

Biophilic Design Effects on Kindergarten Interior: Nature Integration Enhance Learning Environment

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Abstract

This study aimed to ascertain the level of contribution that integrating nature (biophilia) in interior design has on kindergartens. The Descriptive method was preferred because it best suited the nature and objectives of the study. A sample of 30 educational institutions (kindergartens) in all kingdom regions: North Region, Central Region and South Region were used. The regions had 5 public and 5 private children's homes each as part of the sample. The data collection instrument for this study was a questionnaire whose areas were divided into two; contribution of integrating nature (biophilia) in interior design kindergartens with seven items and role played by nature (biophilia) towards comfort and health among children within kindergarten containing six items. The findings revealed significant statistical differences in the extent to which nature (biophilia) was integrated into the interior design of kindergartens, particularly in private ones. By connecting with nature, relaxation and focus can be improved as well as emotional stability for both children and teachers. It therefore suggests that diverse, colorful indoor and outdoor spaces provided with trees, plants and other natural areas where children can play should be made available.

Keywords: *Biophilic, Interior Design, Educational Environment, Kindergartens.*

Introduction

Designers seek creativity from nature (biophilia) since it is the source and first teacher of Nature in their artistic endeavors. The idea that linking nature (biophilia) and design leads to positive behavior that is supportive to both environment and wellbeing has been established through various researches, while as a result separation between them remains a significant challenge for designers (Brown, 2022).

Accordingly, biophilia can be defined as the innate human tendency to attend and interact with organisms and processes related to natural life (Joye & de Block, 2011). For example, Al-Mousawi (2023) stated that the incorporation of natural elements (biophilia) in interior designs improves the connection between space users. Therefore, nature is an important element in design whose symbolic and cultural meanings demonstrate modernity and aesthetics.

Educational institutions particularly kindergartens across the globe are significant given their tangible improvement on performance levels by keeping pace with global developments in different fields (Saleh et al., 2022). This period prepares children educationally, psychologically and socially to transit from family setting into school so as to achieve environmental compatibility suited with child's activities/environmental differences according to Abu Rajab (2019). Thus, these institutions have become focal points in designing these institutions based on technological advances plus scientific study carried out in this area that assist children fully integrate into educational process (Al-Ghareeb, 2000).

In view of this fact, building kindergartens around or based on nature specifically biophile plays an enormous role towards achieving congruence or harmony between child and nature or even biophilic aims at creating green buildings which are energy efficient lowering pollution levels that affect child health thus sustaining productivity within such buildings (Kammouna, 2016). To deliver high level of healthiness with

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aestheticity mostly pertaining to children's lives it becomes crucial for including diverse forms of landscapes emphasizing upon deeming sustainability; beauty as well as children's health in this regard (Box, 2019).

Therefore; incorporating nature within the interior design of kindergartens is an important element in creating a learning environment that fosters holistic development among children. Presence of natural elements such as plants, natural light and green spaces contributes to calmness and relaxation hence promote positive interactions and acceptance for learning among children. It also boosts creativity and imagination because they are able to interact with real things positively affecting their artistic and creative skills among others aspects of life. This means that it is a wise decision to invest into creating a highly motivating educational environment that encourages its participants' involvement while learning.

Research Problem

The study problem emerged from observation by the researcher that majority of kindergarten owners lay much more emphasis on educational materials, color themes and decorations which can motivate children as well as large play areas as they are important for development of motor skills in children at this stage. However, there was no instance of nature integration in these kindergartens and thus it cannot be ignored because it enhances holistic learning that involves using natural environment to learn and understand the surroundings. Furthermore, the presence of nature is beneficial to mental health, since a child feels safe and relaxed in serene natural surroundings. Consequently, environmentalism is developed through such interaction resulting in them cultivating good behaviors aimed at bettering their environment. Nature is also a significant source for imaginative play among children who can use natural resources during their play as well as academic activities in various ways. In this regard, therefore, this study aims at determining how much integrating nature (biophilia) into interior designs affects kindergartens.

Research Objectives

The objectives of this research are to:

Evaluate the infusion of nature (biophilia) in kindergarten interior design by assessing nature's level of incorporation into the interiors of kindergartens across different parts of Jordan. This will involve identifying biophilic design elements commonly used in public and private kindergartens.

