



Bioformic Form and Pattern in Landscape Architecture Education: An Example from the Architectural Design

Peyzaj Mimarlığı Eğitiminde Biyoformik Form ve Örüntü: Mimari Tasarım Dersi Örneği

ABSTRACT

Human beings are living organisms that instinctively strive to survive in nature. Since the formation of the world, humans have imitated nature to create a habitat for themselves. Imitation is a behavior exhibited by almost all living beings and is where design essentially begins. Abilities such as perception, analysis, judgment, creativity, and sensory memory are crucial in design.

The objective of the architectural design course taught at Recep Tayyip Erdoğan University's Landscape Architecture Department is to enhance students' abilities in perception, analysis, judgment, creativity, and other aspects. Consequently, their design skills improve.

In this study, term-end assignments within the scope of the Architectural Design course, delivered online (remotely) during the spring semester of the 2020-2021 academic year, were evaluated based on bioformic forms and patterns. The aim of the course was to instill an understanding of design that integrates with nature and is inspired by nature in creating unity between the structure and its environment. Accordingly, students were asked to choose a material from nature to design their ideal homes and surroundings and derive 2-dimensional patterns from this material. In the final stage, the transformation of patterns into products and the creation of 3-dimensional models were requested. The students' designed models and created patterns were evaluated within the context of bioformic forms and patterns. As a result, awareness was raised regarding nature-based design approaches, enhancing students' creativity. (Times New Roman, 9 Punto, Mak. 250 Sözcük).

Keywords: Architectural Design, Bioformic Form, Pattern, Landscape Design

ÖZET

İnsan, doğada hayat bulan, içgüdüsel olarak hayatta kalmak için çaba harcayan bir canlıdır. Dünyanın oluşumundan bu yana insanlar kendilerine yaşama barınma ortamı oluşturmak için, doğayı taklit etmişlerdir. Taklit etmek, hemen hemen tüm canlıların gösterdiği bir davranış biçimidir. Aslında bu noktada da tasarım başlar. Tasarımda algılama, analiz etme, muhakeme yapabilme, yaratıcılık, vb. gibi yetenekler ve duyuşal hafıza son derece önemlidir.

Recep Tayyip Erdoğan Üniversitesi Peyzaj Mimarlığı Bölümünde okutulan mimari tasarım dersinin amacı, öğrencilerin algılama, analiz etme, muhakeme yapabilme, yaratıcılık gibi yeteneklerini geliştirilmesidir. Bunun sonucunda tasarım yetenekleri de gelişir.

Bu çalışmada 2020-2021 eğitim-öğretim yılı bahar dönemi çevrimiçi olarak (uzaktan) verilen Mimari Tasarım dersi kapsamında yapılan dönem sonu ödevleri biyoformik formlar ve örüntüler parametresi doğrultusunda değerlendirilmiştir. Ders kapsamında öğrencilere, yapı-çevre birliğinin oluşturulmasında doğa ile bütünleşen ve doğadan esinlenen tasarım anlayışının kazandırılması amaçlanmıştır. Bu amaç doğrultusunda öğrencilerden hayallerinde ki konutu ve çevresini tasarlamak için doğadan esinlenecekleri bir materyal seçmeleri ve bu materyalden 2 boyutlu örüntüler elde etmeleri istenmiştir. Son aşama olarak ta örüntülerin ürüne dönüştürülmüş, 3 boyutlu modelleri istenmiştir. Öğrencilerin tasarladıkları maketler ve oluşturdukları örüntüler, biyoformik form ve örüntü kapasamında değerlendirilmiştir. Bunun sonucunda Öğrencilerin yaratıcılığının geliştirilmesinde ve güncel tasarım yaklaşımları olan, doğa temelli tasarım yaklaşımları konusunda farkındalık yaratılmıştır.

