

## Accessing the Role of Biophilic Integration Strategies in Institutional Buildings

Agboola Olusegun Isaac, Adedire Funmilayo Mokunfayo,  
Department of Architecture,  
Lead City University, Ibadan, Oyo State, Nigeria.

### ABSTRACT

*Introducing the concept of biophilic into our institutional buildings spans further in depth the connectivity between nature and human relations. As no human find it difficult not to associate with nature, the desire to intimately connect with nature is strong both in indoor and outdoor activities and the presence of this system at a place where human spend half of their day-to-day activities require to be physical and mental a good place to stay. Scientifically, this concept plays a good role in improving users' productivity, well-being, and health, otherwise, the situation may lead to high-stress levels and mental health issues, poor performance, and a service delivery system to receiver's recipients. Quite a few decades back, several researchers such as Ebtesan A. et al, 2022., have proved the importance of the human and nature relationship stating that this concept helps to; clean the indoor air of harmful toxins emitted, provide oxygen and absorb carbon dioxide both in indoor and outdoor, decrease fatigue, create natural vision of beauty, reduces stress and increase productivity and among others. Therefore, this research design thesis aims to integrate the concept of biophilic into institutional building design while the objectives are to design a functional central administrative building that includes biophilic features, landscaping features, access to a good learning environment, to promote designing institutional building through the approach of biophilic architecture and adoption Biophilic design consideration. Case studies were conducted for observations, and findings focused on the aspects of the concept of biophilic in an institutional building, natural elements, and the importance of biophilic. Institutional buildings such as educational structures were selected, locally and internationally (case study), and reviewed. Their connectivity with nature is directly and indirectly and descriptively analyzed according to the purpose it was built. However, the need for incorporating this concept into educational buildings can never be overlooked not only to enhance the productivity of the users with their recipients but sustain the objective of sustainability by designing a good quality of built environment and life-friendly design.*

### INTRODUCTION

Biophilic design has been described as process and tool of architecture which is not just the mere greening of spaces and buildings to increase the appeal of aesthetics, but it is a way of discovery and introducing people into nature and driving nature into its place in people's spaces, *Browning et al. 2020*. Biophilia where human spend half of their day allows human- nature connection within such environment. Biophilia is a term which is coined

from two words; "Bio" and "Philia", bio means nature and philia means love or affinity and this term is an expression which articulates the connection between a built environment and nature so humans may experience the benefits of both nature and artificially built environment, it can also emphasis as an idea which is based off the theory that beings always have the necessity to connect to the nature on levels which are physical, metal and social to foster wellbeing. Kellert S.R, 2018 formulated a set of

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Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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principles using a biophilic solution at a workplace; in an institutional building complex precise. Biophilia as a form of architecture has been applied and used by architects as a tool to have an indelible reflection on the minds of people, Wang *et al.* 2019. Biophilic spaces and environments have been reported with good and substantial evidence to have a healing effect on the human body, Barbiero G and Berto R (2021), having contact with nature affect the human health in so many ways such as the air quality improvement, social cohesion, and stress reduction. The natural balance of the production and emission of oxygen and carbon dioxide has been disturbed because of the rapid development of humans, this needs to be somehow rebalanced using architectural design principles which are in line with nature. Biophilia as a design tool has been associated with bringing a perceived balance to the natural order of the environment, it reduces stress, improves creativity, and also improves the overall state of the human health, and designers hence need to incorporate such tools into their designs to improve the human wellbeing, Browning *et al.* 2020.

According to Kellert (2012), contact with nature giving benefits to humans is very much dependent on a habit of repeated experiences, in as much as there is an inherent inclination on the part of humans to connect with nature, this attraction to the forces of nature needs to be nurtured and developed. The distinctive learning and growth of individual humans is reliant on our capacity to choose specific courses of actions, with regards to biophilia and in such context humans may choose to seek a connection with nature or inherently sever ties with it as is the case of most modern built societies, where several obstacles of nature have been built to block it out, this has led to an increasing and alarming disconnection of humans from the natural world, the growing disconnection of humans from nature in the modern society can be seen in sectors of manufacturing, agriculture, education healthcare and lastly architecture, Weijie Z *et al.* 2021. There are also factors such as the lifestyle changes which people embark upon which also play a significant role in their isolation from the inherent natural environment, contact with the natural environment in most developed societies and countries have been

shown to have significantly reduced in recent times, and in some places it has also been completely lost, it has been reported that due to lifestyle changes people tend to spend up to 90% of their time indoors which isolates them from experiencing the natural system outdoors, Stankovic *et al.* 2018. The need for contact with nature by humans has been reported to be critically beneficial to the wellbeing of humans and a level of satisfactory contact to this regard in today's-built environment has proven to be very much challenging, as the major approach to modern buildings does not treat nature as an element to be factored into its design and construction rather than an obstacle which it most times seeks to get rid of, and sometimes it even sees nature as a trivial and irrelevant factor.

