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Study People and Nature Connection in Built Environment to verify Aqa-Bozorg Mosque as Biophilic Design

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Abstract

In this era that new technology has affected human life, many research scientists believe that Biophilic design can improve human well-being. Biophilic architecture can provide healthy spaces connected with nature and reduce stress and enhance longevity. Different researchers have identified and categorized different patterns in the Biophilic design. These patterns have a wide range of applications for both interior and exterior environments with physiological, cognitive and psychological benefits. This paper focuses on the 14 Biophilic patterns connected with nature that have been shown to impact human health.

The objective of this qualitative study is to determine if one of the traditional mosque-schools in Iran has incorporated the 14 patterns of Biophilic Design defined by Ryan (2014). We aim to meet this objective by researching people's reactions to the fourteen Biophilic patterns (Ryan, 2014) using questionnaires and assessing people's connection to nature when present at the mosque. Aqa-Bozorg mosque-school in Kashan city which is one of the oldest cities in Iran was selected as the case study. Through questionnaires we asked whether visitors felt connected to or removed from nature while physically present in this mosque-school. Data results indicated that most of the visitors felt connected to nature while they were present in the building. We concluded that Aqa-Bozorg Mosque-school which was built long before the conceptualization of "Biophilic design" does incorporate these patterns.

Key words: *Biophilic Design; Pattern; Nature; Mosque-School; Iran.*

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1.Introduction

The human connection to nature as a concept is related to and supported by the theory of Biophilia which states that humans have an innate tendency to focus on life and lifelike processes (Wilson, 1984). The goal of Biophilic design is to translate an understanding of Biophilia into the design of the built environment, resulting in a beneficial contact between people and nature within modern buildings and landscapes (Kellert et al., 2009). The term "Biophilia" literally means "love of life or living systems." It was first used by Erich Fromm to describe a psychological orientation of being attracted to all that is alive and vital (Fromm, 1964). Biophilia is the deep-seated need of humans to connect with nature. It helps explain why crackling fires and crashing waves captivate us, why a view to nature can enhance our creativity, why shadows and heights instill fascination and fear, and why gardening and strolling through a park have restorative healing effects (Ryan, 2014). Biophilia in Context looks at the evolution of Biophilic Design in architecture and planning and presents a framework for relating it to the human biological science and nature (Browning, 2014).

Researchers such as Alexander et al. (1977), R. Kaplan et al. (1998) and Jacobson et al. (2002) have categorized Biophilic design according to a variety of different patterns. These patterns have a wide range of applications for both interior and exterior environments with physiological, cognitive and psychological benefits, all of which are related to each other

This study focuses on the 14 Biophilic design patterns connected with nature as described by Ryan (2014) that have been shown to have a positive impact on human health. This study is conducted on Aqa-Bozorg mosque-school in Kashan city which is an ancient building in a hot dry area of Iran. the

2. Research methodology

The goal of this paper is to determine if Biophilic design patterns (Ryan, 2014) exist in one of the traditional architectural sites in Iran. This study tries to determine if visitors felt connected to or removed from nature, specifically in relation to the various nature related aspects of the building, and if these aspects created an enjoyable moment for them. One hundred questionnaires were distributed to visitors of this mosque-school to determine which of the patterns of Biophilic Design were present in the building. Each visitor documented his or her experiential moment by filling out the questionnaire. The data were collected on December 2014 by the author.

The conceptual framework for Biophilic Design in this paper has been obtained from Ryan and her colleagues (2014). They have defined Biophilic buildings as buildings that encompass 14 patterns within three categories. The categories and the patterns are as follows:

- Nature in the Space,
- Natural Analogues,
- Nature of the Space.

2-1. Nature in the Space describes the presence and diversity of plant life, water bodies, animal species, and other elements from nature within the built environment. Seven patterns related to these interactions have been identified: [1] Visual connection with nature, [2] Non-visual connection with nature, [3] Non-rhythmic sensory stimuli, [4] Access to thermal and airflow variability, [5] Presence of water, [6] Dynamic and diffuse light, and [7] Connection with natural systems.

