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Biophilic Design In Educational Spaces: Enhancing Well-Being And Socioemotional Development

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Introduction

The physical space of a school has a significant influence on children's behavior and an impact on their cognitive abilities. Since the 1800s, classrooms have been set up with rows of desks that are aimed at the central teaching space in a rectangular room (Stock, 2024). In the modern age, most school programs have the same standardized type of design. While this can be cost-effective, it does not provide a proper enriching learning environment for those using the area. The stark, often uninspiring aesthetics and rigid layouts of many contemporary schools can, in fact, have detrimental effects on students, impeding their natural inclination towards curiosity, exploration, and emotional expression (Kazemi, 2025).

Elementary school architecture can be designed to be inclusive for learning while also having a positive influence on child development. Biophilic design in particular can be an effective way to maximize child development. "Findings reveal that factors such as biophilic design…enhance social interactions, a sense of belonging, creativity, and student vitality" (Kazemi, 2025, p.156). A promising avenue for achieving this transformation lies in the incorporation of biophilic design principles.

Significance

How can biophilic design be used to foster an enriching learning environment that supports student well-being and socio-emotional development? This study aims to identify how biophilic design can effectively increase environmental awareness, encouraging a deeper appreciation for ecological systems and promoting more sustainable behaviors and a greater sense of environmental stewardship. Furthermore, the study seeks to understand the profound impact of biophilic design on cultivating emotional and social intelligence, exploring how connections to nature can promote empathy, improve interpersonal relationships, and enhance self-awareness. The final objective is to examine the most significant ways that biophilic design can be strategically integrated to foster enhancements across child development. Specifically, the research will investigate how the incorporation of natural elements and principles within built environments can serve as a catalyst for boosting creativity and cognitive development, thereby enriching problem-solving abilities and innovative thinking.

Literature Review

The concept of biophilic design was first developed by social psychologist Erich Fromm in 1964, who defined it as a psychological attraction to all that is living and vital. It was popularized by Edward O. Wilson in the 1980s, who then defined it as an innate tendency to focus on life and realistic processes. Biophilic design has become more popular within the last few years in the field of architecture and design because it promotes a higher quality of life and reinforces sustainability (Tedjari, et al., 2024). This literature review focuses on how biophilic design, when used in elementary school architecture, can increase environmental awareness, social intelligence, and enhance creativity.

Environmental Awareness

Biophilic Wellbeing Systems Approach focuses on enhancing student wellbeing in an educational setting by fostering a deep connection with nature. Integrating this approach improves learning outcomes and emphasizes the interdependence of individual and planetary health. The profound connection between human society and nature is vital for both psychological and physiological well-being. Humans have evolutionary instincts that affect our interactions, decision-making, and more. Engaging with nature can fulfill innate needs for wellbeing, exploration, and harmonious coexistence with our environment. Children are greatly impacted by this balanced connection with nature, as it offers abundant sensory experiences that enhance their cognitive growth, fine and gross motor skills, and spatial awareness (Gray & Downie, 2024).

Social Development Through Emotional Intelligence

When designing an environment for children, it is important to consider how space can benefit a child developmentally. Aside from home, children spend a lot of their formative years in school. Thus, the physical environment of schools can play a large role in how they learn and develop socially and emotionally. The first few years in the life of a child are very important, as they create the foundation for how they will learn to navigate life. Learning to interact, empathize, and collaborate with others sets them up for more success in the future.

Biophilic elements such as natural plants, open views to the outdoors, and natural lighting can reduce aggression in children, enhancing independence and self-confidence. These positive behaviors can help boost social intelligence, which can directly impact interpersonal skills and improve overall learning outcomes. A space without biophilic elements can often lead to negative outcomes, such as a higher rate of depression among students and less active participation within classroom discussions (Kazemi, 2025).

Impact of Color and Texture

Studies have shown that color and texture specifications can have a positive impact on a child's development; it can help foster creativity, cognitive skills, and emotional well-being. Understanding the importance of color psychology is necessary to create a nurturing environment for children that is both easy to navigate but also provides a space for them to explore and play. Color choices can help reduce stress, promote well-being, improve productivity, and encourage creative thinking. For example, blue evokes the feeling of peace, lowering the heart rate and promoting focus; green offers a sense of vitality and encourages harmony; purple can signify wisdom and luxury. Pattern recognition and memory can be enhanced by the use of vibrant colors. Texture can act as a complement to design, as it influences the perception of space. In the school environment, earthy tones, such as greens and blues, as well as warm hues, like orange, are best to encourage social interaction, connection to nature, and reduce stress. Colors that reflect the local nature can help boost the connection between the students and their surroundings. There are certain colors that can be overused and cause detrimental effects to the classroom environment; bright colors can often hinder focus levels and create distractions for students. Red, although it can be seen as stimulating, can also lead to anxiety and feelings of anger (Falusi & Omale, 2025). When choosing a color palette for a space, it is important to be mindful of how they can affect the users that inhabit it.