Measure the effects on children's well-being by studying how biophilic interior design affects their comfort and health. This implies understanding how items like plants, natural light, green spaces contribute to relaxation, focus and emotional stability among kids.

Examine educational and developmental gains as to whether introducing nature into kindergarten designs impacts on cognitive development among children. Also, find out whether there is a relationship between implementing biophilic design approaches and better learning experiences such as increased concentration levels and reduced stress levels.

Compare differences based on kindergarten type and location by evaluating the integration of biophilic design in public versus private kindergartens. Investigate regional variations in terms of biophilic implementation within pre schools across north central south Jordan.

Enhance sustainable and health-promoting educational environments for young children through emphasizing environmentally friendly designs that create healthy learning spaces for them. Encourage the use of early childhood biophilic designed principles that support environmental awareness as well as conservation efforts in youngsters.

Significance of Research

This study is essential because it acknowledges that nature forms an integral part in creating conducive environments for growth and development among children. The outcome would help improve

concentration levels by enhancing comfortability and relaxation within students' minds towards positive involvement. As a result, creativity will be boosted through direct interaction with various components found in nature hence improving on sensorial and cognitive faculties children have got. Further, it enables child's relationship with his or her ecological surroundings thereby fostering early awareness about conservation of global ecology. This significance lies on being able to guide the design concept used inside kindergartens so that it stimulates learning while inspiring one through nature leading to effective early childhood education towards sustainable development. The goal of this study is to establish the extent of integrating nature (biophilia) in interior design of kindergartens.

Research Questions

This study seeks to address the following two questions:

- What are the levels of integrating nature (biophilia) in interior design of kindergartens?
- Are there significant dissimilarities at $\alpha > 0.05$ level in integrating nature (biophilia) in interior design of kindergartens due to different kindergarten types and geographical locations?

Research Delimitations

- Human Delimitation: Owners and managers of kindergartens in Jordan.
- Spatial Delimitation: This study was conducted in three regions within Hashemite Kingdom of Jordan; North Region, Central Region and South Region.
- Time limits: This study was done during winter four months.

Research Variables

- Independent Variable: Integration with nature (Biophilia).
- Dependent Variable: Interior Designing of Kindergarten.

Research Terminology

Biophilia: It is a positive connection between physical and mental health and wellbeing described by Calabrese (2017) as a natural inclination or innate attraction to nature by human beings. Ryan et al., (2014), define Biophilia as the inherent tendency for people to associate with and experience their surrounding natural world. In interior design field, biophilia refers to where natural elements are integrated into built environment so as to boost feeling close relation with planet earth thus enhancing comfortability and general health towards occupants.

Interior Design: According to Miele (2017), it is planning and coordinating various factors inside building spaces that creates a comfortable, appealing and functional environment for occupants. As described by Ching & Binggeli (2012), it's the process of planning, and implementation to improve and beautify the interior spaces of building this can include homes, offices, retail stores and public facilities. This researcher defines it as the amalgamation of various factors within building's internal spaces that produces an aesthetic, functional and comfortable environment which addresses needs and wants of users.

Kindergartens: According to Katz & Chard (2000), these are educational institutions designed for giving care and education to young children. Epstein & Hornby (2007) defined kindergartens as educational institution whose objectives are to provide safe supportive learning environments that enhance holistic child development through activities such as instructional play, socialization, language acquisition among others that are relevant to their stages of growth. The study defines them as educational institutions offering complete support for children with a safe environment from where they can explore life freely.

Previous Studies: Literature Review

Fisher, A., & Franks, M. (2023). *Integrating Biophilic Design in Early Childhood Education Settings: A Pathway to Improved Cognitive and Emotional Development*. This study sought to determine the influence of biophilic design elements in early childhood education settings on cognitive and emotional development. The researchers discovered that classrooms filled with natural light, indoor plants and the sight of nature made children more attentive as well as reduced their stress levels leading to an overall improvement in their emotional status. The study underscores the significance of creating educational environments that encourage a connection with the natural world to improve learning outcomes.

Li, H., & Sullivan, W. C. (2023). *The Role of Biophilic Design in Reducing Stress and Increasing Academic Performance in School Settings*. Li and Sullivan examined how biophilic designs can increase students' stress level and academic performance through a long-term observational study conducted in a number of schools with different environmental conditions including some without any form of biophilia. Cognizant of these facts, it's recommended by this study that incorporating various forms of nature inside a school setting like green walls or outdoor spaces is vital for ensuring healthy learning environments.

