Journal of Architectural and Planning Research
39:4 (3-16, 2026) 3

A NON-FORMAL ARCHITECTURAL EDUCATION TO DISCUSS THE CODES OF BIOPHILIC DESIGN IN VERNACULAR ARCHITECTURE: A WORKSHOP EXPERIENCE IN AND AROUND ANKARA CASTLE

Güneş Mutlu Avinç
Ayşenur Coşkun
Semra Arslan Selçuk

The primary objective of this study is to offer a comprehensive overview of biophilic design and its practical applications within the realm of architectural education. To achieve this aim, a workshop experience was employed to underline the significance of biophilic design in fostering a harmonious relationship between built environments and the natural world, as well as to highlight the strong correlation between biophilic design and the attainment of Sustainable Development Goals (SDGs). Furthermore, an exploration of the incorporation of biophilic design principles within local architecture was shared, serving as a means to encourage architectural educators and practitioners to contemplate contemporary global issues through interactive workshops. By engaging in such activities, the intent was to enable architecture students to discern the potentialities within their immediate surroundings and to provide them with a practical framework for implementation. To reveal how biophilia can serve as a catalyst for SDG attainment, an informal educational proposal was formulated as an alternative approach to integrating biophilic design into architectural education.

https://doi.org/10.66033/japr2025-401

INTRODUCTION

Biophilic design, which is a modern design approach, has received increasing attention in recent years. The literature provides strong evidence for physical, psychological and performance improvement for people when they are in close contact with nature (W. Browning et al., 2014).

Biophilic design is based on the Biophilia hypothesis, which suggests that humans have an innate connection with the natural world and therefore exposure to the natural world is important to human well-being (E. O. Wilson, 2017). The idea behind biophilic design is the incorporation of natural features and systems into the built environment to increase human-nature interaction (S. R. Kellert, 2008). However, human interaction with nature is often lacking in today's societies due to societal trends such as urbanization, building design and lifestyle (S. R. Kellert, 2012).

The number of research on biophilic design in different disciplines is increasing day by day. Joye (Joye, 2007) dealt with the art and design education of biophilic design and the enhancement of both theoretical and practical knowledge of architects and designers. Zhong, Schröder & Bekkering (Zhong et al., 2021), conducted a comprehensive literature review to examine the treatment of nature in architecture and discussed biophilic design in a theoretical framework. Lee & Park (Lee & Park, 2018), evaluated the importance and characteristics of biophilic design patterns in the children's library. Grazuleviciute-Vileniske, Daugelaite & Viliunas (Grazuleviciute-Vileniske et al., 2022), analyzed existing biophilic classifications and design examples to better understand the architectural potentials offered by the biophilic design approach. Cacique & Ou (Cacique & Ou, 2022), discussed the biophilic design approach to develop healthy and sustainable environments. Bettaieb & Alsabban (Bettaieb & Alsabban, 2022), investigated the role of users in the application of biophilic properties to the interiors of residential areas. McGee, Jin, Park, Ball & Carr (McGee et al., 2022) used the test of the biophilic interior design matrix they developed for China to determine the biophilic perceptions of the designers. Cavanagh et al. (Cavanagh et al., 2020) utilized biophilic design criteria to design an artistically created multisensory environment that enhances participant engagement. Bangwal, Tiwari & Chamola (Bangwal et al., 2017) suggest leading organizations, practitioners, and designers to apply biophilic design criteria to workplace design to increase employee focus. From this point of view, the main difference of our paper from the studies in the literature is that it seeks an alternative method for how the biophilic design approach can be handled in architectural education outside of the design course.

The main reason for this search is the importance of transforming the education system to enable students to live in the changing world and to actively participate in the solution of world problems. Because biophilic design is seen as a "design philosophy" (S. R. Kellert, 2008) that encourages the use of natural systems and processes in the design of the built environment and is important to use in the education process.

In this context, this study includes the experience and results of a three-day workshop prepared to show the importance of biophilic design to architects and to teach it in a non-formal educational environment -outside the classroom. Within the scope of the workshop, the biophilic elements in the buildings were determined by the research and on-site investigations on the examples of local architecture, Pilavoğlu Han (commercial), a traditional mansion on Barış Street (residence), and Aslanhane Mosque (religious) in the historical city center of Ankara. The most important reason for selecting these buildings is to ensure that the biophilic design features of the modern world are examined both in relation to SDGs and in terms of vernacular architecture. Thus, it was possible for students to question the guiding effects of "healing properties of nature" on the shaping of architectural spaces.

BIOPHILIC DESIGN APPROACHES AND ELEMENTS

Recent research suggests that urban environments negatively impact mental well-being and health (Corcoran et al., 2017). In this context, in response to the increasing environmental problems and the pandemic, the biophilic approach has started to attract attention in architectural design. Biophilic design is increasingly recognized as a strategy that can help build bridges between human and nature (Gillis & Gatersleben, 2015). Biophilic design approach aims to create positive conditions for humans in various anthropogenic environments while at the same time restoring the broken human-nature link (Grazuleviciute-Vileniske et al., 2022). The term biophilia was used by social psychologist Erich Fromm [(Gillis & Gatersleben, 2015):406] to mean "the passionate love of life and of all that is alive."

Biologist and naturalist Edward Wilson [(E. O. Wilson, 1984):1] defined biophilia as the innate tendency to focus on life and lifelike processes. The biophilia hypothesis states that humans have an innate biological need to relate to nature. Biodiversity and diversity of relationships with nature and diversity of landscape types are important for the physical and psychological development of people (Ode et al., 2008). Biophilia leads to positive results with close and visual contact with plants, animals and other humans, and artificial creations that follow geometric rules for the structure of organisms (Salingaros, 2019).