2-2. Natural Analogues are objects, materials, colors, shapes, patterns and algorithms that evoke nature. Broadly speaking, analogues can be characterized in architecture and design as representational artwork, ornamentation, biomorphic forms and natural materials. Three Natural Analogue patterns have been identified: [8] Biomorphic forms and patterns, [9] Material connection with nature and [10] Complexity and order.

2-3. Nature of the Space refers to different spatial configurations and associated psychological and physiological responses they engender. Four Nature of the Space patterns

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have been identified: [11] Prospect, [12] Refuge, [13] Mystery and [14] Risk/Peril(Ryan and others ,2014)

The main question that exists in this study is: What are the characteristics of Aqa-Bozorg mosque-school visitors' perceived experiences regarding feeling connected to; or removed from nature while they are in this mosque-school? Biophilic pattern was explained to the visitors of the Aqa-Bozorg mosque-school and we asked them to fill out a questionnaire. Data were collected by using a Likert scale questionnaire method. Specifically, fourteen questions that addressed the research objective were asked from the visitors. We also asked them to give an example for each of the Biophilic design patterns that they observed. The sampling method of the questionnaire was non-probability sampling. One hundred visitors in this study were selected via a quota sampling. Fifty female and fifty males were asked to fill out the questionnaire.

The questionnaires use a Likert-type scale. to obtain visitors' preferences and degree of connection or lack of connection with each statement. The 5.point scale ranged from: Strongly Connected, Somewhat Connected, No Idea, Somewhat Removed, to Strongly Removed. Likert-scale gauged the degree to which visitors felt either removed from or connected to the 14 nature related patterns inside Aqa-Bozorg mosque-school. For the last three patterns, the 5-point Likert scale asked if they "strongly agree', "somewhat agree", "no idea", "somewhat agree" or "strongly agree with the statement. In addition, for each question, we asked for descriptive examples in order to verify the accuracy of comprehension of the question. To analyze the data, descriptive-Analytic techniques was used.

3.Data

The consistency of natural themes in historic structures and places suggests that Biophilic design is not a new phenomenon; rather, as a field of applied science, it is the codification of history, human intuition and neural sciences showing that connections with nature are vital to maintaining a healthful and vibrant existence as an urban species (Browning, 2014 :6). As it was mentioned, the goal of this paper is to determine if Biophilic Design patterns existed in a traditional architecture in Iran. We concluded from the results that the 14 principles of Biophilic Design patterns laid out by Ryan and others (2014) have been incorporated in Aqa-Bozorg mosque-school in Kashan city.

Kashan is a city in the central region of Iran, in the province of Isfahan. The climate of the central region of Iran is relatively similar to desert climate. This region represents a hot and dry area with a high temperature difference between day and night. The construction of Aqa-Bozorg mosque-school dates back to 1875 AD. The building is built by earthen vernacular materials. It is a valuable complex of architectural and embellishment elements that have got appropriate combination of masses and organs. The main masses of this building includes entrance hall, two courtyards in two-story, Gonbad Khane (aka. Domed house), Shabestan (aka. Prayer hall), Badgir (aka. Wind catcher) and so on.

The entrance hall includes two floors, located in the front side of the building. In the first floor, after the main entrance door, there is a Vestibule with two corridors on two sides and there is a porch in front of it that has accesses from those corridors. In fact this is the roof of main hall in the underground floor that has been designed in porch shape. Those corridors connect the entrance to both above-courtyard and underground spaces. One minor and small courtyard is located along them that supply access to porch.

3.1. Visual connection with nature:

This pattern is characterized by Ryan (2014) as a view to living systems and natural processes (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from visual nature at this mosque-school, and we asked them to provide examples of visual connections to nature. Results

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Figure 1.Visual elements of nature (trees) in Aqa-Bozorg mosque-school.

showed 53 respondents "strongly connected", and 35 "somewhat connected" to nature; 5 said, "no idea", and 7 "somewhat removed" from nature. Participants mentioned trees, birds nestling on the trees, and fish in the pool as examples of visual connection with nature.
Figure one shows the sunken garden of Aqa-Bozorg mosque-school. It shows how this mosque is characterized by natural elements such as trees.