Anahtar Kelimeler: Mimari Tasarım, Biyoformik Form, Örüntü, Peyzaj Tasarımı

INTRODUCTION

In the first year of education that includes design training, the primary goal is to prepare individuals who encounter the design problem for the first time for this process and teach them the ways of creative thinking. In this context, individuals learn both how to design and how to improve their creativity throughout the process. The knowledge and skills they acquire in the early years develop creative thinking and prepare the groundwork for the following years. In this creative process, individuals need to grasp the design and actively participate in the design organization. This occurs with the shaping of the foundation of creative thinking (Yılmaz, 2022). An individual can only reach this potential through education (Atalayer and Üstün, 2000;

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Georgiev and Casakin, 2020). In departments structured around creativity and design, such as landscape architecture, the architectural design course, one of the main courses in the education process, constitutes a significant step in structuring creative thinking (Yılmaz et al., 2022). Consequently, designers in the early stages of their education can develop a consistent, readable, and highly creative design approach when they establish a successful connection between the sources of inspiration in nature and design problems.

The Architectural Design course is particularly important in the context of the unity of structure and environment. When conveying information about achieving the unity of structure and environment, the internal functions and outward expressions of structures with different functions are also examined. Especially in landscape design, focusing on the concept of "visual unity" or "character unity," the aim is to design a project that transforms and integrates structures into a cohesive whole with the surroundings. Through landscape design, designers attempt to ensure the unity of aesthetics, semantics, and functionality between the landscape a residence is situated in (Yılmaz et al., 2016).

The failure to achieve coherence between human-made structures and the natural environments they are in is a result of overlooking the unity of structure and environment in architectural composition (Yılmaz et al., 2016). However, the effectiveness of architectural design, a dynamic process capable of adapting to constantly evolving environmental conditions, determines the form of the connection between humans and nature (Bayraktaroğlu, 2013). Architecture and Landscape Architecture are disciplines that have evolved in parallel. Architects plan structures that harmonize with the environment, while Landscape Architects plan in harmony with the structure (Dinçer et al., 2016). Throughout history, people have, consciously or unconsciously, mimicked nature and intervened in it to create habitats and living environments for themselves. Design actions acquired from nature unconsciously have resulted in spaces that integrate with natural forms based on ideas derived from nature, images retained in memory, and experiences. This design action acquired in ancient times manifests today as a design approach where life and forms of nature integrate in architecture (Ertin Tezgör and Karakaya Aytin, 2022). The philosophy behind these approaches offers valuable insights into the complex structure of nature and nature-based design (Bayraktaroğlu, 2013).

Achieving the unity of structure and environment, one of the fundamental objectives of landscape design, signifies the intersection of the field of landscape architecture with the field of architecture. Within the scope of the Architectural Design course in Landscape Architecture Departments, the focus is on this intersecting area between the two professional disciplines, aiming to impart knowledge of achieving unity between landscape design and structure-environment (Yılmaz et al., 2016). One of the primary objectives of landscape design in achieving this unity is to integrate human-made structures (residences or other buildings) into their natural environment (Stewart, 2007). Moreover, landscape architects need to have extensive knowledge in both natural sciences and artistic creativity (Gazvoda, 2002).

In landscape architecture programs, the fundamental design course directs students towards form creation, whereas the architectural design course focuses on the concept of visual unity or character unity. In both cases, the aim is for the creator to use their own experiences to derive, reinterpret, and transform the meaning of their work. However, as noted by Orthel and Day (2016), it is challenging for new students in the design field to convey their own ideas through creation initially. In this regard, students need an inspiration source, a starting point, and various creative conceptual ideas to shape and organize forms in their designs. This starting point can sometimes be shaped according to user needs and sometimes emerges as a result of imitation of nature (Ertin Tezgör and Karakaya Aytin, 2022). Designers in the early stages of their education can develop a consistent, readable, and highly creative design approach when they establish a successful connection between the sources of inspiration in nature and design problems (Yılmaz et al., 2020).

Biomorphic forms allow designers to interpret the perceived objects in nature through different output-products by imitating the forms acquired from nature using the analogy method (Ertin Tezgör and Karakaya Aytin, 2022). The forms in nature are significantly different from what traditional geometry teaches us. In nature, they are the patterns within natural structures that serve as sources of inspiration. Creative shaping in spatial design can be achieved through patterns. In other words, patterns can be used to generate new forms for reproduction (Düzenli et al., 2018).

One of the disciplines that has the highest interaction with nature is landscape architecture. In landscape architecture, the goal is for design products to be compatible with nature. Therefore, developing a design approach by taking inspiration from nature is a priority for landscape architects. In this way, designers can respond to user needs while showcasing their creativity and producing designs that harmonize with nature. In this context, it is necessary to convey the methods of creative design in landscape architecture education with different perspectives (Yılmaz et al., 2016).