The concept of biophilia is discussed by Erich Fromm (Fromm, 1974) and Edward O. Wilson (E. O. Wilson, 1984), while its specific application in shaping the built environment is based on Stephen R. Kellert (S. R. Kellert & Wilson, 1995). Kellert (S. R. Kellert, 2008), defined biophilia as a natural human tendency to relate to natural systems and processes. And it is possible to claim that today, the ecological crisis is due to the decrease in this human-nature relationship. In this context, human-nature interaction can be increased by increasing the use of biophilic criteria. Biophilic design aims not only to reduce the negative effects of human activities on the natural habitat, but also to lead to positive effects on human mental and physical health (Wolfs, 2015). Environmental psychology and medical researchers ("14 Patterns of Biophilic Design: Improving Health and Well-Being in the Built Environment", 2014; Ode et al., 2008) have proven the benefits of connecting with nature. Being in a biophilic environment helps to accelerate post-operative recovery, as documented in the classical experiments of Roger Ulrich (Ulrich, 1984).

To exploit the full potential benefits of the biophilic approach, several criteria and model systems ("14 Patterns of Biophilic Design: Improving Health and Well-Being in the Built Environment", 2014; S. R. Kellert et al., 2011; Salingaros, 2019) have emerged that facilitate the implementation of biophilic design disciplines, biophilic urbanism, and biophilic projects. Similarly, it has been proposed as a design guide to eliminate the lack of nature in architecture. (Almusaed, 2010; Cramer & Browning, 2008; Joye, 2011; S. R. Kellert, 2008; Ryan et al., 2014; A. Wilson, 2008). The resulting biophilic architecture contributes to sustainability, overcomes the lack of contact with nature and effectively manages natural resources (Almusaed, 2010; Hidalgo, 2014; Jiang et al., 2020; Kayıhan, 2018; McMahan & Estes, 2015). Therefore, more research is needed to develop the relationship between sustainable architecture and biophilic design (Zhong et al., 2021).

According to Wolfs (Wolfs, 2015), biophilic architecture has unprecedented potential for bio-collaboration where the integration of natural elements goes beyond aesthetics or symbolism. Moreover, bio-collaboration in design can occur at aesthetic, functional and structural levels (Wolfs, 2015). There are biophilic design criteria prepared by different researchers in the literature. Researchers have developed suggestions in the context of strengthening the human-nature relationship and designing healing spaces. For example, Heerwagen and Hase (Heerwagen & Hase, 2001) defined eight criteria as "prospect, refuge, water, biodiversity, sensory variability, biomimicry, a sense of playfulness, enticement". Kellert et al., S. R. Kellert et al., 2011, p.15 established more than seventy criteria under six categories: "environmental features, natural shapes and form, natural patterns and processes, light and space, place -based relationships, evolved human-nature relationships".

Cramer and Browning (Cramer & Browning, 2008) defined human-nature relations in three categories: nature in the space, natural analogues and nature of the space. Similarly, Kellert and Calabrese (S. R. Kellert & Calabrese, 2015) listed twenty-four biophilic criteria in three categories. Browning and Ryan (W. D. Browning & Ryan, 2020), on the other hand, defined 15 criteria in 3 categories. The classifications made by different authors are presented in Table 1.

Table 1: Biophilic design framework

Kellert (2008) biophilic design patterns					
Enviromental Features	Natural shapes and forms	Natural patterns and processes	Light and space	Place -based releationships	Evolved human-nature relationships
Color Water Air Sunlight Plants Animals Natural materials Views and vistas Façade greening Geology and landscape Habitats and ecosystems Fire	Botanical motifs Tree and columnar supports Animal (mainly vertebrate) motifs Shelles and tubular forms Arches, vaults, domes Shapes resisting straight lines and right angles Simulation of natural features Biomorphy Geomorphology Biomimicry	Sensory variability Information richness Age, change, and the patina of time Growth and efflorescence Central focal point Patterned wholes Bounded spaces Transitional spaces Linked series and chains Integration of parts to wholes Complementary contrasts Dynamic blanace and tension Fractals Hierarchically organized ratios and scales	Natural light Filtered and diffused light Light and shadow Reflected light Lightpools Warm light Light as shape and form Spaciousness Spatial variability Space as shape and form Spatial harmony Inside-outside spaces	Geographic connection to place Historic conection to place Ecological connection to place Cultural connection to place Indigenous materials Landscape orientatio Landscape features that deifne building form Landscape ecology Integraton of culture and ecology Spirit of place Avoiding placelessness	Prospect and refuge Order and complexity Curiosity and enticement Change and metamorphosis Security and protection Mastery and control Affection and attachment Attraction and beauty Exploration and discovery Information and cognition Fear and awe Reverence and spirituality
Kellert (2018) biophilic design patterns					
Direct Experience of Nature		Indirect Experience of Nature		Experience of Space and Place	
Light Air Water Plants Animals Landscapes Weather Views Fire		Images Materials Texture Color Shapes and forms Information richness Change, age and the patina of time Natural geometries Simulated natural light and air Biomimicry		Prospect and refuge Organized complexity Mobility Transitional spaces Place Integrating parts to create wholes	
Browning and Ryan (2020) biophilic design patterns					
Nature in the Space		Natural Analogues		Nature of the Space	
Visual Connection with Nature Non-Visual Connection with Nature Non-Rhythmic Sensory Stimuli Thermal & airflow variability Presence of water Dynamic & diffuse light Connection with natural systems		Biomorphic forms & patterns Material connection with nature Complexity & order		Prospect Refuge Mystery Risk / peril Awe	

These three proposed frameworks aim to help designers understand and apply the concept of biophilic design (Zhong et al., 2022). These classifications guide the application of the criteria of the biophilic design approach to the built environment.