3.2. Non-visual connection with nature

This pattern is characterized by auditory, haptic, olfactory, or gustatory stimuli that engender a positive reference to nature (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from nature by non-visual connection at this mosque-school, and asked for examples of non-visual connections with nature. Results showed 43 respondents "strongly connected", and 27 "somewhat connected" to nature by non-visual connection; 6 said "no idea", 18 "somewhat removed" and 6 "strongly removed" from nature by non-visual connection. They mentioned airflow through the latticework, the smell of rosewater and the prayers whisper as examples of non-visual connection.
Figure 2 shows the northwestern site of the courtyard of Aqa-Bozorg mosque-school. Existence of many stone latticework windows (Jalis) on this side causes the air to flow and touch the body while letting its inhabitants hear the sound of wind.

3.3. Non-rhythmic sensory stimuli

This pattern is characterized as stochastic and ephemeral connections with nature that may be (analyzed statistically but may not be predicted precisely. In the questionnaire we asked: To what degree do visitors feel connected to, or removed from nature by non-rhythmic sensory stimuli at this mosque-school, and asked for examples of non-rhythmic sensory stimuli. Results showed 34 respondents "strongly connected", and 20 "somewhat connected" to nature by non-rhythmic sensory stimuli; 30 said "no idea", 12 "somewhat removed" and 4 "strongly removed" from nature by non-rhythmic sensory stimuli. Respondents mentioned waves on the surface of pool's water and also movement of tree leaves as examples of non-rhythmic sensory stimuli. Figure 3 shows the water and tree in the sunken court of Aqa-Bozorg mosque-school. Blowing wind makes waves on the surface of the pool's water and also causes movement among the tree leaves.

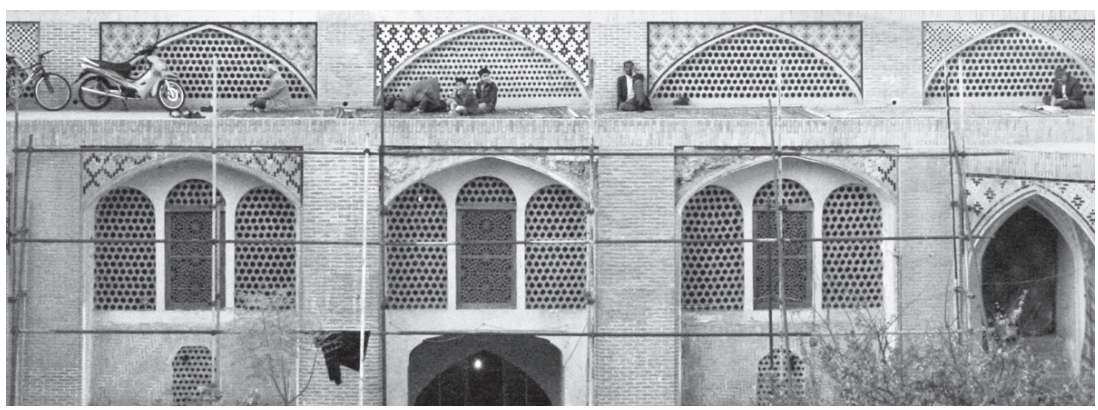


Figure 2. Stone latticework windows in Aqa-Bozorg mosque-school.

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Figure 3. Non-rhythmic sensory stimuli (motion of water and tree) in Aqa-Bozorg mosque-school

3.4. Access to thermal and airflow variability

This pattern has evolved from research measuring the effects of natural ventilation, its resulting thermal variability, and worker comfort, well-being and productivity (Heerwagen, 2006). In the questionnaire we have asked the users to answer, to what degree do visitors feel connected to, or removed from nature by access to thermal and airflow variability at this mosque-school. We also asked for respective examples. Results showed 62 respondents "strongly connected", and 27 "somewhat connected" to nature by access to thermal and airflow variability;4 responded "no idea", 6 "somewhat removed" and 1 "strongly removed" from nature by access to thermal and airflow variability. They mentioned airflow through the latticework and also the Bad-Gir (wind-catchers) as examples of access to thermal and airflow variability.