Architecture in every society is a remarkable and significant feature which cannot be detached from nature, biophilic designs have been translated as a way which shows the connection of people to natural systems, nature themed designs can be found in some of the earliest structures built by humans, several cultures over the course of history have used natural representations in their designs in both decorative aesthetic designs and also symbolic ornaments, the consistent use of these natural themes in structure have come to imply that biophilic designs are not a new phenomenon as many would think, however long years of urbanization in recent history which have been geared by the use of computerized design practices have disconnected most designs from the use of biophilic design. Biophilia is a representation of the human love for natural environments and it can be used to influence architectural spaces of all kinds. Recent scientific researches is that our deep-rooted ability to exercise nature is because of its noticeable impacts on psychological and physiological health of people. This can also clearly be seen from the preferences of the construction & design industry for integrating nature into the built environment, or building within and around the nature, itself, Abbas, Jawaid, 2017.

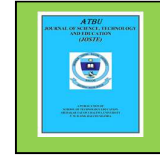
In addition, offices or institutional building consumed more energy compared to other buildings. Moreover, energy in such environment is mainly consumed for heating, cooling, lighting and operating equipment

Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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purposes, Santamouris, & Dascalaki, 2002. Despite the effort by researchers to integrate bioclimatic principles into building design, there is still minimal consideration of these energy efficient approaches especially during design stages of those buildings, in which the main design solutions are identified. Most buildings in Nigeria are designed for just the designing sake with not much attention paid to its orientation, nature and proper climatology, Adeda et al. 2013. Biophilic Design as it is known, is an innovative way of designing the places where we work, learn, and even live. We need nature in a deep and fundamental fashion, but we have often designed our environments and buildings in ways that both reduce the environment and alienate us from nature, Husin, 2022. Biophilic design is a design approach that argues that it is important to incorporate natural systems and processes into the design of the built environment to improve human health Kavas, D., Selcuk, E., Nazligil, H., & Hasirci, D, 2022. Biophilic design within the built environment has been found to promote a sense of place; yet studies are lacking in how nature-based design is conducted on college campuses Peters & D'Penna, 2020.

This study is proposed to research the role of biophilic integrated in an institutional building, and also study biophilia as a design tool with respect to sense of place, and comprehensively exploring the impacts of biophilic in an office spaces and shed light on how biophilia enhances space within the context of sense of place.

1. To introduce Biophilia as a concept, study and explore various patterns, elements and attributes and strategies related to biophilia.
2. To Promote designing institutional building through the approach of biophilic architecture and adoption biophilic design consideration
3. To adopt and integrate a new design that increases the productivity of the staffs and students (Users) efficiency of the environment and facilities and the quality of its space.

## LITERATURE REVIEW

Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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The term biophilia is coined from dual Greek words "bio", meaning life, and "philia", meaning "love" or "lover of". The psychologist Eric Fromm was the first to introduce the idea. Biophilia, thus, can be defined as the "love for all things living", Bayraktaroğlu, 2014. In his book *The Secret Garden of Nature*, the American biologist Edward O. Wilson defined biophilia as "the in-born tendency towards life and life cycles", Wilson, 1996. Biophilic design, thus, draws attention to the emotional side of human beings, and states that people adapt better in environments where there are elements and designs that are one with, or reflect, nature.