Wolfs (Wolfs, 2015) stated that architects and designers have been inspired by nature since ancient times. Similarly, Salingaros (Salingaros, 2019) stated that the human-nature relationship has maintained its importance since traditional cultures, but this relationship could not be carried out with the rise of industrialization. Researchers analyzing biophilic design have noticed that both professional and vernacular architecture of past

eras was qualitatively biophilic, even though the term itself was unknown ("14 Patterns of Biophilic Design: Improving Health and Well-Being in the Built Environment", 2014; Salingaros, 2019; Wolfs, 2015). In this context, this study aims to help architects read the importance of biophilic design, design criteria and the contribution of biophilic design to sustainability through vernacular architecture.

EVALUATION OF BIOPHILIC DESIGN IN THE CONTEXT OF SUSTAINABILITY DEVELOPMENT GOALS

In 2015, the United Nations (UN) published the 2030 Agenda for Sustainable Development. This agenda presents a 17-goal blueprint for the peace and prosperity of humanity and the planet in a global partnership. These goals aimed to complement the Millennium Development Goals adopted in 2000 to "reduce extreme poverty" (by 2015). The 2030 Agenda promotes economic development in which problems related to climate change, land and water life, education, health, and inequalities are considered and resolved simultaneously, as well as ending poverty and other deprivations. (UN, n.d.)

The SDG is an ambitious and challenging plan with comprehensive content, the core promise of "Leave No One Behind" (UNSDG, n.d.). It is vital that all actors who have a role in its realization contribute to these goals with small-medium-large projects and actions. In this context, it is undeniable that architects who design built environments are the main actors. On the other hand, architectural education plays a fundamental role in ensuring sustainable development by educating future professionals with a "sustainability" sensitivity. However, it has been observed that there is a significant gap in the evaluation of architectural education worldwide in this direction. (Martínez-Ventura *et al.,* 2021) From this point of view, integrating the outcomes of the biophilic architecture education program with the UN Sustainable Development Goals constitutes the motivation of this study.

In this context, first, SDG targets in the Figure 1 were examined in the context of Kellert's biophilic design criteria. It has been determined that all SDGs directly or indirectly relate to biophilic design criteria to a certain extent. In addition, as can be read from the Figure 1, some substances are more directly related to the biophilic design and have a strong link. Asterisks (*) indicate the ratio of interest between SDG and biophilic design. Relevance is more related to the strength of the link rather than meeting the biophilic criteria. These relationships were established as a result of literature reviews. At this point, special attention should be paid to Article 3 of SDG. The biophilic design, with which SDG 3 is the strongest and most directly related, contributes positively to the users' physical and psychological health and well-being with the healing spaces it creates. Many studies have supported the healing and motivating power of biophilic design (**16**; Gray & Birrell, 2014).

METHOD

A three-day training program (workshop) has been designed for architecture graduate students. On the first day of this program, the relationship between biophilic education and biophilic design criteria with SDG was discussed. On the second day of the workshop, the biophilic approach was traced in the vernacular buildings in and around Ankara Castle. On the third day, the biophilic criteria determined in selected buildings were evaluated and each student shared their experiences. In determining the vernacular buildings to be examined within the scope of biophilic design, the structures that make up the historical urban texture in and around the Ankara Castle were analyzed and an example from residential, commercial, and religious building groups was determined.