Figure 4 shows a Bad-Gir (wind-catcher) in Aqa-Bozorg mosque-school. It uses natural resources to ventilate the building through



Figure 4. Element of airflow variability (Bad-Gir) in Aqa-Bozorg mosque-school

creative architectural elements. Bad-Gir in this building has been used as a natural ventilator and supplies the inner spaces with natural weather. It helps people present in the building feel better. It is a creative natural technology in hot desert climate areas which guides the hot wind to the underground spaces beneath. In this space, with the aid of the hot wind, the Ghanat water both cools down, humidifies, and refreshes the air. At this mosque, the Bad-Gir was placed at Shabestan main hall.

3.5: Presence of water

This pattern enhances the experience of space when seeing, hearing or touching water (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from nature by the presence of water at this mosque-school, and we asked for examples they observed of the presence of water. Results show that 100 respondents "strongly connected" to nature by presence of water. They mentioned the pool as an example of the presence of water.



Figure 5. Element of water (pool) in Aqa-Bozorg mosque-school

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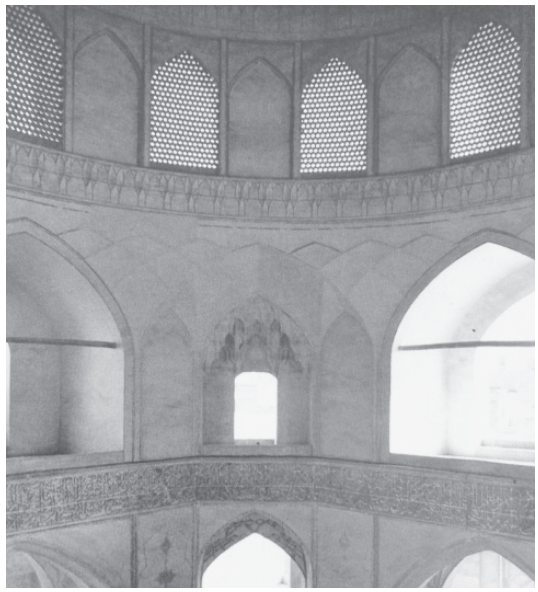


Figure 6. Elements of light and shadow in Aqa-Bozorg mosque-school

Figure 5 shows a pool at Aqa-Bozorg mosque-school. A pool at the mosque is mostly used for Vosou (aka. Ablution). Vozou is the Islamic procedure for washing parts of the body using water, typically in preparation for formal prayers.

3.6. Dynamic and diffuse light

This pattern is characterized by leverages of varying intensities of light and shadow that change over time to create conditions that occur in nature (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from nature by dynamic and diffuse light at this mosque-school, and asked visitors to provide an example of this pattern. Results show 55 respondents "strongly connected", and 12 "somewhat connected" to nature by dynamic and diffuse light; 24 said "no idea", 6 "somewhat removed" and 3 "strongly removed" from nature by dynamic and diffuse light. Participants mentioned stone latticework windows and gates as examples of dynamic and diffuse light.

Figure 6 shows stone latticework clerestory windows and gates in Aqa-Bozorg mosque-school. Stone latticework windows and gates cause movement of light and shadow.