In this regard, 1st-year landscape architecture students' works, supported by various theoretical transmissions and applications throughout a semester of architectural design education, were evaluated in the practical part of the chosen landscape architecture within the application of architectural design education. In conceptualizing the relationship between nature and the built environment, the approach of deriving inspiration from nature in the design process was examined in the context of bioformic forms and patterns by evaluating research processes (examples from nature) and design product (model) (Yılmaz et al., 2016).

Nature-Inspired Approaches in Architectural Design

Since the existence of humanity on Earth, individuals have been learning by subjecting every observation and perception of natural phenomena to mental processes, deriving deductions from these teachings when needed, and generating solutions. They take the knowledge existing in nature, along with their accumulated knowledge, tools, and/or technologies, and transfer it to their own designs using various "approaches" (copying/ imitation/ mimesis/ analogy/ metaphor/ mirroring/ inspiration/ learning/ interpretation/ biomimicry, etc.) (Avinç and Arslan Selçuk, 2020).

The concept of 'nature,' which can be regarded as one of the fundamental sources of art and architecture, provides designers with different perspectives along with advances in science and technology. These different perspectives also bring different approaches; these approaches involve understanding biological phenomena, objects, functions, structures, and principles found in nature by scientists/researchers/designers and create an interdisciplinary field (Ripley and Bhushan, 2016).

While shaping the environment they live in, humans have created the first architectural examples by observing nature. Throughout history, knowledge transfer has been realized by copying/imitating/learning/interpreting from the biological environment up to the present. However, contemporary environmental issues shaping the architecture of the 21st century (climate change, energy and resources, ecology, and sustainability) have made it inevitable to perceive nature as a role model (Avinç and Arslan Selçuk, 2020).

As a result, nature-inspired design approaches such as 'Green design,' 'Ecological design,' 'Biophilic design,' 'Biomimicry,' and 'Regenerative design' have emerged today. In the architectural design course, the first dimension that addresses the forms and structures of these approaches (copying/ imitation/ mimesis/ analogy/ metaphor/ mirroring/ inspiration/ learning/ interpretation/ biomimicry, etc.) is discussed. If we describe the first dimension as 'transition from nature to design,' we can explain the second dimension as 'transition from design to nature.' In the second dimension, holistic solutions for the design of efficient structures from ecological, structural, and functional perspectives are gradually included in the education process. However, it should not be forgotten that these design approaches can be achieved as a result of "interdisciplinary activities."

Bioformic form and Pattern

In this context, in the Architectural Design course, efforts are made to highlight students' creativity through designs that produce more creative forms following the parameters of biomorphic forms and patterns using abstraction, imitation, mimesis, analogy, and metaphors from nature.

Humans have adorned their living spaces with representations of nature since ancient times, and architects have long drawn inspiration from the forms and patterns in nature to create spaces (Senosiain, 2003; Browning et al., 2014). Biomorphy is a term used to describe abstract forms that are derived from or resemble organisms in nature (Morgan, 2007; Pawlyn, 2016). Biomorphic forms and patterns are symbolic references to the patterns, textures, contours, or numerical arrangements existing in nature (Ryan et al., 2014; Beyhan et al., 2018). Additionally, biomorphic forms and patterns emphasize the value of the existing shapes and forms in nature (Beatley, 2016).

Biomorphic forms and patterns are a design parameter utilized within the scope of natural analogs, a category of biophilic design. Natural analogs address the organic, inanimate, and indirect associations of nature. The goal of this parameter is to reflect materials, colors, shapes, patterns, and designs found in nature in the built environment, ranging from buildings to artworks, urban furniture, and various designs, thus achieving creatively mimicking nature (Browning et al., 2014). The surpassing of the boundary between the built environment and the natural environment is clearly visible in Peter Vetsch's Earth House project (Figure 1) (Bayraktaroğlu, 2013).



Figure 1. Earth House, Peter Vetsch (URL-1)

The Earth House project represents more than just an architectural structure; it embodies a philosophy of human life intertwined with the natural environment. Introducing the concept of "living with the land," the project intricately utilizes the land itself to create its spatial elements. It offers a unique and natural experience to its occupants by addressing their shelter and recreational needs through this harmonious integration with the land (Bayraktaroğlu, 2013).