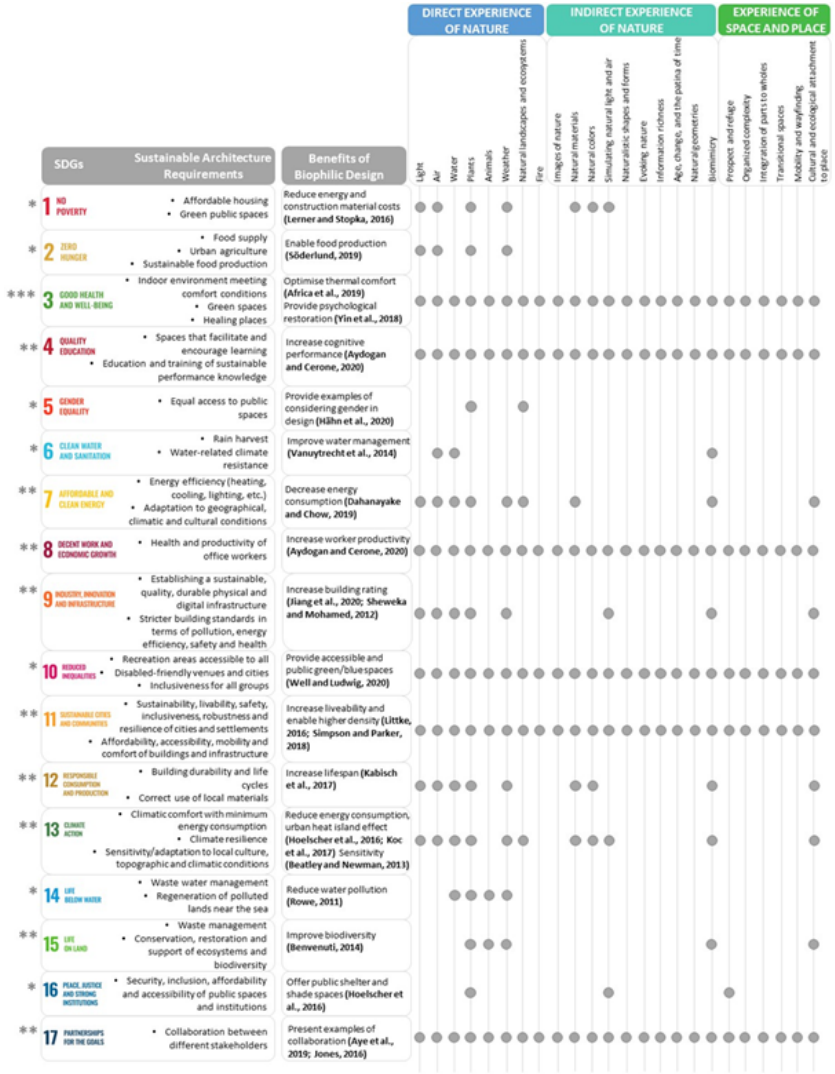

Figure 1: SDG and biophilic design criteria relationship (Developed using the study of Zhong, Schröder, & Bekkering (Zhong et al., 2022)) (* weakly connected; ** moderately connected; *** strongly connected) (Source: authors)

Then, it was decided which of the biophilic design classifications in the literature would evaluate the selected buildings. The scope of the field study is limited to the vernacular buildings, which are thought to provide better opportunity to examine the local architecture in terms of biophilic qualities due to their characteristic and typological features. All the structures examined are still in active use today. Within the scope of the study, an on-site investigation was carried out and the interior and exterior spaces of selected buildings were photographed. In addition, photographs of the buildings from the main sources of the area were also examined. Biophilic elements were experienced and evaluated by examining the materials, land layout, facade and interior setup, details, and decorations of each building.

In order to evaluate vernacular buildings within the scope of biophilic design criteria, firstly, the classifications made by Kellert (S. Kellert, 2016; S. R. Kellert, 2008), Browning and Ryan (W. D. Browning & Ryan, 2020) were examined. Among these classifications, it was seen that Kellert and Calabrese (S. R. Kellert & Calabrese, 2015) had the most comprehensive study in determining the nature-related design elements applied in historical buildings. Evaluation of the selected buildings is limited to the classification in question. The

buildings were examined and evaluated on site with the students participating in the workshop.

The selected buildings were examined with the criteria of Kellert and Calabrese (S. R. Kellert & Calabrese, 2015) under the categories of "Direct Experience of Nature, Indirect Experience of Nature, Experience of Place and Space", and applications that set an example for each criterion were evaluated by supporting with visuals (Table 2). In this context, nature-related and healing elements in Ankara's vernacular buildings have been put forward in a holistic way. By means of these charts, the elements that are found in different frequencies, related to nature and healing have been revealed. Within the scope of the field study, the blank version of Table 2 was distributed to the students. They were asked to analyse and photograph the buildings. In this way, the students interpreted the biophilic design criteria and analysed the use in the traditional buildings.

Table 2: Models, processes and features of biophilic design (Kellert and Calabrese, 2015)

	Biophilic Design Parameters	Building Images	Biophilic Effect	Related SDG
Direct Experience of Nature	Light			
	Air			
	Water			
	Plants			
	Animals			
	Landscapes			
	Weather			
	Fire			
Indirect Experience of Nature	Images			
	Materials			
	Texture			
	Color			
	Shapes and forms			
	Information richness			
	Change, age and the patina of time			
	Natural geometries			
	Simulated natural light and air			
	Biomimicry			
Experience of Space and Place	Prospect and refuge			
	Organized complexity			
	Mobility			
	Transitional spaces			
	Place			
	Integrating parts to create wholes			

On the third day of the workshop, the data in Table 1 filled by the students and the observations of the students were evaluated. It is aimed to reinforce the subject with the evaluations, discussions and brainstorming.

IMPLEMENTATION PROCESS

The planned workshop (Figure 2) was announced on social media accounts with a poster to ensure the participation of students. The training, which is designed as 3 days, is limited to the participation of only graduate students. The training was carried out with three instructors and 9 students.

A schedule (Table 3) was developed by the authors in order to reveal the conceptual and technical background of the biophilic design approach and to help students gain a faster and more permanent perspective on the goals of biophilic design.

Table 3: Outline of the schedule implemented during the workshop.