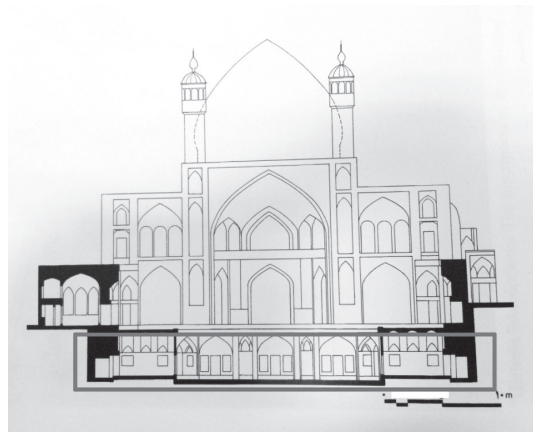


Figure 7. Connection with natural systems (Basement) in Aqa-Bozorg mosque

3.7: Connection with natural systems

This pattern is characterized by awareness of natural processes, especially seasonal and temporal changes characteristic of a healthy ecosystem (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from nature by connecting with natural systems at this mosque-school and asked for examples of this pattern. Results showed 80 respondents "strongly connected", and 2 "somewhat connected" to nature by connecting with natural systems; 10 said "no idea", 4 "somewhat removed" and 4 "strongly removed" from nature by connecting with natural systems. Participants mentioned Bad-Gir (wind-catcher) and basement as examples of connection with natural systems.

Figure 7 shows a section of Aqa-Bozorg mosque-school. As it was mentioned, Kashan city has a relatively desert climate. The weather is hot especially in summer. In summer time people go to the basement where the weather is cooler while they use upper floors within other seasons.

3.8: Biomorphic forms and patterns:

This pattern is characterized by symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from nature by biomorphic forms and patterns at this mosque-school, and asked for examples for this pattern. Results showed

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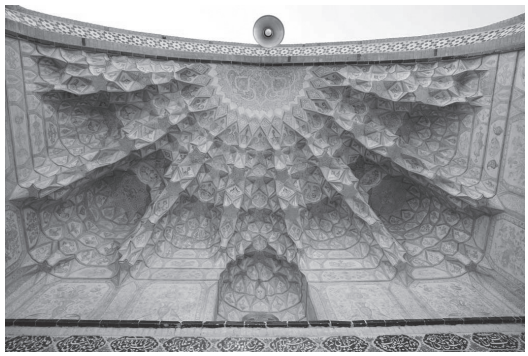


Figure 8. Biomorphic forms (Muqarnas) in Aqa-Bozorg mosque-school

75 respondents "strongly connected", and 3 "somewhat connected" to nature by biomorphic forms and patterns; 14 said "no idea", 4 "somewhat removed" and 4 "strongly removed" from nature by biomorphic forms and patterns. Participants mentioned Muqarnas and Karbandi which they believe is very similar to stalactites and honeycomb structures as the examples of biomorphic forms and patterns.

Figure 8 shows Muqarnas in Aqa-Bozorg mosque-school. Muqarnas is a type of corbel employed as a decorative device in traditional Islamic and Persian architecture. The related Muqarnas refers only to projecting elements that resemble stalactites, alveoli or honeycombs. Muqarnas display radial symmetry based upon N-gonal symmetry. The number of unique tiles possible is derived from N = N/2 - 1. Larger N values result in thinner Muqarnas tiles.

3.9: Material Connection with nature

This pattern is characterized by materials and elements from nature that, through minimal processing, reflect the local ecology or geology and create a distinct sense of place (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from materials connecting with nature at this mosque-school, and asked for examples for this pattern. Results showed 89 respondents "strongly connected", 8 "somewhat connected" to materials connecting with nature, and 3 said "no idea". They mentioned different kinds of stone, brick and adobe that



Figure 9. Elements and materials from nature used in Aqa-Bozorg mosque-school

are used for constructing the buildings as examples of materials connecting with nature.

Figure 9 shows elements and materials used at Aqa-Bozorg mosque-school which fulfill criteria for this pattern. In Iran, every building material in a desert town is composed of mud and its derivatives. Clay is the most important material that is used for constructing the Aqa-Bozorg mosque-school. It is a local natural material for making adobe and brick.

