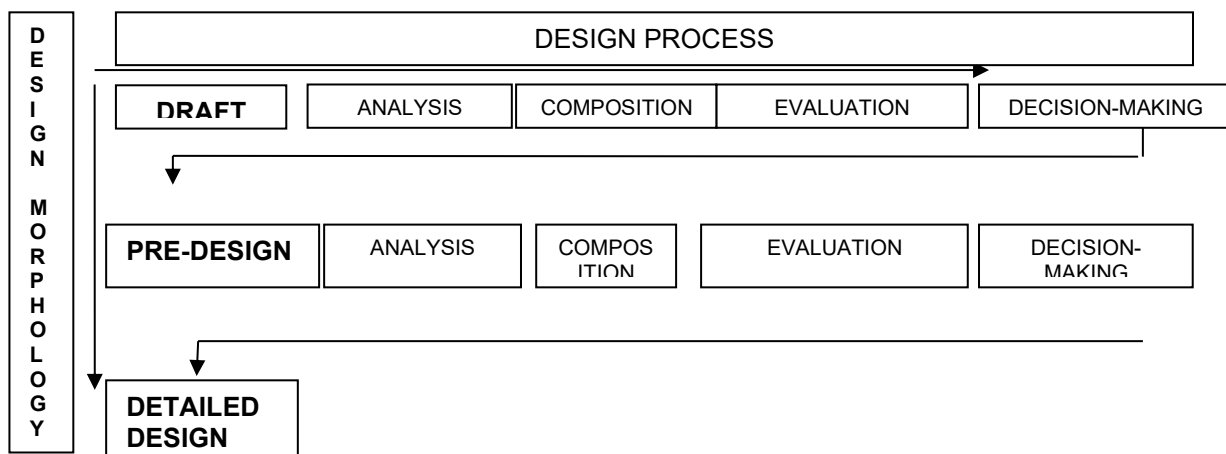


Figure 1. The landscape design process adopted in the landscape design and construction course

As schematized in Figure 1, each furniture design stage (draft, pre-design, detailed design) exhibited a lateral development (analysis, composition, evaluation, and decision-making) in landscape design and construction course, while the whole design exhibited a vertical development (draft, pre-design, detailed design).

3. Findings and Discussion

3.1. Furniture Design

1st Furniture; The designer produced the form with the phytomorphic approach, the most common biomorphic design approach where plant branching/flowering systems are utilized. The phytomorphic emulation is a significant approach in architectural analysis. The plant, branches and trunks allow fluid flow, while providing the required structural strength for the plant. Furthermore, branches and leaves move, alter their location, and grow based on certain rules. Due to these basic factors, the design was particularly based on wide gaps, foot systems and tree branches and plants.

2nd Furniture: The designer adopted the micromorphic approach, in other words, the design was inspired by microscopic images of animate or inanimate elements in the nature that could be observed due to the advances in microscopes and imaging technologies.

3rd Furniture: Designer adopted zoomorphic approach in furniture design. The design was inspired by animal sources. In this furniture called honeycomb included hexagonal forms in seating elements, cover and cover columns and the pavement.

4th Furniture: The designer adopted the phytomorphic approach in the design. In other words, the design was inspired by plants. The Latin name of the plant of inspiration is *Trifolium repens* and the local name is the four-leaf clover. Furthermore, according to the superstition, the plant brings good luck, but the origin of this superstition is not known. This was one of the reasons why the designer selected this plant. The designed hopes that people who will use this seating element would find the luck, belief and success they will be looking for.

5th Furniture: The designer adopted the ecomorphic approach in the design. In other words, the designed aimed analyze the habitats of living beings in the design. A cave was selected as the source of inspiration and also the name of the furniture. The designer created an abstraction based on a cave photograph and achieved hexagonal forms. In the design, where hexagonal forms that complement each other were embedded, and the colors were based on the photograph of the cave. Accordingly, material in these colors were selected. The wooden hard floors in cold colors and the grass cover led to an energetic landscape design. The borders defined the furniture boundaries, consistent with the units. The employment of different materials in the pavement leads the individuals. The half-hexagonal form of the elements was in the same in the sunshade and formed by stacking. The backrest design was consistent with the shadows based on different angles of the sun, adding to the design dynamics.

6th Furniture: The designer adopted the zoomorphic approach in the design. The design was based on animal images. However, the designed aimed to design the furniture by analyzing the animal images. The sea turtle shell was the inspiration of the landscape design where the seating element was placed, not the seating element itself. The designer employed the sea turtle shell in the formation of hard and soft floor designs.