Day	Hour	Topic
1	10:00-11:00	**Introduction** Lessons on the concept of biophilia Investigation of biophilic design parameters in traditional buildings
1	11:00-12:00	**Lecture 1: The emergence and definition of the concept of biophilic design** **Motivational Questions** How do you see the human-nature relationship today? What is the biophilic approach and how can it give us ideas for solving problems? What are the key components of the biophilic approach? How can designers benefit from nature? How do architects apply the biophilic approach to their structures to create solutions to sustainability problems? First, a pre-test was applied to the students. Then, it is explained how the concept of biophilic design emerged from the theories related to environmental psychology and how it was defined in the literature. In this course, it is aimed to explore the biophilic design approach, which provides a theoretical framework for conceptualizing nature in architectural design.
1	12:00-13:00	**Lunch Break**
1	13:00-14:30	**Lecture 2: Key design strategies in biophilic design** What is biophilic design and how can it give us ideas to increase the human-nature relationship? Biophilic design examples were shown to the students and asked, "How would you describe this example?" the question was asked. Together with students the video "Biophilic Design" (**Video**) was watched. The biophilic design framework is described. Biophilic design strategies are discussed along with the advantages and disadvantages of integrating natural elements into buildings. In this context, firstly, current classifications developed on biophilic design approaches and biophilic design studies prepared by researchers from different disciplines are presented. Then, within the existing studies, the classification that is suitable for examining the historical structures in more detail has been determined.
1	14:30-15:00	**Coffee Break**
1	15:00-16:30	**Lecture 3: Contribution of biophilic design to the goals of sustainable architecture** **Motivational Questions** What are the sustainability problems we have to face globally? What are the Sustainable Development Goals (SDGs) developed by the United Nations? How does integrating biophilic criteria into architecture contribute to ensuring "health and well-being (SDG 3)"? The important elements of biophilic design in contemporary architecture and the potential of biophilic design to address the challenges of sustainable architecture are discussed. The relationship between the concept of biophilia and sustainability goals in architecture is discussed.
2	10:00-16:30	**Lecture 4: Researching biophilic design criteria in traditional architecture** **Motivational Questions** What biophilic criteria did you explored in the building you examined? How was the biophilic criterion handled in the building you examined? Has this affected the health and well-being of users? The human-nature relationship and healing qualities in traditional buildings that have the potential to contribute to modern architectural practices have been identified. The existence of biophilic design criteria was investigated on the Pilavoğlu Han (Commercial), Konak (Barış Sokak) (Residential) and Aslanhane Mosque (Religious) building located in and around the Ankara Castle. The existence of biophilic design parameters determined by Kellert and Calabrese (2015) was investigated in traditional buildings to benefit from the healing aspects of architecture in the examined buildings.
3	10:00-16:30	**Lecture 5: Evaluation** On the third day of the workshop, the field trip experiences were conveyed. Biophilic teachings learned from vernacular buildings were discussed. Students were brainstormed about what they could do in their professional lives for biophilic design research.

Figure 2: Poster of the workshop

ASSESSMENT OF CASE STUDY BUILDINGS

In this section, the historical and architectural features of the vernacular buildings, which are considered within the scope of the biophilic design approach, are mentioned. Pilavoğlu Han, the first building evaluated with students, became one of the important points of Ankara trade during its period. The building, which is estimated to have been built in the 16th -17th centuries was served as a prison, in the last years of the Ottoman Empire and the first years of the Republic; just like many other *hans* (khans) around, it. Afterwards, it has become a place where orphans or homeless people live for a long time (Şahin, 2017). As time passed, the building, which had many different functions, started to be used for commercial purposes again towards the end of the 20th century. The ground floors contain leather shops and warehouses, while the upstairs rooms are rented for accommodation like hostels (“Ankara Hanlar”, n.d.).

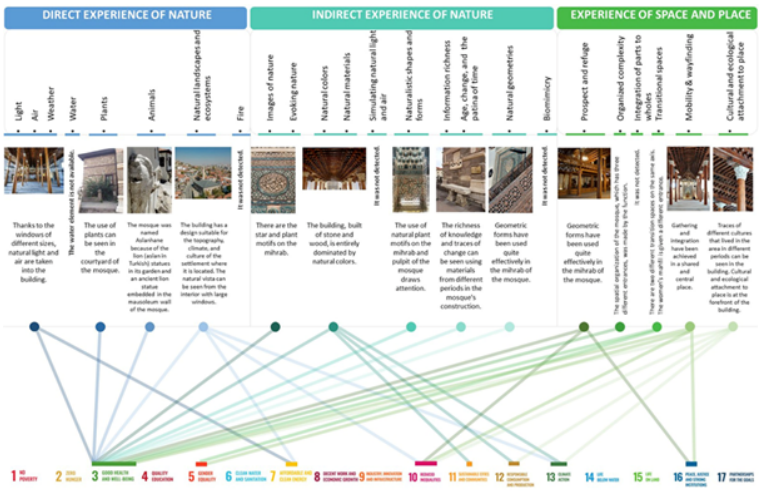

Figure 3: Biophilic traces detected in Aslanhane Mosque

Today, it serves as a multifunctional building with cafes, gift shops, handicraft workshops and offices. On the third day of the training, traces of the biophilic design criteria identified by Kellert and Calabrese (S. R. Kellert

& Calabrese, 2015) were investigated in this building with the students. Furthermore, these criteria were related to the SDG targets (Figure 3).

The second building discussed was the Ahi Şerafeddin Mosque, which was built in the 13th century and is known as Aslanhane Mosque among the people. There are spolia materials from the Roman and Byzantine periods at many points of the building, especially on the minaret base. The mosque has three entrances, east, west, and north. The interior of the mosque reflects a 13th century example of wooden Seljuk mosques ("Aslanhane (Ahi Şerafettin) Camii", n.d.). It is also on the UNESCO heritage tentative list as a successful example of wooden columned and wooden roofed mosques, which constitute a rare building group in Anatolian Turkish Architecture (Figure 4) ("UNESCO Tentative List Entry", n.d.). On the third day of the training, the traces of the biophilic design criteria identified by Kellert and Calabrese (S. R. Kellert & Calabrese, 2015) were investigated in this building with the students, and these criteria were associated with the SDG targets (Figure 4).