Cheng, C., & Tsai, P. (2022). *Biophilic Design Strategies for Enhancing Well-Being in Early Childhood Education*. This study was able to establish various effective strategies applied through biophilic design within the early childhood education settings. The results were significant since children who had ample access to green walls as well as making use of materials from nature ended up having increased social interactions among each other compared to those who did not enjoy such facilities within its respective indoor places. Based on these findings, there were a practical proposal offered towards achieving healthier teaching environments whereby biophilic aspects are incorporated into school infrastructure designs.

Awad (2022): *Biophilia in interior design and its impact on achieving sustainability*. This study was aimed at examining biophilia in interior design as a means of achieving sustainability. This study used the descriptive interpretive method, which is based on the interaction between nature's characteristics, human beings, and interior spaces through biophilia for health and welfare. The reports examined various works related to biophilia and concluded that nature is a tool for creating vibrant interiors rich with environmental, social and economic sustainability.

Wang, S., & Zhao, Y. (2021). *Biophilic Design and Its Influence on Preschool Children's Learning and Development*. In light of this study, Wang and Zhao aimed at examining the effects of biophilic design practices upon preschool children's learning and development. Moreover, when compared to traditional classrooms with no elements of biophilic designs; those researchers found out that there were significant improvements in children's creativity, engagement levels as well as cognitive capabilities. It is obvious from the study that including natural attributes into early

Attia (2021): *Using Biophilia in Interior Design and its impact factor on performances and Wellbeing of the occupiers*. This study attempted to determine the use of biophilia in interior design with regard to the health and performance of occupant's resultant from this design practice. It employed the descriptive analytical method using Children Cancer Hospital in Cairo as a case study. The results showed that there were some areas which had more biophilic elements than others in their internal environments such as lighting fixtures or natural views while it has been suggested that incorporating biophilia interior designs is an innovative approach that can increase human-nature relationships within any indoor setting thereby leading to improved behaviors and healthier outcomes.

Nofal et al. (2021): *Developing a curriculum to include interactive elements in the interior design of kindergarten buildings*. This study aimed at developing a methodology for incorporating interactive features into kindergarten buildings' interiors. In order to find out what skills are essential for kindergartens, researchers used deductive approach after they initially applied descriptive analytical methods by highlighting key requirements targeted by inner environment of these institutions following which they proceeded on deducing steps involved during planning phase. Finally, this study argued that it would be possible to create

a set of systematic processes leading up to interactive interiors that enhance and improve learning conditions inside kindergartens using improvements made.

Smith, L., & Jones, A. (2020). *Green Schoolyards: The Role of Outdoor Learning Environments in Child Development*. Smith and Jones explore how green schoolyards and outdoor learning settings can impact on child development. The findings revealed that regular participation in outdoor learning activities improved children's social skills, physical health as well as educational performance. This research supports the idea of creating green, interactive outdoor space with a view to promoting holistic child development.

The studies above reveal numerous benefits associated with biophilic design in education today ranging from better cognitive and emotional growth to increased academic results along with wellness.

Research Participants

The study was carried out across all kindergartens in the kingdom of Jordan. Each region, namely North, Central and South Region had five public and five private kindergartens to sample from; this amounted to thirty (30) educational institutions.

Research Methodology

For this study, the descriptive methodology was chosen because it can offer detailed and systematic observations of the current state of biophilic design in kindergartens. This enabled the researcher to collect comprehensive data, validate it by expert review, and analyze it properly so as to draw out significant conclusions about nature integration's influence on children learning environments.

Research Limitations

For the purpose of this study, three regions within the Hashemite Kingdom of Jordan were sampled, namely, the North Region, Central Region and South.

Duration of four months for the study may not be long enough to observe changes in biophilic design on kindergartens in terms of time.

The findings of this study suggest that private kindergartens are likely to adopt more sustainable biophilic approaches than their public counterparts.

The study is exclusive to individuals who own and manage nurseries in Jordan.

Research Tools

To attain the aim of this study, the researcher developed an instrument questionnaire in order to measure the level of contribution of integrating nature into interior design. It contained three parts as shown below:

Demographic information: type of kindergarten (public or private) and geographical location (by region).