3.10: Complexity and order

This pattern is characterized by the presence of rich sensory information that is configured with a coherent spatial hierarchy, similar to the occurrence of design in nature (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel connected to, or removed from nature by complexity and order at this mosque-school, and asked for examples for what they observed. Results showed 44 respondents "strongly connected", 24 "somewhat connected" to nature due to complexity and order; 21

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Figure 10. Karbandi in Aqa-Bozorg mosque-school

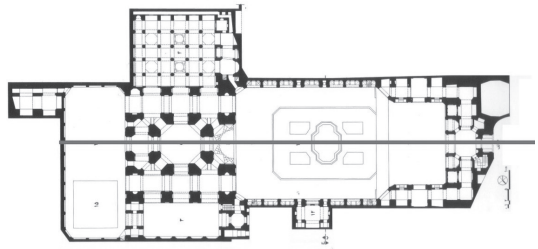


Figure 11. First floor plan of Aqa-Bozorg mosque-school

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said "no idea", 2 "somewhat removed" and 9 "strongly removed" from nature due to complexity and order. They mentioned Karbandi, Muqarnas, and Stone latticework windows as examples of complexity and order.

Figure 10 shows Karbandi in Aqa-Bozorg mosque-school. Karbandi is a structural interface element that provides acceptable load transition among a dome and pier via sophisticated geometric methodologies. Karbandi patterns create a harmonic relationship between form and function. Such harmony facilitates extended applications such as sound and thermal insulation, as well as lighting adjustment in interior spaces (Matin, 2011).

3.11: Prospect

This pattern refers to a spatial element characterized by the presence of an unimpeded view over a distance for surveillance and planning (Ryan, 2014). In the questionnaire we asked: To what degree do visitors feel the presence of an unimpeded view over a distance for surveillance in this mosque-school, and to give an example they observed. Results showed 17 respondents "strongly connected", and 29 "somewhat connected" to nature by prospect; 43 said "no idea", and 11 said "strongly removed" from nature by prospect. They mentioned the view from entrance to the main parts of the mosque and also symmetric design as examples of prospect. Figure 11 shows the first floor plan of Aqa-Bozorg mosque-school. This figure shows that the mosque porch in the entrance hall was built on top of other parts of the underground building, giving view to the site and open spaces and accordingly connecting outside and inside. It also shows the entire mosque can be easily seen from the entrance.

3.12: Refuge

This pattern is characterized by a place for withdrawal from environmental conditions or the main flow of activity, in which the individual is protected from behind and overhead (Ryan, 2014). In the questionnaire we have asked to what degree they agree that the mosque-school includes spaces in which visitors feel removed from the main flow of activity while they feel protected, and to give an example for such places. Results showed 63 respondents strongly agree, and 13 "somewhat agree" that there are such places within the mosque; 7 said "no idea", 12 "somewhat disagree" and 5 "strongly disagree". They mentioned the yard, Shabestan (aka. Prayer Hall) and Gonbad-Khane (aka. Domed-room) as examples of refuge pattern. Figure 12 shows Aqa-Bozorg mosque-school yard, where people are sitting in difference corners of the mosque yard to keep their tranquility while they are doing what they do.

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Figure 12. Aqa-Bozorg mosque-school yard

3.13: Mystery

This pattern refers to a spatial element characterized by the promise of more information manifested by the presence of partially obscured views or other sensory stimuli that fascinate and entice the individual to travel deeper into the environment (Herzog & Bryce, 2007). In the questionnaire we asked: to what degree they agree that the mosque-school includes a spatial element that fascinates and entices them to travel deeper into the environment due to the promise of more information manifested by the presence of partially obscured views or other sensory stimuli, and asked them for examples they observed of this pattern. Results showed 33 respondents "strongly agree", 31 "somewhat agree", 27 "no idea", 6 "somewhat disagree" and 3 "strongly disagree". They mentioned Ravaq (aka. Arcade) and Gonbad-Khane (aka. Domed-room) as examples of the mystery pattern.

Figure 13 shows Aqa-Bozorg mosque-school Ravaq (aka. arcade). The play of light and shadow being provided by the mysterious architecture of the arcades and their respective skylights creates the spatial pattern of mystery, which motivates visitors to explore the building further.