To effectively incorporate inspirations from nature into the architectural design process, a systematic approach must be established. Patterns serve as a manifestation of this systematic approach. Bums (2000) emphasizes that patterns are pivotal in understanding concepts, attributing this importance to their role in recognizing, maintaining, and creating structures. He sees patterns as fundamental in perceiving relationships, forming generalizations, and understanding order. Albertson (2010) further elaborates on how pattern recognition aids in identifying similarities between strategies found in organisms and designs produced by humans. It significantly influences the conceptualization process during the design phase.

The objective of this study is to equip landscape architecture students with a design approach that facilitates the versatile development of their creative ideas, enabling them to produce sustainable, high-quality designs that seamlessly integrate with nature. This was achieved through the Recep Tayyip Erdoğan University Department of Landscape Architecture's 2020-2021 spring semester 1st Year Architectural Education program conducted via online distance education, specifically within the design course (Bayraktaroğlu, 2013).

METHODOLOGY AND MATERIALS

In order to facilitate the multifaceted development of landscape architecture students' creative ideas and teach them how to approach their surroundings in various design aspects based on the internal activities of structures with different functions, the 3D models of the 1st-year architectural design course's final projects, inspired by natural formations and their transformed pattern sketches, constitute the material of this study.

Within this course, students are educated on the internal workings of structures with different functions, the activity spaces within them, the relationships between these spaces, and how they can be connected to the outside. The conceptual framework of nature-based design approaches and parameters is conveyed to the students. The concept of biomorphic forms and patterns, inspired by nature and utilizing natural patterns, is examined, and these concepts are explained through nature-based designs.

Following this, students are asked to sketch a two-dimensional pattern, inspired by shapes and forms found in nature, to represent the exterior shell of a house along with its surroundings without delving into its internal functions. The students are encouraged to transform this pattern into a three-dimensional model. The aim is to create a design that integrates with nature, achieving harmony between the structure and the environment/landscape.

The stages of the course to achieve this goal are as follows:

- ✓ Students are asked to provide examples of photographs that inspire them. An analysis of the selected models is then conducted.

- ✓ The formal characteristics of the chosen model and the linear, textural, and color characteristics of the environment's topography are defined. Students are then required to transform these characteristics into a pattern using regular or irregular shapes and sketch a 2D representation. Discussions on what type of material can be used to reflect the design take place.
- ✓ Transitioning to the working models, students use design elements and follow design principles to create 3D models of their projects (often iterating and refining the model based on feedback to better reflect reality).
- ✓ In the final stage, a 1/100 scale final model is created with dimensions of 35x50.

FINDINGS

The results were evaluated based on selected samples from the final products of the course, which were assessed as the end-of-term project and conducted within the studio (Table 1, 2, 3, 4, 5, 6).

TABLE 1 1. (First) Study


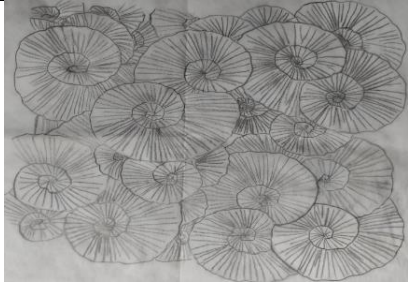

Inspired Sample	Pattern Model	Model
		
<p>The spiral structure of snail shells has been chosen as the bioformic form that served as inspiration. The organization of units that make up the pattern is regular in terms of form, but random in terms of arrangement. According to Oral (2015), it can fall under the aperiodic pattern category. In the model where the concept of 'cycle' is defined, the spatial design is completed by taking inspiration from the created pattern. The model is composed of repetitions of the pattern model in different dimensions, mimicking the spiral shape that constitutes the form of the snail shell. Depending on its size, the model accommodates different spaces and functions.</p>		