7th Furniture: The designer adopted the micromorphic approach when designing this furniture. The design was based on the DNA helix. The DNA helix was abstracted on the pavement design and was also reflected in the seating element form. The seating and backrest elements in the furniture were completely inspired by the DNA helix.

8th Furniture: The designer adopted the phytomorphic approach in furniture design. In other words, the design was based on plant form. The Latin name of the selected plant is *Verbana officinalis* and the local name is sweet alyssum. Concrete and

wood materials were used in the furniture design. The seating element was an equilateral pentagon obtained by the transformation of sweet alyssum leaves into a geometric form. It included wooden material supported by cover profiles and colored glass. The leaf colors were adapted to the furniture in the form of stained glass elements located on the top of cover element.

9th Furniture: The designer adopted the anthropomorphic approach to design this furniture. In other words, the anthropomorphism entails the design where anthropomorphic characteristics are reflected on inanimate objects such as vehicles or buildings. Female and male body has been historically used in façades, bearing elements, plans and building design actively. In this work, the designer adopted a dancing human form to design the seating element.

4. Discussion and Conclusion

In the present study, the final works of senior Afyon Kocatepe University, Internal Architecture and Environmental Design students in Landscape Design and Construction course in the 2019-2020 academic year spring semester were investigated. The design approaches adopted by the students in furniture design are presented in detail. Initially, inspirational object visuals and technical and 3-dimensional drawings produced in the design process are presented. Furthermore, after the visuals presented in tables, the design approaches implemented by each designer were also discussed in detail.

Thus, it was observed that the form development techniques instructed in the theoretical section of the course were adopted and implemented by the students. Fytomorphic, zoomorphic, ecomorphic, micromorphic, and anthropomorphic approaches were implemented in furniture design. Although the furniture designs addressed in the present study were only a small percentage of the class work, only 11 students employed these design approaches in the classroom of 100 students.

The present study demonstrated that although the students employed biomorphic approaches for the first time in a design, most students could adopt and implement these approaches successfully.

Acknowledgements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interests

The authors declare no conflict of interest.

References

- Aksu, Ö. V. (2012). Original approaches in urban furniture design. *Inonu University Journal of Art and Design*, 2(6), 373-386.
- Alexander, C. (1964). A city is not a tree. 1965, 124.
- Anderson, R. E., Brazelton, W. J., & Baross, J. A. (2011). Is the genetic landscape of the deep subsurface biosphere affected by viruses? *Frontiers in microbiology*, 2, 219.
- Asimow, M. (1962). *Introduction to design*. Englewood Cliffs, NJ, Prentice-Hall.
- Bayazıt, N. (2008). *Tasarımı Anlamak*. İstanbul: İdeal Kültür Yayıncılık.
- Best, G. (1969). Direction-finding in large buildings. In *Architectural Psychology. Proceedings of the conference held at Dalandhui, University of Strathclyde*. RIBA Publications Ltd..
- Bulut, Z., Sezen, I., & Karahan, F. (2010). Determination of spring visual ceremonies of urban fruit trees and shrubs: A case study from Erzurum, Turkey. *Journal of Food, Agriculture & Environment*, 8(1), 289-296.
- Çoban, E., & Demir, Z. (2014). Kent mobilyalarının buldukları mekânlara etkileri: Düzce örneği. *Düzce Üniversitesi Bilim ve Teknoloji Dergisi*, 2(1), 128-140.
- Duzenli, T., Alpak, E. M., & Çiğdem, A. (2018). Flexible Design In Urban Furniture. *Yıldız Journal of Art and Design*, 6(1), 37-50.
- Kahveci, H., & Göker, P. (2020). Kent Mobilyaları Tasarım Dersi Stüdyo Çalışması; Üst Örtü-Oturma Birimi ve Piknik Donatısı Tasarımı. *Bartın Orman Fakültesi Dergisi*, 22(3), 1-1.
- Newel, A., & Simon, H. A. (1972). *Human Problem Solving*. Englewood.
- Önal, G. K. (2011). Yaratıcılık ve kültürel bağlamda mimari tasarım süreci. *Uludağ University Journal of The Faculty of Engineering*, 16(1).
- Önel, K., Karaçam, Z., & Gerçek, E. (2011). Effects of unplanned pregnancy on maternal health in Turkey. *Midwifery*, 27(2), 288-293.
- Yeler, G. M. (2012). *Mimarlıkta biyomorfizm*.