3.14: Risk/Peril

This pattern refers to an identifiable threat coupled with a reliable safeguard (Ryan, 2014). In the questionnaire we asked: to what degree



Figure 13. Aqa-Bozorg mosque-school Ravaq (aka. arcade)

they agree that the mosque-school includes spaces in which they feel the existence of an identifiable threat coupled with a reliable safeguard and to give an example for that. Results showed 29 respondents "strongly agree", 19 "somewhat agree", 36 "no idea", 4 "somewhat disagree" and 12 "strongly disagree". They mentioned the mosque-school's different stories and levels without hand rails and the Gonbad-Khane (aka. Domed-room) on the second level without hand rails as examples of Risk/Peril pattern.

Figure 14 shows Aqa-Bozorg mosque-school façade. As seen in the photo, this building has three stories, and the front façade does not have a wall or a hand rail. Although on first glance it can seem risky to pass through these different levels of the building, the arrangement of different architectural elements let people feel safe when they walked through.

4.Results

In this paper a case study in Iran was used to analyze the presence of Biophilic patterns in a traditional architectural site. Table 1 shows results of completed questionnaires. To get the

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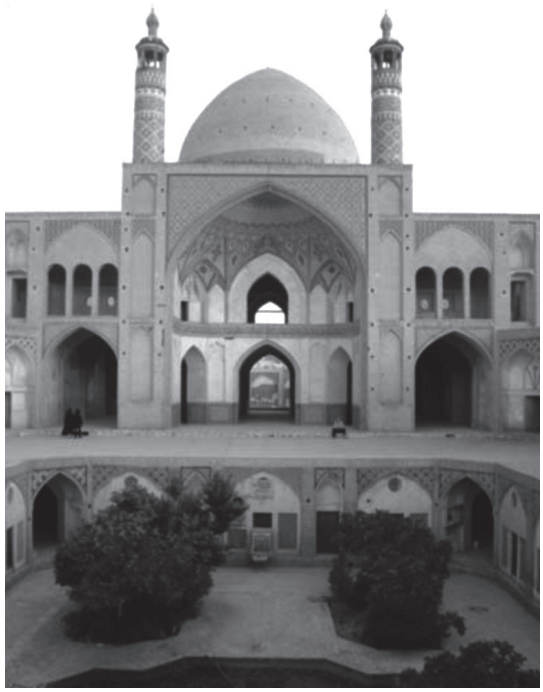


Figure 14. Aqa-Bozorg mosque-school façade.

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score for each pattern, the number of respondents who answered "strongly connected" is multiplied by two, "somewhat connected" is multiplied by one, "no idea" multiplied by zero, "somewhat removed" is multiplied by minus one and "strongly removed" is multiplied by minus two. The following formula was used to calculate the final score:

[Strongly Connected x (2)] + [Somewhat Connected x (1)] + [No Idea x 0] + [Somewhat Removed x (-1)] + [Strongly Removed x (-2)} = Score for each pattern.

The 3 last Biophilic pattern questions used a Likert Type scale response format similar to the first 11 but used the words "Strongly Agree", "Somewhat Agree", "No Idea", "Somewhat Disagree", and "Strongly Agree"; they were calculated similarly.

Our results showed that none of the Biophilic patterns had a higher score for a sense of being removed from nature. All of the patterns had a score of feeling connected that was at least three times the value of feeling removed from nature. This indicates that all 14 Biophilic patterns were used at the mosque and helped the majority of visitors feel connected to nature. Notably the Presence of Water had a score of 200 suggesting a highly positive experience of Iranian people with respect to water.

The maximum possible score for each Biophilic pattern is 200, which would indicate that every respondent felt strongly connected to nature for that particular pattern at the Aqa Bozorg Mosque School. All scores higher than 100 means that there is a higher than 50% connection to nature for that pattern. Eight out of fourteen patterns of Biophilic design induced a higher than 50% connection to nature (score higher than 100). These patterns are as follows: Visual Connection to Nature (such as observation of trees, birds, and fish), Access to Thermal and Airflow Variability (such as Badgir Wind catcher), Presence of Water (such as the pool), Dynamic and Diffuse Light (such as the light and shadow created by the Stone latticework), Connection with Natural Systems (such as the wind catcher and the basement), Biomorphic Forms and Patterns (such as Muqarnas an Karbandi decorative devices), Material Connection with Nature (such as stone, brick and adobe), and Refuge (such as the Shabestan Prayer Hall and Gonbad Khaneh Domed Room).