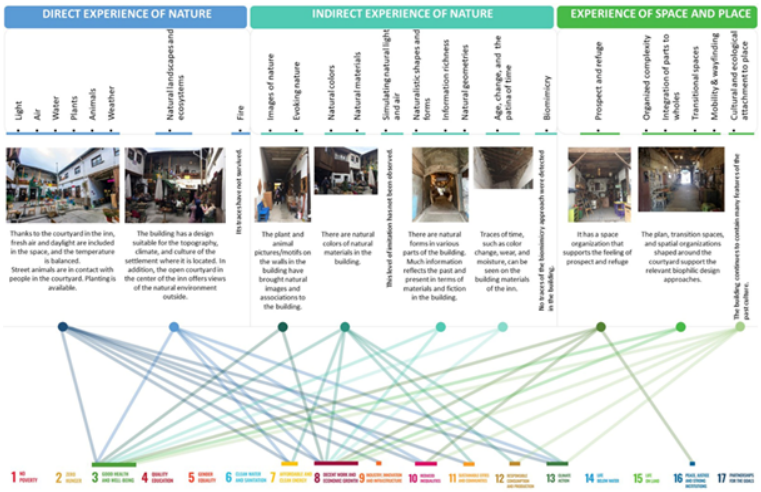

Figure 4: Biophilic traces detected in Pilavoğlu Han

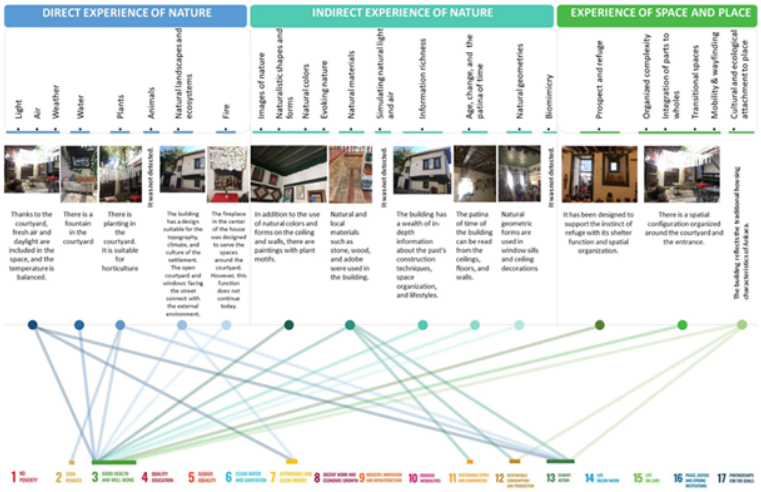

Figure 5: Biophilic traces detected in in the residential building

As the last building, a mansion, which is located in the Ankara Castle continues to function as a cafe today and has the characteristics of a vernacular Ankara residence, has been examined. The biophilic design criteria identified by the students in this building and their relationship with the SDG targets can be seen in Figure 5.

From the analysis so far, it is clear that SDG 3 is the common and dominant goal provided in all buildings. Secondly, Pilavoğlu Han mainly meets SDG 8 due to its commercial function. Because the biophilic design approach has proven to affect working conditions positively. Aslanhane Mosque relatively supports SDG 10 and 16 due to its inclusiveness and publicity. On the other hand, the residential building meets SDG 13 as the next weighted target with its design based on location, culture, and ecology.

DESCRIPTIVE ANALYSIS AND DISCUSSION OF CASE STUDY BUILDINGS

The knowledge gained by the participants during the training was measured using pretest and posttest assessments, which are commonly used in many studies (Dimitrov & Rumrill, 2003; Knapp, 2016). In this research model, the participants are measured in two separate situations to determine whether there is a difference between the first and second measurements taken by the researcher. The first measurement is the pretest, which serves as the baseline measurement, and the second measurement taken at the end of the process is called the posttest (Bonate, 2000). From this point of view, a pre-test was administered to the students on the first day of the training and a post-test was administered at the end of the 3-day period.

In this context, in the pre-test post-test application, which is another evaluation result, the average of the students' pre-test scores (16) and the average of their post-test scores (80) were calculated. The t-Test was used to determine whether the difference between the two means was significant. It was seen that the average scores of the students were different from each other after the t-Test, which was made to compare the first test and the last test.

0.05 was used as the significance level and a significant dependency or relationship was accepted when $p < 0.05$. (Çepni, 2010). According to the results, this difference in the mean scores of the experimental and control groups was found to be statistically significant ($t(9) = -24.000$; $p < 0.05$), (Table 4).

Table 4: t-Test results of students' pre-test and post-test "open-ended evaluation test consisting of 10 questions" scores

	N	X	S	Sd	t	p
Pre-test	9	16.00	6.99206	9	-24.000	.000
Post-test	9	80.00	9.42809			

Before the workshop, it was determined with the pre-test that the students did not have knowledge about the biophilic approach, the relationship of the biophilic approach with the SDGs, and the biophilic criteria in vernacular buildings. With the post-test, it was determined that the students who completed the training given within the scope of the workshop had knowledge about the biophilic approach, the relationship of the biophilic approach with the SDGs, and the existence of biophilic design in traditional buildings. The difference between the pre-test and the post-test in favor of the post-test score indicates that the workshop outputs turned into gains successfully.

DISCUSSION AND CONCLUSION

The biophilic design approach holds significant potential for architectural design and education. Most importantly, architecture students and architects have seen in their professional lives that the biophilic design approach makes significant contributions to how buildings become livable.