TABLE 2 2.(Second) Study


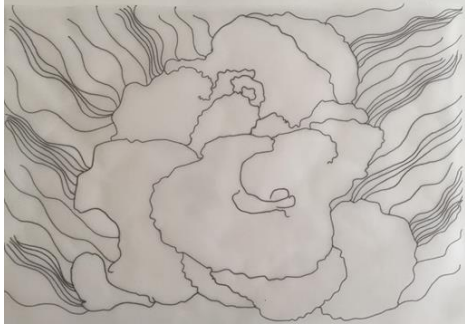

Inspired Sample	Pattern Model	Model
		
<p>The organic structures of coral reefs and the undulating movements of water have been chosen as the bioformic form in this work. In the visual material representing the concept, organic forms placed at close intervals are positioned in the middle, while irregular curved lines integrated with the surroundings create the pattern. According to Kılıç (2021), this can fall into the category of a random pattern due to the arrangement of different forms placed side by side at different intervals. In the model where the concept of 'nest' is defined, the spatial design is completed by taking inspiration from the created pattern. The model is formed by the repetition of the organic form that constitutes coral reefs in different dimensions, assuming functions in various spatial formations. The second element of the pattern, irregular curved lines, takes on functions such as circulation and ground elements.</p>		

TABLE 3. 3.(Third) Study

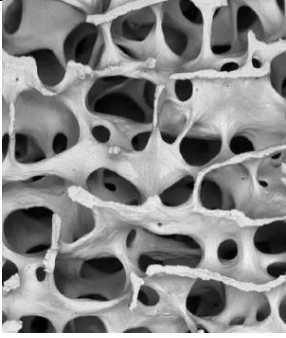





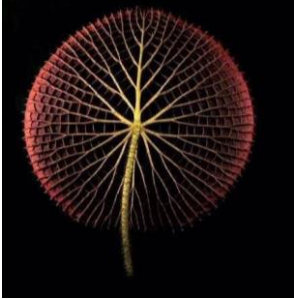
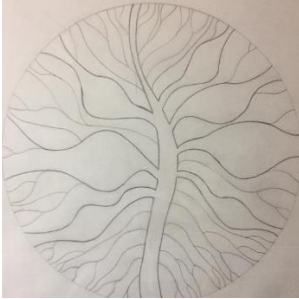

Inspired Sample	Pattern Model	Model
		
<p>The microscopic view of bone tissue, consisting of regular and irregular forms, has been chosen as the bioformic form in this work. In the visual material representing the concept, irregular organic forms placed at different intervals create a pattern by being juxtaposed at different intervals with spaces left in between, forming a random pattern. In the model where the concept of 'cell' is defined, the spatial design is completed by taking inspiration from the created pattern. The model is formed by the repetition of the irregular organic form that constitutes bone tissue in different dimensions, assuming functions in various spatial formations, expressed with funnels.</p>		

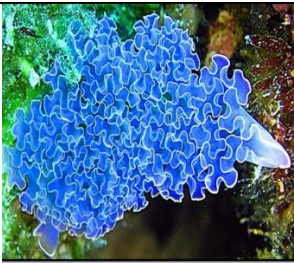
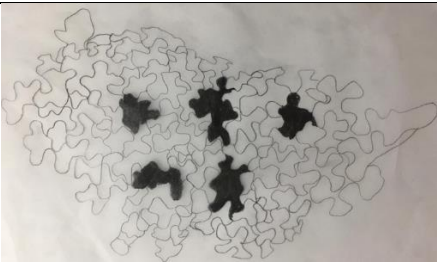

TABLE 4. 4. (Fourth) Study

Inspired Sample	Pattern Model	Model
		
<p>The bioformic form inspired by the structure of a sea sponge was chosen from nature. The pattern was created by drawing inspiration from the circular structure of the visual material that formed the basis of the work. The organization of the units that make up the pattern is regular in terms of form, but random in terms of arrangement. According to Oral (2015), such a pattern can fall into the category of aperiodic patterns. The concept of 'Bubble' was determined, and the spatial design was completed by taking inspiration from the created pattern in the model. The model was created by the repetition of the cylindrical structure of the sea sponge, taking on different functions in various spatial formations, based on different dimensions.</p>		

TABLO 5. 5.(Fifth) Study

Inspired Sample	Pattern Model	Model
		
<p>The bioformic form inspired by the organic tissue composed of curved lines of leaf veins was chosen from nature. The basis of the work was the curved lines of the visual material that formed the inspiration for the project, which were similarly juxtaposed at different intervals, creating a random pattern with spaces in between. The concept of 'Balance' was determined, and the spatial design was completed by taking inspiration from the created pattern in the model. The model was created by the repetition of the form made up of the curved lines of leaf veins, resulting in spatial formations that took on different functions based on different intervals.</p>		