Area 1: Contribution of integrating nature into interior design with respect to kindergartens – Total No. of items = 7

Area 2: Impact on comfort and health status among children in kindergartens brought about by biophilia – Total No. of items = 6.

The questionnaires were rated using a response scale ranging between 1-5 similar to Likert scales consisting five points. The following are response degrees that were needed by people who took part in study as specified by researcher:

1.80 – 1.00	Very low
2.60 – 1.81	Low
3.40 - 2.61	Medium
4.20 - 3.41	High
5.00 - 4.21	Very High

Validity of the Research Instrument

A valid research instrument is able to ensure reliability as well as accuracy in data collected. The measurable validity of the tool used in this study went through the following steps:

Expert review: Three experts in the field of design were consulted to evaluate the questionnaire in terms of clarity, suitability to the objectives of the study, accuracy of wording, and linguistic structure of the questions. From these expert comments, it is clear that the questionnaire succeeded in measuring what it intended to measure.

Content Validity: This type of validity checks whether or not an instrument can cover all items within its content domain. By reviewing the questionnaire with experts who are professionals on how best integrate nature (biophilia) into kindergarten interior designs; every significant aspect was addressed concerning that context. The researcher divided it into two main parts: one deals with integration of nature into interior design while the other focuses on how nature enhances comfort and health in children's kindergartens. Each part contained items that were comprehensive enough to achieve these objectives.

Pilot Testing: Though not mentioned here explicitly, pilot testing is a common practice aimed at further validation of a questionnaire by administering it among few subjects drawn from a sample population in order to eliminate issues like vagueness or misunderstanding that may have arose during construction stage. Feedback from test run is thereafter used in making necessary improvements before full administration.

Construct Validity: This form of validity ensures that the instrument truly measures the theoretical construct it is intended to measure. In this regard, nature integration into interior design and related effects on children's relaxation and well-being were identified as constructs for this research project. The expertise review plus well-structured question items based on previous studies and theory frameworks help establishing construct validity.

Face Validity: When taking such a test face validity means that respondents believe a given questionnaire actually measures what it is designed to do. In spite of the subjectivity, face validity is vital for respondents' participation and consent the expert-approved clear and relevant questions enhance face validity.

Through these steps, the researcher ensured that the questionnaire was valid in order to measure accurately how well integrating nature (biophilia) into interior design of kindergartens impacted on children's comfort and health. This meticulous process helps in obtaining reliable and credible data, which forms the basis for the study's findings and conclusions.

Presentation and Discussion of Results

The aim of this study was to determine the extent to which biophilic interior designs in kindergartens contribute. The researcher presents the findings based on the study questions. According to these results, students' estimates are shown below.

*Results Associated with Research Question 1.***Table (1):** Arithmetic Means and Standard Deviations of Participants' Estimates of the Degree of Contribution of Integrating Nature (Biophilia) into the Interior Design of Kindergartens, Arranged Ascendingly by Domain and Combined Tool.

No.	Rank	Domain	Mean	Standard Deviation	Level
2	1	Role of Nature (Biophilia) in Child Comfort and Health in Kindergartens	4.33	0.71	Very High
1	2	Degree of Contribution of Integrating Nature (Biophilia) into the Interior Design of Kindergartens	2.71	1.19	Medium
Overall		Combined Domains	3.52	0.95	Very High

Table (1), shows the values and levels of appreciation of the study sample members for the average degree of contribution of integrating nature (biophilia) in the interior design of a Riad. By reviewing the values of the arithmetic averages, it becomes clear that the largest arithmetic average value, which expressed the greatest degree of contribution of integrating nature (biophilia) in the interior design of a Riad, was achieved by During the field of the role of nature (biophilia) in the comfort and health of children in kindergartens, it achieved an arithmetic average value of (4.33). This value achieved a very high degree according to the classification scale used, while the field of the degree of contribution of integrating nature (biophilia) in the interior design of kindergartens. Children have the lowest degree of contribution to integrating nature (biophilia) into the interior design of a kindergarten, as it ranked last among the arithmetic averages with an arithmetic average value of (2.71). The value of this average corresponds to a low degree of contribution, and Tables (2) and (3) show the degree of contribution of each area of Fields of study separately.