Within the scope of the field study of the research, the traditional buildings in and around the Ankara Castle

were focused. Three of the vernacular buildings that have survived to the present day were selected for the field study and these structures were evaluated by examining the determined biophilic parameters. As a result of the examinations, it has been seen that many biophilic design elements including direct and indirect use of nature have been applied in these structures. It is clear that innovative perspectives on existing biophilic design approaches/classifications can be developed with future interdisciplinary and large-scale research on these structures.

As a result of the investigation of the biophilic design features determined by Kellert and Calabrese (S. R. Kellert & Calabrese, 2015) in the vernacular buildings of Ankara, it is important to show the benefits of buildings that are directly and/or indirectly connected with nature, especially for human health, efficiency and life well-being, in terms of contributing to today's architecture. This contribution is also confirmed by the fact that the biophilic design approach works in harmony with the sustainable architectural requirements and Agenda 2030 goals in the study.

In this research, it has been observed that more time is needed to discuss the existence of each criterion of the biophilic design approach in traditional buildings in detail. It will provide architectural students with an acquisition that is worth discussing the subject of biophilic design in the context of the studio and spending a lot of time on it. However, quantitative and qualitative research should continue to be conducted to assess the biophilic performance of the historic buildings studied.

REFERENCES

14 patterns of biophilic design: Improving health and well-being in the built environment. (2014). https://www.terrapinbrightgreen.com/wp-content/uploads/2014/09/14-Patterns-of-Biophilic-Design-Terrapin-2014p.pdf

Almusaed, A. (2010). *Biophilic and bioclimatic architecture: Analytical therapy for the next generation of passive sustainable architecture*. Springer Science & Business Media. https://doi.org/10.1007/978-1-84996-534-7

Ankara hanlar. (n.d.). https://www.academia.edu/19595888/Ankara_Hanlar

Aslanhane (ahi şerafettin) camii. (n.d.). https://www.kulturportali.gov.tr/turkiye/ankara/gezilecekyer/aslanhane--ahi-serafettin--camii

Bangwal, D., Tiwari, P., & Chamola, P. (2017). Workplace design features, job satisfaction, and organization commitment. *SAGE Open*, *7*(3), 2158244017716708. https://doi.org/10.1177/2158244017716708

Bettaieb, D. M., & Alsabban, R. F. (2022). Users' role in applying biophilic attributes to the interiors of residential spaces [Ahead-of-print]. *Open House International*. https://doi.org/10.1108/OHI-02-2022-0040

Bonate, P. L. (2000). *Analysis of pretest-posttest designs* [p. 1]. CRC Press.

Browning, W., Ryan, C., & Clancy, J. (2014). 14 patterns of biophilic design: Improving health and well-being in the built environment [Accessed on 20 September 2022]. https://www.terrapinbrightgreen.com/wp-content/uploads/2014/09/14-Patterns-of-Biophilic-Design-Terrapin-2014p.pdf

Browning, W. D., & Ryan, C. O. (2020). What is biophilia and what does it mean for buildings and spaces. In *Nature inside: A biophilic design guide* (pp. 1–5). RIBA Publishing. https://doi.org/10.4324/9781003033011

Cacique, M., & Ou, S. J. (2022). Biophilic design as a strategy for accomplishing the idea of healthy, sustainable, and resilient environments. *Sustainability*, *14*(9), 5605. https://doi.org/10.3390/su14095605

Cavanagh, B., Haracz, K., Lawry, M., & James, C. (2020). Receptive arts engagement for health: A holistic and trans-disciplinary approach to creating a multisensory environment. *SAGE Open*, *10*(4), 2158244020978420. https://doi.org/10.1177/2158244020978420

Corcoran, R., Mansfield, R., Giokas, T., Hawkins, A., Bamford, L., & Marshall, G. (2017). Places change minds: Exploring the psychology of urbanicity using a brief contemplation method. *SAGE Open*, *7*(2), 2158244017707004. https://doi.org/10.1177/2158244017707004

Cramer, J. S., & Browning, W. D. (2008). Transforming building practices through biophilic design. In *Biophilic design* (pp. 335–346). Wiley.

Dimitrov, D. M., & Rumrill, J., P. D. (2003). Pretest-posttest designs and measurement of change. *Work*, *20*(2), 159–165.

Fromm, E. (1974). Love of death and love of life. In *Ba drabeck et al. (eds.)* (pp. 193–198). Houghton Mifflin.

Gillis, K., & Gatersleben, B. (2015). A review of psychological literature on the health and wellbeing benefits of biophilic design. *Buildings*, *5*(3), 948–963. https://doi.org/10.3390/buildings5030948

Gray, T., & Birrell, C. (2014). Are biophilic-designed site office buildings linked to health benefits and high performing occupants? *International Journal of Environmental Research and Public Health*, *11*(12), 12204–12222.

Grazuleviciute-Vileniske, I., Daugelaite, A., & Viliunas, G. (2022). Classification of biophilic buildings as sustainable environments. *Buildings*, *12*(10), 1542. https://doi.org/10.3390/buildings12101542

Heerwagen, J., & Hase, B. (2001). Building biophilia: Connecting people to nature in building design. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=a48a14f6a2b0a11bd720a26b8b2157e6ba10a0da

Hidalgo, A. K. (2014). Biophilic design, restorative environments and well-being [Bogotá, October 6–10, 2014]. In J. Salamanca, P. Desmet, A. Burbano, G. Ludden, & J. Maya (Eds.), *Proceedings of the colors of care: The 9th international conference on design & emotion* (pp. 535–544). Ediciones Uniandes.