TABLO 6. 6. (Sixth) Study

Inspired Sample	Pattern Model	Model
		
<p>The bioformic form inspired by the organic tissue composed of curved lines of coral reefs was chosen from nature. The basis of the work was the irregular curved lines closely spaced in the inspiring visual material, similarly juxtaposed at different intervals, creating a random pattern with spaces in between. The concept of 'Labyrinth' was determined, and the spatial design was completed by taking inspiration from the created pattern in the model. The model was created by the repetition of the form made up of the curved lines of coral reefs, resulting in spatial formations that took on different functions based on different intervals.</p>		

CONCLUSION

Creativity at the core of design allows for different perspectives on problems and the ability to propose multiple solutions and recommendations in a short amount of time. In the first year of programs that include design education, the primary goal is to teach students the methods of creative thinking. This way, as students' creativity develops, so does their ability to design. Therefore, in programs focused on design and creativity like landscape architecture, architectural design courses play a crucial role alongside fundamental design courses, as they structure creative thinking.

In this study, through bioformic forms aimed at gaining new perspectives via understanding nature and finding solutions inspired by nature in response to the needs and problems posed by design, we sought to establish unity between the built environment and nature, which is a fundamental principle of design.

When evaluating the six selected result samples, it is observed that students predominantly chose underwater habitats and then plants and animals as their source of inspiration for their designs among biomorphic forms found in nature.

In the evaluation of the characteristics of the selected bioformic forms in line with the purpose of this study, it is evident that visual appeal is highly influential. While color is the most appealing feature for students, form and texture characteristics follow. In their two-dimensional works where they created patterns, except for Table 4, in the other examples, the bioformic form of the visual material has been directly reproduced. In terms of the arrangement of the forms that constitute the pattern, it is seen that there are aperiodic or random pattern types.

When evaluated at the model level, it has been observed that in Table 3 and Table 5, the forms that make up the pattern units undergo a change when brought together, while in others, they are brought together while preserving all their characteristics. In the formation of spaces, it is observed that forms of different intervals or different sizes are brought together, providing dynamism to the spaces in this way.

The architectural design course offers students a broad perspective on the importance of the unity of structure-environment in landscape architecture designs and how to draw inspiration from nature and natural forms to achieve this unity. It also raises awareness about contemporary design approaches such as nature-based design approaches. In the architectural design course, the functional aspect of design is partially taught to students, but predominantly, the aesthetic dimension is emphasized. As a result of the studies, it is observed that there is a lack of knowledge and awareness about nature-based design from a professional perspective. This deficiency in landscape architecture education can be addressed through the development of course curricula.

In conclusion, this study incorporated a nature-based perspective into students' design approaches, thereby involving them in the process of creativity. Furthermore, it increased awareness about contemporary concepts such as nature-based designs.