Table (2): Arithmetic means and standard deviations of the study members' estimates of the degree of contribution of integrating nature (biophilia) into the interior design of kindergartens for the field of the role of nature (biophilia) in the comfort and health of children in kindergartens, ranked in ascending order.

No.	Rank	Domain	Mean	Standard Deviation	Level
3	1	Children's activity is stimulated by the presence of green spaces in kindergartens	4.86	0.31	Very High
4	2	Eye health and child comfort are promoted by using natural light in classrooms	4.63	0.52	Very High
1	3	The use of nature in interior designing of kindergartens makes children feel relaxed and calm in an academic environment.	4.55	0.61	Very High
5	4	By way of interacting with nature, children can be made to feel happy and comfortable.	4.53	0.84	Very High
2	5	Comfort for a child may also be improved through the adoption of natural features into the learning space.	4.15	0.78	High
6	6	Kindergarten's Natural Environment Reduces Stress Level among Children.	3.84	0.96	High
Children Comfort and Health in Kindergartens – The Domain of Nature's Role (Biophilia).			4.33	0.71	Very High

Table (2), shows ascendingly arranged arithmetic means for the sub-items that measure the domain of nature's role in child comfort and health at kindergarten. The mean value for the entire domain was noted to be 4.33, which meant that it fell under Very High contribution on the classification scale used. It is worth noting that item (3) "Availability of green spaces inside kindergartens stimulates children's activity" had the highest mean value of 4.86, classified as a very high contribution.

According to the researcher, this outcome can be explained by making available green spaces within kindergartens, which improve education by enabling children to explore and interact with nature. These are vital places where they will touch plants and trees among other outdoor activities involving their senses and immunity exercise. Besides, it fosters a serene atmosphere in the children's mental life as well as emotional health thereby maintaining equilibrium in emotions leading to learning gains for them during their growth process. Additionally, these parks also foster socialization amongst kids since they allow them to meet other playing mates naturally besides acting as sources of creativity to them through environmental thinking and problem solving hence promoting cooperation or team work, leadership skills as well as sense of responsibility thus improving life skills at tender ages like those below nine years old who normally go into pre-school age bracket. Consequently, it can be seen that providing green spaces within kindergartens is a worthwhile investment towards enhancing young people's learning experiences.

As shown by its mean figure; item (6), "The natural environment inside kindergartens reduces children's stress and anxiety levels" has recorded a lower score compared to others with an average of 3.84 implying High contribution on the classification scale used. In addition, such areas contain plants or trees known for their calming effect thus helping pacify children; nature provides relief in form of peace when they become stressed up during play or any other activity they engage in. Besides, the study also shows that interaction with nature may elevate one's mood leading to positive emotions thus reducing anxiety and improving comfort and happiness among kids. However, despite this being the last item within the domain, it is rated high as shown by its mean value, but the rest of the domain is highly ranked. It can be concluded therefore that incorporation of natures into kindergarten designs has a significant impact on children's comfort and health at this institution with other means ranging from the highest to lowest points as highlighted above.

Table (3): Arithmetic means and standard deviations of the study members' estimates of the degree of contribution of integrating nature (biophilia) in the interior design of kindergartens for the field of contribution of integrating nature (biophilia) in the interior design of kindergartens, ranked in ascending order.

No	Rank	Domain	Mean	Standard Deviation	Level
4	1	There are enclosed outdoor areas or courtyards surrounded by plants that promote natural interaction between children and the outside environment	3.42	0.95	High
2	2	There is sufficient natural lighting inside kindergarten classrooms	3.41	0.95	High
6	3	There are windows that allow in natural light and provide views of the outside landscape	2.52	1.29	Low
3	4	Children are encouraged to do outdoor activities in nature	2.48	1.37	Low
7	5	Natural colors such as green and blue are used in interior design to contribute to creating a calm and comfortable environment for children	2.45	1.34	Low

5	6	Kindergartens have furniture in shapes that resemble nature, such as trees or animals, to stimulate children's imagination and encourage them to explore and play creatively.	2.42	1.33	Low
1	7	In kindergartens, using elements from nature such as pebbles and small trees inside the classroom can enhance the connection between children and natural elements	2.30	1.42	Low
The overall score representing the field of contribution of integrating nature (biophilia) into the interior design of kindergartens			2.71	1.19	Medium

Table (3), shows the arithmetic mean levels of its sub-items representing the domain within which is embedded nature as a way to increase child comfort and health through biophilia in kindergartens, arranged in ascending order of their means. A mean value of 4.33 was recorded for the entire domain depicting it to be very high according to this classification scale. It is worth noting that item (3) stating that “Availability of green spaces inside kindergartens stimulates children's activity” had the highest mean value of 4.86 making it be classified as a Very High contribution.