Edward O. Wilson's book *Biophilia* has gained tremendous currency in recent years. Now that people have transitioned from living in natural habitats to living closed and artificial habitats, the need for us to re-connect with nature has once again emerged. Therefore, now is the time to discuss biophilic design, as it aims to combines our need to re-connect nature with our need to live in modern buildings. In doing so, it focuses on how living naturally can enhance both human health and productivity, namely by integrating natural light, natural materials, and natural landscapes into the modern world. Urbanization has caused us to lose our relationship with nature. One indicator of modern life is that structures like homes, schools, workplaces, and shopping malls, within which most of us spend a large portion of our lives, are designed using artificial light, artificial ventilation, and artificial materials. This in turn threatens our health, welfare, and level of productivity. Biophilic design heals people and motivates their performance and productivity through environments that are connected to nature, Erbay, 2018. Biophilic design may also be referred to as healing architectural design. Biophilic primarily focuses on hospitals, schools, and work places in order to enhance healing/recovery, learning, and productivity, Dünya, 2014.

Kellert (2018) states that biophilic design has two basic orientations: organic and regional design. Inspired by biology, organic design refers to forms found in nature, including water, trees, plants, landscape, and the like. All of these have the ability to affect people's productivity, emotional state, and ability to recover and learn. Regional design, in contrast,

refers to the interaction between culture, history, and ecology, and is tied to one's sense of appreciation towards nature. The process of one becoming detached from nature often emerges into the process of one becoming detached from them themselves, and thus trying to satisfy that detachment with power. Biophilia exists therefore exists in order to help us find and fulfill our need for satisfaction and security within nature itself, Bayraktaroğlu, 2013.

**Biophilic Design Application and Its Elements**

Kellert and Calabrese's "The Practice of Biophilic Design" describes that we experience biophilic design in three ways: (1) directly experiencing nature, (2) indirect experiencing nature, and (3) experiencing

space. Directly experiencing nature refers to our direct contact with nature (e.g. the direct incorporation of natural light, air, flora, animals, and natural scenery in artificial spaces). Indirectly experiencing nature refers more to representing and/or giving off the appearance of nature in spaces through figurative means, such as landscape paintings and other nature-themed works of art, natural colours, natural materials, and natural shapes. Experiencing space enables human beings to connect with nature and make them feel safe within spaces through the presence of visual transitions linking space and nature. We can further divide these three experiences into 24 sub-experiences, Erbay, 2018.

**Table 1.** Experiences in Biophilic Design (Application)

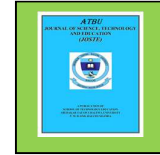
Directly experiencing nature	Indirectly experience nature	Experiencing place and space
Lighting	Image of nature	Expectations and housing
Air	Natural materials	Order and complexity
Water	Natural colors	The integration of parts into a whole
Plants	Simulating natural light and air	Transition Spaces
Animals	Natural shapes and forms	Mobility and navigation
Weather conditions	Calling nature	Cultural and ecological attachment to space
Natural landscapes and ecosystems	Wealth of knowledge	
Fire	Age, change, and traces of time	

Boz and Cengiz, (2019) emphasized on two main dimensions biophilic design which are: organic or natural, and spatial or regional.

**Table 2.** Two Main Dimensions of Biophilic design (Kellert Boz and Cengiz, 2019)

ORGANIC OR NATURAL	
The organic, or natural, dimension of biophilic design symbolically demonstrates whether human beings are either directly or indirectly tied to the environment around them.	
Direct experiences highlight the direct relationship between man with nature, i.e. through daylight, plants, and animals.	Indirect experiences, symbolically bring human contact with nature through elements like potted plants, fountains, and aquariums.
SPATIAL OR REGIONAL	
On other hands, space-based or regional dimension, as our transposing the ecology and culture of a particular region or geography onto both buildings and landscape elements	
This dimension aims to transform inanimate objects into living objects, with particular emphasis on social identity.	

Corresponding author: Agboola Olusegun Isaac.  
 ✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)  
 Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.  
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These two basic dimensions of biophilic design include seventy features detailed under six elements, Kellert Boz and Cengiz, 2019.

1. Environmental characteristics
2. Natural shapes and forms
3. Natural patterns and processes
4. Light and space
5. Space-based relationships
6. Human-nature relationships that have developed

**Approaches in Biophilic Design**

In view of biophilic design-based solutions in an office spaces, there are strategies and relationship between elements which fusion these contexts to co-host and successfully creates a comfort indoor and outdoor environment. Identifies these strategies elementals attributes as defined by Kellert, 2018. He accentuated on strategizing biophilic design in early stage of design and preparation process and integrating the teaching of ecology

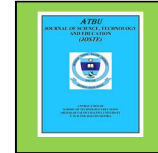
into the buildings, Signs and indicators about natural elements and features enable people to understand and value what they see. Designing landscapes and buildings that create a sense of mystique and encourages users to explore, discover, and learn about the complexities of nature. Ensuring an ecological, historical, and cultural connection between man and the space helps users/inhabitants to better connect to that space. Doing so inspires them to want to protect the area, as well as ensures significant that they become loyal to, responsible for, and manage that space. In its perceptions around landscape, building and interior designs and field use, Kellert, emphasized on several strategies to create space which will allows human beings to bond with nature and make them feel safe within spaces through the presence of visual changes connecting space and nature. And the highlighted are theoretically proffered in a tabular form.