Jiang, B., Song, Y., Li, H. X., Lau, S. S. Y., & Lei, Q. (2020). Incorporating biophilic criteria into green building rating tools: Case study of green mark and leed. *Environmental Impact Assessment Review*, *82*, 106380. https://doi.org/10.1016/j.eiar.2020.106380

Joye, Y. (2007). Architectural lessons from environmental psychology: The case of biophilic architecture. *Review of General Psychology*, *11*(4), 305–328. https://doi.org/10.1037/1089-2680.11.4.305

Joye, Y. (2011). Biophilic design aesthetics in art and design education. *Journal of Aesthetic Education*, *45*(2), 17–35. https://doi.org/10.5406/jaesteduc.45.2.0017

Kayıhan, K. S. (2018). Examination of biophilia phenomenon in the context of sustainable architecture. In S. Fırat, J. Kinuthia, & A. Abu-Tair (Eds.), *Proceedings of 3rd international sustainable buildings symposium (isbs 2017)* (Vol. 6). Springer. https://doi.org/10.1007/978-3-319-63709-9_7

Kellert, S. (2016). Biophilia and biomimicry: Evolutionary adaptation of human versus nonhuman nature. *Intelligent Buildings International*, *8*(2), 51–56. https://doi.org/10.1080/17508975.2014.902802

Kellert, S. R. (2008). Dimensions, elements, and attributes of biophilic design. In *Biophilic design: The theory, science, and practice of bringing buildings to life* (pp. 3–19).

Kellert, S. R. (2012). *Building for life: Designing and understanding the human-nature connection*. Island Press.

Kellert, S. R., & Calabrese, F. E. (2015). The practice of biophilic design. https://www.biophilic-design.com/

Kellert, S. R., Heerwagen, J., & Mador, M. (2011). *Biophilic design: The theory, science and practice of bringing buildings to life*. John Wiley & Sons.

Kellert, S. R., & Wilson, E. O. (1995). *The biophilia hypothesis*. https://philpapers.org/rec/KELTBH

Knapp, T. R. (2016). Why is the one-group pretest–posttest design still used? *Clinical Nursing Research*, *25*(5), 467–472.

Lee, H. C., & Park, S. J. (2018). Assessment of importance and characteristics of biophilic design patterns in a children's library. *Sustainability*, *10*(4), 987. https://doi.org/10.3390/su10040987

McGee, B., Jin, X., Park, N.-K., Ball, S., & Carr, A. (2022). Designers' perceptions of biophilia and testing of the biophilic interior design matrix in china. *Archnet-IJAR*, *16*(3), 517–535. https://doi.org/10.1108/ARCH-10-2021-0279

McMahan, E. A., & Estes, D. (2015). The effect of contact with natural environments on positive and negative affect: A meta-analysis. *The Journal of Positive Psychology*, *10*(6), 507–519. https://doi.org/10.1080/17439760.2014.994224

Ode, Å., Tveit, M. S., & Fry, G. (2008). Capturing landscape visual character using indicators: Touching base with landscape aesthetic theory. *Landscape Research*, *33*(1), 89–117. https://doi.org/10.1080/01426390701773854

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. *ArchNet-IJAR: International Journal of Architectural Research*, *8*(2), 62. https://doi.org/10.26687/ARCHNET-IJAR.V8I2.436

Şahin. (2017). Pusu'la saklı kalmış tarih pilavoğlu Han. https://www.lavarla.com/sakli-kalmis-tarih-pilavoglu-han/

Salingaros, N. A. (2019). The biophilic healing index predicts effects of the built environment on our wellbeing. https://patterns.architexturez.net/node/218834

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, *224*, 420.

Unesco tentative list entry. (n.d.). https://whc.unesco.org/en/tentativelists/6346/

Wilson, A. (2008). Biophilia in practice: Buildings that connect people with nature. https://www.buildinggreen.com/feature/biophilia-practice-buildings-connect-people-nature

Wilson, E. O. (1984). *The human bond with other species*. Harvard.

Wilson, E. O. (2017). Biophilia and the conservation ethic. In *Evolutionary perspectives on environmental problems* (pp. 250–258). Routledge.

Wolfs, E. L. (2015). Biophilic design and bio-collaboration: Applications and implications in the field of industrial design. *Archives of Design Research*, *28*(1), 71–89. https://doi.org/10.15187/adr.2015.02.113.1.71

Zhong, W., Schröder, T., & Bekkering, J. (2021). Biophilic design in architecture and its contributions to health, well-being, and sustainability: A critical review. *Frontiers of Architectural Research*, *11*(1), 114–141. https://doi.org/10.1016/j.foar.2021.07.006

Zhong, W., Schröder, T., & Bekkering, J. (2022). Biophilic design in architecture and its contributions to health, well-being, and sustainability: A critical review. *Frontiers of Architectural Research*, *11*(1), 114–141.

AUTOBIOGRAPHICAL SKETCHES

Assoc. Prof., Dr. Güneş Mutlu Avinç, Department of Architecture, Ankara Yıldırım Beyazıt University, Ankara, Turkey, gunesavinc@gmail.com.

Research Assistant Ayşenur Coşkun, Department of Architecture, Gazi University, Ankara, Turkey, Department of Architecture, Bozok University, Yozgat, Turkey.

Prof. Dr. Semra Arslan Selçuk, Department of Architecture, Gazi University, Ankara, Turkey.

Manuscript revisions completed 11 January 2026.