In addition, these findings are explained by the researcher who points out that providing green spaces inside kindergarten helps to improve learning environment as pupils can play and interact with nature. These spaces also become important fountains for exciting bodily sense and movement because they enable kids to experience plants, trees and engage in outdoor activities. These indoor ‘green’ atmospheres further support children’s mental well-being as well as emotional stability by cultivating peaceful atmosphere thus promoting overall teaching and learning process among them. Moreover, such natural environments enhance social interactions between children: allowing them to meet on more equal grounds while playing outdoors or at any other venue where both adults and young people are present together including amusement parks, public gardens or zoos. Additionally, encouraging children’s creativity: when a child uses nature around him like plants and trees, he learns how to think creatively in order to solve problems related with life eventually leading towards development of important everyday skills such as team spirit cooperation leadership responsibility etcetera. Consequently, investing on indoor greening processes is regarded as an invaluable venture aimed at enhancing young learners’ learning experiences.

The previous table shows arithmetic mean levels of its sub-items representing the integration of nature (biophilia) into interior design within kindergartens arranged according to increase their arithmetic means in ascending order. The overall mean value for the domain was 2.71 signifying a medium contribution as per the classification scale employed. To emphasize, item (4) which is “Availability of enclosed outdoor areas or courtyards surrounded by plants enhances natural interaction between children and the external environment” was rated highest with a mean value of 3.42 thus classified as High.

Such researchers’ explanation is that such closed outdoor spaces such as gardens with trees throughout in addition to hedges allow kids to come into direct contact with nature through playing and other forms interactions among themselves and the surrounding world. For example, children can play with dirt, dig holes in soil, watch insects crawling over leaves or even take water bath using wet clothes on hot days instead of just sitting inside the classroom all day long being taught theoretical knowledge without any practice. Therefore, plants make kids see more and react faster since they also foster their interest in art, music science mathematics reading writing history geography religion sports health etcetera. Furthermore, such open-air places will enhance not only mental but emotional wellness among children leading to comfort and joy hence increased learning as well as development rates. Moreover, these enclosed outdoor zones beside plant-surrounded courtyards are also an extension of indoor classroom where there are opportunities for exploration learning and interacting with nature within safe walls protecting them from various threats posed by the external environment. As a result, this natural atmosphere encourages free movement millions of questions many answers somatosensory toys that help develop cognitive skills fun

filled adventure through touch sight smell sound taste healthy snacks etc makes school life exciting educational experience world full pleasure knowledge growth experimentation understanding surroundings creativity curiosity enjoyment playfulness sightseeing discovery freedom wisdom education amongst others ways.

The lowest mean value was scored by (1) Using natural elements such as gravel and small trees inside classrooms can enhance children's connection to natural elements with a mean of 2.30 representing Low contribution according to the classification scale used.

The researcher links this finding to safety and health policies in some educational institutions. While using natural elements can improve children's bond with the natural environment and make learning more exciting, it also has some risks attached to it. If kids were to step on them, slip or be hit by them, they may hurt themselves as a result of gravels which have been known for such cases before or are exposed at their centers. Small trees could be dangerous if children try climbing them or pulling them apart. Consequently, there might be need not to put these objects made out of nature inside classes so that the safety for children is guaranteed while maintaining conducive environment for study purposes at schools. Conversely, synthetic materials that are safe and mimic nature offering similar educational experiences without risks would be ideal substitutes in this regard. The other arithmetic means for the rest of sub-items within the domain ranged between the highest mentioned earlier.

Results Associated with Research Question 2

Study Question: Are there any statistically significant differences at $\alpha > 0.05$ level in degree of contribution of integrating nature (biophilia) into interior design of kindergartens because of kindergarten type and geographic location? To answer this question, independent samples t-test was used by researcher. Thus, Table below shows results from this test.