**Table 3.** Approaches in Biophilic Design (Wilson. Boz and Cengiz, 2019)

<b>LANDSCAPE DESIGN AND FIELD USE</b>	
Provision of open spaces around buildings	In order to heighten our contact with nature, we must increase the number of open, naturalized, and
Preserving existing vegetation and natural landscapes	Preserving existing trees and natural landscapes during land development and construction is one of most effective ways in which we can create natural landscapes.
Arranging plants around buildings and creating natural environments	Well-designed landscaping areas need to be a visible part of buildings. There should be as many windows as possible overlooking vegetation and water elements.
Establishing passageways in natural and regulated areas	Walking and cycling need to be established along restored landscapes in both residential and commercial areas.
Using various plants in place of impermeable surfaces	Vegetation not allows rain and snow to melt and penetrate into the soil, but contributes positively to the environment, transforming spaces in areas that people want to see and explore.
Creating green facades	Green facade bring nature to the space, which is important for the interaction between people and nature.
<b>BUILDING DESIGN</b>	
Providing a view of nature	Architects/designers should design and position windows in such a way that they allow people to easily look outside.

Corresponding author: Agboola Olusegun Isaac.  
✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)  
Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.  
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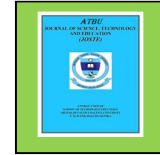
Creating a transition between a space's interior and exterior	Wherever possible, living and working areas should open up to outdoor areas such as terraces, courtyards, balconies, and gazebos, being set up in such a way that they ensure that people use these areas.
Uninterrupted line of view	When designing glass systems, deck railings, and other elements interrupt the nature landscape, it is imperative that the view be obstructed in any way.
Penetration of daylight	Practically-speaking, glass not only allow users to look outside, but they do so in such a way that they sync with the natural flow of light and shadow.
Providing functional windows	Those occupying the space should be able to take in the scent of the surrounding flora and to access clean air.
Creating green roofs	Low-pitched roofs should be transformed into green roofs, thus providing both visual and physical access.
Landscaping and interior spaces	The main idea of planting atria is bringing nature into buildings and to create a relaxing indoor environment for users. Atriums in hospitals, for example, seem both to promote patient healing as well as reduce patient stress. The atriums of such structures can be multi-storied, and should also contain walking paths.
Using green walls and other similar systems to treat air and water in buildings	Green wall systems remove air pollutants. Similarly, many buildings feature living systems that treat wastewater.
Adding water elements into buildings	Water elements can provide numerous visual and acoustic benefits.
Creating a sense of complexity in building design	The single most important element of biophilic design is the relationship between complexity and diversity within the natural structure.
Considering both spaciousness and shelter in building design	Architects/designers can create spaces with mimetic exteriors and places of shelter by alternating ceiling height, just as Frank Lloyd Wright's had done in many of his buildings.
Using organic forms in buildings	Architects/designers can integrate shapes and forms that integrate nature in order to add depth and diversity to spaces.
<b>INTERIOR DESIGN</b>	
Using potted plants in interiors	Using potted plants indoors allows users become more in touch with certain elements of nature.
Providing natural materials and natural art in spaces	Especially in cases where nature cannot be brought into the space, architects/designers might want to incorporate natural building materials and pictures/paintings depicting nature.
Setting up office spaces that provide users with a view of natural landscapes	Architects/designers should position work desks in offices in such a way that employees can see windows as well as make the most of natural light and other biophilic features.

Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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Emphasizing biophilic elements as part of the interior	From the angle of management and intelligibility, it is important that architects/designers draw upon signage and other makers in order to explain to users biophilic elements.
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**Biophilic Design in an Interior Spaces**

In El-Ghobashy and Mosaad, 2016, researches have shown that a good interior space is considered to be a space which has a sound ecology and gives productivity to the people living in it or using it by making them actives at their optimum. Innermost space of a building using a biophilic approach employs an advanced framework with the single goal of improving the practicality of the interior space of a built environment, and the successful application of a biophilic design in an interior space depends on the mindful adoption of the principles of biophilia with respect to the natural environment around the built environment which is meant to a practical and effective design and implementation of an interior space. They also stressed in addition that design in the context of biophilia of interior spaces is meant to make people understand and acknowledge the impact of the natural environment and its elements on their overall wellbeing, the importance and effect of biophilic designs is rapidly growing and this is influencing a lot of adoption of the biophilic design in interior spaces, there are concepts which are being adopted which are in line with the principles of biophilic design, with concepts such as the natural concept furniture and naturalistic influenced interior space designs. Furthermore, Biophilic interior design is often misinterpreted as a “green” interior design attimes, even though green interior design is an aspect of

biophilic design, it is not the only aspect on biophilic interior design, as the presence of greenery in an interior space is definitely therapeutic, but there are also other elements of biophilic interior design as it is discovered by Stankovic et al. 2018. Guo 2016, conducted an investigation which described a support to the assertion of interior spaces with biophilic design application having a positive visual form as well as advancing the wellbeing of people, biophilic designs are successful in drawing the attention of people which in turn generate a positive feeling towards the built environment’s interior space, the study also places emphasis on non-natural objects which have a naturalistic method to them such as realistic paintings also triggered positive responses in the participants of the study. His study adapts to the philosophies of some researches which have recommended the use of natural materials in an interior space of having a positive response and are able to lead to decrease of stress in people, and this is valid to both natural elements and simulated natural elements placed in an interior space, based off the three experience of nature according to biophilic design the manifestation of nature in interior spaces can be categorized as direct experience of nature, indirect experience and human nature relationship in interior spaces as it also aforementioned in Kellert and Calabrese research works.

**Table 4.** Approaches in Biophilic Design (Browning et al. 2020)

<b>Direct presence of nature in interior space</b>	Visual and non-visual connection Air and thermal variability Presence of water Natural light Plants
<b>Human nature relationship in interior space</b>	Sensory variability Prospect and refuge Ecological and cultural attachment
<b>Human nature relationship in interior space</b>	Sensory variability Prospect and refuge Ecological and cultural attachment

Corresponding author: Agboola Olusegun Isaac.  
 ✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)  
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### Sense of Place and its theory

Theory of sense of places in Abdallah's research thesis shown that sense of space is an architectural term used to describe the relationship between humans and space, this is often done within the context of the characteristics of the environment and the subjectivity of the imaginations of humans with the environment. It is safe to say sense of place is a subjective experience which may vary from one person to another, but it is noteworthy to understand it is very much influenced by the objective context of the environment. Mohammed et al. 2017. The empirical stand point on the subject of sense of place is based off the features of a place with regards to cognition of the place's components, such as the human variables and the environment itself, which further implies a space gets and finds meaning in what is contained within it; its elements, AbdallahA., 2021. Some scholars argue that long term interaction with place and memories that occur through could create attachment. People have the need to form attachment to many things. They not only form attachments to others but they also form attachment to the environment and places around them (Lewicka, 2010), (Morgan, 2009). Sense of place needs a careful and conscious selection of functional and symbolic characteristics in order to achieve the desired effect in a space, these characteristics include but are not limited to cultural characteristics of a people and their community. Also there is a notion to be a concept which entails of multidimensional conceptualization, this concept is said to be of features which are both physical and psychological, however it is also noteworthy that sense of space is a concept which is believed to be subjective with relation to the individual experience of the environment by a subject which is again predetermined by

### Case Studies: General Information on the Buildings.

**Table 1:** General Information on the Buildings

S/N	Case study name	Location	Project address	Project Type	Year of completion	Land Area	Height	Occupants	Constituent Function
1	Obafemi Awolowo	Accessed Through Adesoji Aderemi	Obafemi Awolowo	Academic Building	1986	4130	18m	Administrative and Domestic Staffs	Office, Administrative Purpose.

the persons cognition and behavior, hence the conclusion that the experience of sense of space by individuals heavily depends on the cognitive variable of an individual. Sense of place contains four individual dimension elements which are: personal/psychological elements, socio-cultural context elements, biophysical environmental elements and political/economic elements.