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REFERENCES

- Albertson, T., L., 2010. The Integration of Biomimicry into a Built Environment Design Process Model: An Alternative Approach Towards Hydro-Infrastructure, Yüksek Lisans Tezi, University of Nevada Collage of Fine Arts, Las Vegas.
- Atalayer, F. & Üstün, B. (2000). "Temel tasarım eğitim ve öğretimi". Mimarlık Dergisi, Dosya: Temel Tasarım Eğitimi, (293).
- Avinç, M., Arslan Selçuk, S., 2020. Geçmişten Günümüze Yapı Tasarımında Doğa Temelli Paradigmal Değişimler. Gelenekselden Moderne Yapı Tasarımı Ve Malzemesi. Iksad Publications.Ankara.
- Bayraktaroğlu, Ö., E., 2013. Mimarlıkta Ekosistem Düşüncesiyle Tasarlamak İstanbul Teknik Üniversitesi ,Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.
- Beatley, T., (2016). Handbook of Biophilic City Planning and Design, 13, DOI 10.5822/ 978-1-61091-621-9_2, Island Press, 2000 M Street, NW, Suite 650, Washington, DC 20036, USA.
- Beyhan, F. , Selçuk Arslan, S. ,Genç, G., 2018. Biyofilik Kavramının Tarihi Binalar Bağlamında Değerlendirilmesi:Tokat Mustafa Ağa Hamamı. Uluslararası Sosyal Araştırmalar Dergisi / The Journal of International Social Research Cilt: 11 Sayı: 58.
- Browning, W. D., Ryan, C. O., ve Clancy, J. O., 2014. 14 Patterns of Biophilic Design; Improving Health & Well-Being in the Built Environment, Terrapin Bright Green LLC: New York, NY, USA.
- Bums, M. (2000). About Teaching Mathematics. A K-8 Resource. (2nd ed.) Sausalito, California: Matlı Solutions Publication.
- Diñer D. , Bekiryazici F. , Yılmaz S. , Bekci B. , 2016 "Interaction of other art fields with landscape architecture", in: "Turkey, Looking Behind And Before", Taylor W.H., Eds., Peter Lang Publishing, Inc. Lang see Lang İstanbul, 16-24.
- Düzenli, T., Yılmaz, S. Ve Alpak, E.M., (2018). Peyzaj Mimarlığı Eğitiminde Bir Tasarım Yaklaşımı: Doğal Örüntülerden Esinlenme.sed, 6 (1).s.21-35
- Ertin Tezgör, D., G., ve Karakaya Aytin, B., 2022. "Biyomorfik Form ve Örüntülerden Esinlenen Tasarımlar Üzerine Bir Stüdyo Deneyimi". Sanat Eğitimi Dergisi, 10/1 (2022 Bahar): s. 33–45.
- Kılıç, S., 2021. Uzaktan Eğitimde Temel Tasarım Dersine Yönelik Örüntüye Dayalı Parametrik Çalıştay Önerisi. Doktora Tezi, MSGSÜ Fen Bil. Enst., İç Mimarlık Anabilim Dalı, İstanbul.
- Gazvoda, D., 2002. Characteristics of modern landscape architecture and its education, Landscape and Urban Planning (60) 117–133

- Georgiev G.,V., and Casakin, H., 2020. Semantic measures in design conversations as predictors of creative outcomes in design education. The Sixth International Conference on Design Creativity (ICDC2020) Oulu, Finland, August 26th – 28th
- Morgan, A. L., 2007. The Oxford Dictionary of American Art and Artists, Oxford University Press, New York, 2007.
- Oral, H., 2015. Doğadan Esinli İnteraktif Bina Kabuğu Tasarımı İçin Örüntüye Dayalı Bir Model. İTÜ Fen Bil. Enst., Bilişim Anabilim Dalı, Yüksek Lisans Tezi, İstanbul.
- Orthel, B. D. ve Day, J. K. (2016) Processing Beyond Drawing: A Case Study Exploring Ideation for Teaching Design, SAGE Open, Vol. 6, No. 3, pp. 1–16.
- Pawlyn, M., 2016. Biomimicry in Architecture, 2nd Edition, RIBA publishing, ISBN: 978 1 85946 738 1 (pdf), UK.
- Ripley, R. L., & Bhushan, B., 2016. Bioarchitecture: bioinspired art and architecture—a perspective. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 374(2073), 20160192.
- Ryan, C. O., Browning, W. D., Clancy, J. O., Andrews, S. L., Kallianpurkar, N. B., 2014. Biophilic Design Patterns: Emerging Nature-based Parameters for Health and Well-being in the Built Environment. International Journal of Architectural Research, S. 8 (2), s. 62–76.
- Senosiain, J., 2003 . Bio-architecture. Architectural Press, Oxford (Burlington, Mass). s.173
- Stewart, J., 2007. Professional Landscaper: A Complete Course, Delhi, IND: Global Media.
- URL-1. <http://www.bubblemania.fr/en/peter-vetsch-2007-dietikon-suisse/>,14.05.2023.
- Yılmaz, S., Mumcu, S., Düzenli, Özbilen, A., 2016. Tasarımda Birlik Kavramının Öğrenci Çalışmalarında İrdelenmesi: Mimari Tasarım Dersi Örneği Inonu University Journal of Art and Design. Cilt/Vol. 6 Sayı/No.14 (2016): 1-12.
- Yılmaz, S., Düzenli, T., Çiğdem, A., 2020. Residential environmental design with nature inspired forms. ITU A|Z • Vol 17 No 3 • November.
- Yılmaz, S., Baltacı, H., Dinçer, D., 2022. Creativity And Creative Thinking In Design Architectural and Engineering Research and Practice. Livre de Lyon. Chapter II. p.27. June, France. Lyon.