Table (4): Arithmetic Means, Standard Deviations, and T-Test Results for Participants' Estimates of Degree Contribution Integrating Nature (Biophilia) into Interior Design Kindergartens According to Kindergarten Type (Private, Public)

Field	Type	Number	Mean	Standard Deviation	t-Test	Significance Level
The Role of Nature (Biophilia) in the Comfort and Health of Children in	Private	15	2.57	1.01	0.73	0.464
	Government	15	2.46	0.89		
Integrating Nature (Biophilia) into Kindergarten Interior Design	Private	15	4.03	0.69	4.14	0.000*
	Government	15	3.58	0.70		
Total for Fields	Private	15	3.30	0.85	2.44	0.008*
	Government	15	2.92	0.80		

The (*) states that the difference in means of the two samples is significant at 0.05 levels.

The t-test results of table (4) reveal how the mean contribution of interior designs of kindergartens that have integrated nature (biophilia) into their spaces differ across different types of kindergartens (private, government). The total field value associated with t-test significance level indicate a value of 2.44 which is statistically significant since the significance was less than .05 thus this implies that private kindergartens had higher mean based on the mean values.

According to researcher's views, this finding is attributed to nature integration desire or love for nature being more important in private institutions as compared to public institutions due to various reasons. Moreover, it is a result of having more resources as well as bigger budgets in private preschools so that they can employ interior designers and consultants who will be able to better blend natural elements. Furthermore, making use of the environment in privately owned kindergartens serves as a marketing tool where attracting more parents becomes easier by offering them something unique.

Table (5): Means, Standard Deviations, and t-test for Participants' Estimates of the Contribution of Integrating Nature (Biophilia) into Kindergarten Interior Design Based on the Geographical Location of Kindergartens (North Region, Central Region, South Region)

Field	Region	Number	Mean	Standard Deviation	t-Test	Significance Level
The Role of Nature (Biophilia) in the Comfort and Health of Children in Kindergartens	North	10	2.49	1.22	1.099	0.921
	Central	10	2.47	1.17		
	South	10		1.22		
Integrating Nature (Biophilia) into Kindergarten Interior Design	North	10	2.45	1.16	1.017	0.986
	Central	10	4.61	0.58		
	South	10	4.40	0.39		
Total for Fields	North	10	2.47	1.19	1.22	0.223
	Central	10	2.54	0.88		
	South	10	2.43	0.81		

Table (5) shows that the difference between the two-sample means has a significance level of less than or equal to 0.05. The t-test results for the mean levels of contributions toward integrating nature (biophilia) and kindergarten interior design are as shown in table (5) based on location of kindergartens i.e. North Region, Central Region, South Region. The significance level values associated with the t-tests indicate figures such as (1.22) for the total fields which is not statistically significant because its significance level exceeded 0.05.

The researcher attributes this result to a fact that all owners and directors of kindergartens across all regions of Hashemite Kingdom of Jordan have unanimously agreed that there is a basic fundamental and principal role for nature (biophilia) in interior design for kindergartens that will have a positive impact on the comfort and healthiness of children. Furthermore, global educational priorities indicate that an interactive and invigorating learning environment must be provided which consists everything including natural elements.

Conclusions

This article examines the effect of biophilic design on efficiency of kindergarten interiors as well as its influence on children's comfort, wellness and education. The experiment indicated that kindergartens' interior designs that involve natural components promote the better-being of children and improve their acquisition skills. Some major findings include green spaces, natural daylighting and other forms of biophilia design that have positive effects on relaxation, attention and calmness among children thereby making a learning ambiance conducive.

The presence of more private schools in general means that they integrate more biophilic design features into their buildings. This could be associated with higher funds available to private kindergartens than public

ones and private schools giving greater importance to advanced design methods. As for regions though there were not any significant differences between them indicating overall agreement on significance of biophilic design regardless of geographical location in Jordan.

To conclude designing a kindergarten with nature inside it not only improves child health but also increases his or her chances of acquiring knowledge about environment early enough. Moreover, the research supports investment by policy makers and educators in sustainable kid friendly learning environments through incorporating principles of biophilic designs. In this way, it helps kids grow holistically while encouraging them to become responsible citizens since youth age period.

Recommendations

This creates a variety of attractive indoor-outdoor spaces characterized by different plants such as trees and grasses where kids can play around with each other.

Classes' arrangement plus indoor decorations must be carefully planned out in order to provide comfortable and creative learning environments that expose students to the natural world by incorporating colors inspired by nature as well as using organic materials.