Enhanced Creativity

Exposing children to natural elements, like wood, plants, or water, can assist in activating parts of the brain that generate ideas and daydreaming (Podrekar et. al, 2024). Further, the color green inspires creative thinking, whether that is with the use of plants or in the color palette (Falusi & Omale, 2025). Biophilic environments allow those who use the space to feel more calm and secure. With lower stress levels, creative expression is released. Another way creativity is enhanced through design is by natural forms and shapes. Rather than utilizing rigid shapes, like squares and rectangles, geometric patterns that occur in nature or curved spaces promote movement and collaboration (Tedjari et. al., 2024).

Case Studies in Primary Schools

Lisieux Catholic Primary School, Australia

The Lisieux Catholic Primary School in Australia is a prime example of how biophilic principles help foster an enriching learning environment and promote a deeper understanding of the natural world and the Aboriginal culture (Gray & Downie, 2024). For context, the Aboriginal Australians are the indigenous people that occupied the country around 50,000 years ago, one of the oldest cultures in the world (Berndt & Tonkinson). The design of the

school incorporates local fauna by naming teaching spaces after native species, such as Acacia, Golden Wattle, and Silver Banksia. The school is divided into four houses, which have been named after native birds. Throughout the design process, an Aboriginal artist, Norm Jurrawaa Stanley, designed a mural that represents these birds. The school collaborates with local Aboriginal Elders and artists to introduce a connection of this culture to the kids. A sacred possum skin cloak, created by Aunty Lisa Couzens, is worn by students during ceremonial events. We can also see a deep connection to this culture with the Beach Discovery Program, which offers a hands-on learning experience of local heritage and traditional ecological knowledge (Gray & Downie, 2024). By incorporating all of these thoughtful design elements and collaborations, this educational institute provides a suitable learning habitat for those to have a stronger understanding of the natural world and Aboriginal heritage.

The Green School, Bali

The Green School in Bali uses sustainable materials throughout the architecture of its building. By using bamboo and natural adhesives, they constructed a space that exhibits their deep understanding of nature and promotes environmental integrity. Bamboo is a great resource not only for sustainability purposes, but it also reflects the concepts of flexibility, solidity, and lightness. A structure at this school, known as the Arc, built in 2021, exhibits biophilic forms and patterns; it creates the ceiling structure of a gymnasium and wellness space. Biomimicry is the idea of combining design and the natural forms of biology. The concept of biomimicry is used in the design of The Arc, which resembles a mammal's ribcage that is stabilized by tensile membranes that function like tendons and muscles. The Heart of the school was designed after the nautilus spiral form; "These fluid, organic forms break away from traditional, rectilinear education spaces, to create a physical environment that inspires creativity and dynamic learning experiences" (Gray & Downie, 2024, p.600). The Green School showcases how utilizing biophilic design can enhance the relationship between the built environment and the natural world.

In these case studies, there is a direct connection with nature, as it is integrated into not only the structure, but in the educational programs as well. The Lisieux Catholic Primary School uses local fauna and provides access to the local environment to teach their students about the land around them and how to respect it. By collaborating with the Aboriginal elders and artists, they have been able to integrate cultural symbolism throughout the program, which boosts social awareness and emotional intelligence. The Green School uses sustainable materials and biomimetic architecture to teach the students about nature and how to work with it. They also emphasize

wellness by providing natural lighting. With the environment they created, it allows students to better regulate their emotions and boost their creativity.

Conclusion

Utilizing biophilic design principles can be a great way to transform educational architecture. By prioritizing the holistic development of children in combination with biophilic design, the school environment can provide access for students to feel more environmental awareness, a higher sense of social intelligence, and enhance creativity. This research provides information on how the school environment can better support users in a space; by moving beyond the standardized model of a typical school, architects have the opportunity to provide a space for both students and educators to grow in a multitude of ways.

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