### METHODOLOGY

The proposed methodology of this research is the qualitative research methodology, an intensive literature review is proposed to be carried out with respect to the subject of this study, to understand the theories and framework of biophilia as an architectural design tool. Selected case studies will be reviewed and documented based on the collected data with regards to their implemented design and how they establish and enhance the sense of place in their respective spaces. The analysis of our case studies will follow observation and report of the attributes of biophilic architecture and design which fall under the experience of space and place; Nature in the Space, natural analogues, nature of the space and cultural/ecological attachment to place.

### FINDINGS AND DISCUSSION

This study has been proposed and carried out with the primary aim of reviewing the impacts of biophilic integration in an institutional building. In line with the goals and the methodology selected for the proposed study; qualitative analysis, case studies have been selected to be analyzed within the framework of the research topic. All selected case studies are university senate buildings which are carefully selected across the country.

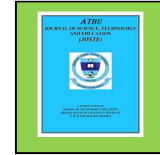
Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

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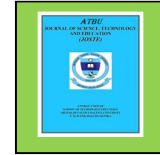
	University, Senate Building	Road (popularly Called Road 1) From The University Main Gate. This Means It The Focal Point On Approach To The Campus; Giving It A High Hierarchy Which A University Senate Building Should Possess.	University, Ile-Ife, Osun State, Nigeria, West Africa, Africa						
2	Ladoke Akintola University, Senate Building	The Senate building of the Institution is located at the core of the core the university, surrounded by motion ground, URP studio and faculty of Engineering Building.	Ladoke Akintola University, Osun State, Nigeria, West Africa, Africa	Academic Building	1986	xxxx	12m	Administrative and Domestic Staffs	Office, Administrative Purpose.
3	University of Lagos, Senate Buildings	The senate house complex is located at the centre of the	University of Lagos, Lagos State, Nigeria, West	Academic Building	1985	12000	18m	Administrative and Domestic Staffs	Office, Administrative Purpose.

Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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		academic core of the Akoka campus of the university, set against the backdrop of the lagoon and within a beautiful landscape that includes a park and a love garden, bounded by the arts lecture theatre to the west, advanced legal studies to the north, and the administrative building and Auditorium to the east.	Africa, Africa						
4	Federal University of Agriculture, Makurdi, Senate Buildings	Federal University of Agriculture, Makurdi (FUAM)	Federal University of Agriculture, Makurdi (FUAM)	Academic Building	1998	79500	12m	Administrative and Domestic Staffs	Office, Administrative Purpose.

**Table 2:** Observation Assessment of the Buildings

Parameter		Case Study	Very Weak	Weak	Fair	Strong	Very Strong
Nature In The Space	Visual Connection with Nature.	Obafemi Awolowo University, Senate Building	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		Ladoke Akintola University, Senate Building	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		University of Lagos, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
		Federal University of Agriculture, Makurdi, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
	Non-Visual Connection with Nature. (i.e smell, sound of water etc)	Obafemi Awolowo University, Senate Building	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		Ladoke Akintola University, Senate Building	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		University of Lagos, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
		Federal University of Agriculture, Makurdi, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
	Non-Rhythmic	Obafemi Awolowo University, Senate Building	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
		Ladoke Akintola University, Senate Building	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		University of Lagos, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
		Federal University of Agriculture, Makurdi, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>
	Access to Thermal & Airflow Variability.	Obafemi Awolowo University, Senate Building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>
		Ladoke Akintola University, Senate Building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>
		University of Lagos, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>
		Federal University of Agriculture, Makurdi, Senate Buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>
Dynamic & Diffuse Light. Connection	Obafemi Awolowo University, Senate Building	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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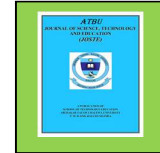
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Federal University of Agriculture, Makurdi, Senate Buildings			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>
	Material Connection with Nature.	Obafemi Awolowo University, Senate Building	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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		Federal University of Agriculture, Makurdi, Senate Buildings	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Complexity & Order.	Obafemi Awolowo University, Senate Building	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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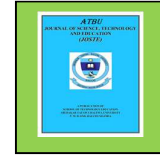
		Federal University of Agriculture, Makurdi, Senate Buildings	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nature of the Space	Prospect.	Obafemi Awolowo University, Senate Building	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Ladoke Akintola University, Senate Building	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		University of Lagos, Senate Buildings	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Federal University of Agriculture, Makurdi, Senate Buildings	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Refuge.	Obafemi Awolowo University, Senate Building	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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		University of Lagos, Senate Buildings	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Federal University of Agriculture, Makurdi, Senate Buildings	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Mystery.	Obafemi Awolowo University, Senate Building	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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		Federal University of Agriculture, Makurdi, Senate Buildings	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Risk/Peril.	Obafemi Awolowo University, Senate Building	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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**Table 3:** General Physical Condition