It is necessary to note that six of the patterns had more than 10% "No Idea" responses suggesting a need for more clarification and explanation of the Biophilic pattern to participants. Removal of the "No Idea" responses from the score for each of the 14 patterns (due to lack of clarity), results in two additional patterns with a higher than 50% connection. These are Complexity and Order (such as the Karbandi, Muqarnas, an Stone Latticework windows which use geometric methodologies), and Mystery (such as the Ravaq Arcade).

As previously mentioned, Ryan's (2014) patterns were categorized into three groups of "Nature in Space", "Natural Analogues", and "Nature of Space". The score for these categories are as follows respectively: 127, 140, and 73. Participants responded much more strongly (more than 50% score) to the presence and

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Categories	Patterns	Strong. Con.	Some Con.	No Idea	Some Rem.	Strong. Rem.	Score
Nature in the Space	Visual connection with nature	53	35	5	7	0	134
	Non-visual connection with nature	43	27	6	18	6	83
	Non-rhythmic sensory stimuli	34	20	30	12	4	68
	ccess to thermal and airflow variabili	62	27	4	6	1	143
	Presence of water	100	0	0	0	0	200
	Dynamic and diffuse light	55	12	24	6	3	110
	Connection with natural systems	80	2	10	4	4	150
Natural Analogues	Biomorphic forms and patterns	75	3	14	4	4	141
	Material connection with nature	89	8	3	0	0	186
	Complexity and order	44	24	21	2	9	92
Nature of the Space	Prospect	17	29	43	0	11	41
	Refuge	63	13	7	12	5	117
	Mystery	33	31	27	6	3	85
	Risk/Peril	29	19	36	4	12	49
Total		777	250	230	81	62	1599

Table 1. Results of Questionnaires

diversity of plant life and other elements from nature, in addition to materials, patterns and algorithms that evoke nature, such as Muqarnas as example of biomorphic forms. They did not respond as strongly to spatial configurations and associated psychological responses such as sense of feeling threatened, or the need to take refuge.

The aforementioned results have several applications both practically and for scholarly research. Future architects could incorporate the ten patterns in their buildings, as this study has shown Iranian people's positive connection to nature with respect to these patterns. Cross cultural studies on similar ancient sites would prove beneficial in assessing cultural differences between the effects of each Biophilic pattern. Furthermore this study suggests that people do not connect equally to nature for all of the 14 patterns. Qualitative studies could further explore the remaining patterns which had below 50% connection to nature and their reasons. In addition, the scores from the three categories could further suggest cultural differences, whereas in Iran people did not respond as strongly to Nature of Space patterns. This could be explored in future research.

5.Conclusions

Based on the results of completed questionnaires, the following conclusions can be made: The visitors' connection to nature in the Aqa-Bozorg mosque-school as the concept of Biophilic design patterns is supported by this research. Most of the visitors had positive experiences in connecting to nature with respect to all 14 patterns, when present at the Aqa-Bozorg mosque-school, This suggests that this building can be considered as a good example of Ryan's (2014) model of Biophilic design. More importantly we conclude that this site, even though ancient and constructed long before the conceptualization of Biophilic design, naturally incorporated many of the Biophilic design patterns when it was constructed in 1875 A.D.. This building can be used as a template to evaluate the Biophilic design criteria in other buildings. This study may serves as a helpful exploratory study that might assist future empirical studies' design.

It is important to add that the positive experiences at the mosque-school is not limited to the 14 recognized patterns of Biophilic design. This site has other characteristics that have positive impacts on each of its visitors. It is a holy place that connects its users' souls to the divinity. Identification of patterns within the spiritual domain which increase visitors' sense of connection and well-being might help to better understand the Biophilic Design criteria.

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