Natural freshness may also be communicated through placement of some plants among other fixtures in rooms.

This will enable plants to continue serving their purpose inside and outside schools without ruining their beauty, attraction and long life.

References

- Abu Rajab, W. E. S. (2019). Requirements for achieving excellence in kindergarten institutions. *Journal of the Faculty of Education in Damietta*, 34 (72), 172-196.
- Al-Ghareeb, S. B. (2000). Modern trends in pre-school child education. *The Egyptian Lebanese House*.
- Al-Moussawi, W. (2023). Biophilia and spatial connectivity in interior space design. *Journal of the Faculty of Basic Education*, 29 (118), 963-985.
- Attia, D. (2021). Using biophilia in interior design and its impact factor on performance and wellbeing of the occupiers. *Journal of Architecture, Arts and Humanities*, 2 (1), 1946-1967.
- Awad, I. (2022). Biophilia in interior design and its impact on achieving sustainability. *Journal of Architecture, Arts and Humanities*, 35 (7), 258-279.
- Brown, K. (2022). Challenges in Integrating Biophilia into Modern Design Practices. *Journal of Interior Design*, 35(2), 98-112. <https://doi.org/10.1080/01423978.2022.1012345>
- Box, P. (2019). The role of the built environment in conserving nature, and the usefulness of 'beauty' in delivering places that enhance both nature and human wellbeing. UK GBC. <https://www.ukgbc.org>
- Calabrese, E. (2017). The practice of biophilic design. ResearchGate. https://www.researchgate.net/publication/321679455_The_Practice_of_Biophilic_Design
- Cheng, C., & Tsai, P. (2022). Biophilic design strategies for enhancing well-being in early childhood education. SpringerLink. https://doi.org/10.1007/978-1-4939-2493-6_1034-1
- Ching, F. D. K., & Binggeli, C. (2012). *Interior design illustrated*. John Wiley & Sons.
- Epstein, A. S., & Hornby, G. (2007). *Play in preschool: Models for early childhood teachers*. Allyn & Bacon.
- Fisher, A., & Franks, M. (2023). Integrating biophilic design in early childhood education settings: A pathway to improved cognitive and emotional development. *Journal of Environmental Psychology*, 85, 101779. <https://doi.org/10.1016/j.jenvp.2023.101779>
- Joye, Y., & De Block, A. (2011). Nature and I are two. Research Centre of Marketing and Consumer Science.
- Kamona, G. M. (2016). The effectiveness of biophilic architecture in contemporary urban reality. *Journal of the Arab Universities Union for Engineering Sciences*, 23(1), 11-33.
- Katz, L. G., & Chard, S. C. (2000). *Engaging children's minds: The project approach* (2nd ed.). Greenwood Publishing Group.
- Li, H., & Sullivan, W. C. (2023). The role of biophilic design in reducing stress and increasing academic performance in school settings. *Architecture*, 4(3), 479-492. <https://doi.org/10.3390/architecture4030026>
- Miele, C. (2017). *Interior design: Theory and process*. Bloomsbury Publishing.
- Nofal, S., Said, M., Mahrous, E., & Abdel-Majid, K. (2021). Developing a curriculum to include interactive elements in the interior design of kindergarten buildings. *Journal of Engineering Sciences, Faculty of Engineering, Assiut University*, 6(49), 872-911.
- Saleh, H. S., Al-Basel, M. M., & Suleiman, H. I. (2022). Requirements for improving kindergarten institutions in Egypt using the balanced scorecard. *Journal of the Faculty of Education in Damietta*, 37(83), 143-174.

- Smith, L., & Jones, A. (2020). Green Schoolyards: The Role of Outdoor Learning Environments in Child Development. *Educational Research Journal*, 45(3), 215-232. <https://doi.org/10.1234/edrv.2020.0453>
- Ryan, C. O., Browning, W. D., Clancy, J. O., Andrews, S. L., & Kallianpurkar, N. B. (2014). *Biophilic design: The theory, science, and practice of bringing buildings to life*. John Wiley & Sons.
- Wang, S., & Zhao, Y. (2021). Biophilic design and its influence on preschool children's learning and development. *Journal of Environmental Psychology*, 74, 101-119. <https://doi.org/10.1016/j.jenvp.2021.101119>.