Case Study	Very Poor	Poor	Fair	Good	Very Good
Obafemi Awolowo University, Senate Building	○	○	✓	○	○
Ladoke Akintola University, Senate Building	○	○	✓	○	○
University of Lagos, Senate Buildings	○	○	○	✓	○
Federal University of Agriculture, Makurdi, Senate Buildings	○	○	○	✓	○

**The outcome of results on the case studies based on Visual Connection with Nature Non-Visual Connection with Nature**

The research shown that there is no relationship between landscape and architectural design of the building itself neither no ample space for occupants to enjoy the dynamic landscape. The circulation and building envelope have no additional benefit however increased direct glare to the workplace, check case study 4. This pattern reinforced office management practices, with each employee given no personal plant stipend to encourage indoor greenery, while there is no vegetable garden and test beds that could provide opportunities for employees to work directly with the landscape. Ecosystems of the courtyard, check case 4. were chosen to respond to the specific solar orientations and courtyard design further encourages seasonal interactions with an edible garden that helps keep occupants connected little plants check figure 3.

**The outcome of results on the case studies based on Non-Rhythmic**

No Views of tall grasses and passing clouds that offer motion that grabs the attention of occupants within the office. Present of plants from the surrounding gardens/landscape attract a range of local and migratory species, including dragonflies, moths, gnats, flies, and birds, including hawks, and even migrating monarch butterflies. The presence of plants, animals, and insects provide non-rhythmic sensory stimuli in the form of stochastic and ephemeral connections with nature (that may be analyzed statistically but may not be predicted precisely) and increase the landscape's ability to grab and hold occupants' attention. No large, operable, panoramic windows which could provide opportunity for random visual and auditory distractions which can lead to decreased mental

fatigue, restored concentration and increased productivity.

**The outcome of results on the case studies based on Access to Thermal & Airflow Variability**

According to sub parameter 3, findings indicated that the occupants are often discouraged from spending time inside because of the poor air quality aside mechanical system is on. The buildings give occupants opportunity to engage and depends on the building's utility systems and understand how natural systems support is significant.

**The outcome of results on the case studies based on Dynamic & Diffuse Light Connection with Natural Systems**

According to the table that analyzed the parameter, floor plans were designed not to captured and maximize daylighting in order to reduce energy requirements and meet net-zero energy standards. While the lighting design was conceived as an energy reduction strategy, hence this design failed to recognized its potential to have positive health impacts. The designer did not take advantage of the shape of the building, on case study 2 and 4. Dynamic glass is installed on the southern wall to address glare and brightness, on the case study 3. Directed light downwards, provide an optimal lighting environment while reducing electricity use.

**The outcome of results on case studies based on Presence of Water.**

The result shows that there is no presence of water however as water create experience to enhance through the capacity to see, hear, and touch. The sound of rushing water that emanates from natural or artificial fountains, accompanied by the gentle trickle from the water sculptures, drowns out unwanted

Corresponding author: Agboola Olusegun Isaac.  
✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)  
Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.  
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sound or noise and creates a tranquil environment that seems miles away from such sound. In addition, evaporation of the water features generates natural air conditioning. Sitting along the relief sculpture wall or on the lower level adjacent to the waterfall, visitors enjoy significantly decreased temperatures.

#### **The outcome of results on case the studies based on Biomorphic Forms & Patterns**

The result shown that wall dividers and carpeting to incorporate biomorphic patterns. The carpeting tiles have abstract, asymmetrical and shifting patterns that trick the eye into perceiving the pattern as random and derived from nature. Oriented strand pattern was used to create surfaces referencing the fractal patterns inherent in the wood. Symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature are expressed not only in the exterior form of the building, but throughout the interior spaces, in wall and floor detailing, furniture, and minutia.

#### **The outcome of results on case the studies based on Material Connection with Nature.**

Material choices play a significant role in the user experience of the space. Study indicated that all case studies lack this parameter in their designs as it is known that surface that are composed of materials and elements from nature minimal processing, reflect the local ecology and geology to create a distinct sense of place. No earth-toned materials were chosen to play off the natural colors of the surrounding landscape. From the exterior seating benches were not available which could also be made from local materials. Good materials selection creates, calming atmosphere, enhancing the main refuge pattern and good communication with the occupants that it is okay to stay more longer within and outer a space

#### **The outcome of results on case the studies based on Complexity & Order.**

All floor plans from each case study is composed of repeating shaped departments and connecting each department is self-sufficient and contains offices and auxiliary spaces. Presence of central light garden courtyards. The repeating spatial arrangements make case study 2 and 4 staffs to navigate

across the office and floors. Within each department, layout that allows occupants to navigate and feel a sense of ownership over their environment.

#### **The outcome of results on case the studies based on Prospect and Refuge.**

The result has shown from case study one to four that all occupants have a prospect view of at least 10 from a seated position although no tall glass windows which could provide even greater opportunities for prospect. This level of prospect is tempered with refuge spaces such as offices throughout the open floor plan. Conference rooms and meeting spaces are open to distant views across the office, while dividers separate the office floor plan programmatically but not visually. The building geometry supports a hierarchy to the prospect condition, with a variety of unimpeded views over a distance for surveillance and planning. The open floor plan on the main floor provides views out over the interior work environment, and to the courtyard in the center of the building.

#### **The outcome of results on case the studies based on Mystery.**

The report shown that the approach view of all aforementioned case study depressed and providing opportunities for exploration and discovery. This inconspicuous entryway can delight visitors with the experience of happening upon an unexpected slice of green in the midst of the environment. Predicting presence of artificial or natural fountain may draw draws visitors in and may prompt them to notice the beauty of nature. A bed of flowers lines facing the fountain or entrance, which visitors and occupants can now see cascades over multiple tiers into a pool that connects to the channel along a course atleast.

### **CONCLUSION AND RECOMMENDATION**

This study has explored how biophilic design philosophies and its strategies when properly implemented in an institutional building can change workability of the occupants. Review of literature studied indicates, Well-being in the work environment means that people feel happy, satisfied and at the best potential in terms of work productivity, when they do their jobs. Health is one of the outcomes

Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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of biophilic within a workplace that can be comprehended through a set of indications. However, the working environment can improve one's mental and physical health, if there is an element of nature introduced to the working environment [52]. Employees of all ages and specialties are desired for nature contact, whether direct or indirect. Staff satisfaction is linked to well-being within the working environment.

Vital Importance of improving employee's healthiness and wellbeing, biophilic design method is introduced in workroom design aiming to increase mental and psychological responses of its occupants. The philosophies stated in above chapters help to focus on the role of nature in improving human's health and wellbeing and deliver a better understanding of the process of translation of biophilia hypothesis into biophilic design principles. Works appraisal on biophilic design benefits in relation to mental, emotional, and physiological health is presented as well and a systematic study of some cases that better illustrate the integration of biophilic designs in office design is conducted.

Application several biophilic elements into an institutional building type, the workplace and provision of crucial phases of biophilic strategies in workplace design that connect our affinity to nature and design nature back into our built setting pointing to improve the employees' experience in workplaces in relation to their intellectual, psychological, and functional health. Furthermore, design interferences can be useful in further practices as a guide for spatial design of workrooms. In addition, study shall educate the measure and excellence of applied patterns, and biophilic design approaches in relation to environmental and climatic conditions shall be studied as well in advance study. Moreover, Architect shall consider sensorial and social requirements of building's users and not focus only on three-dimensional and artistic aspects of building design. This study has however hold out keys to a lot of these challenges to add to the body of knowledge. More still need to be done on this subject that not only residential or creative buildings need application of biophilic design theories but also institutional buildings.

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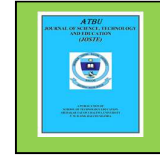
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Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

*Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.*

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Corresponding author: Agboola Olusegun Isaac.

✉ [segzyaa@gmail.com](mailto:segzyaa@gmail.com)

Department of Architecture, Lead City University, Ibadan, Oyo State, Nigeria.

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