



The background image shows a multi-level interior space of a modern building. A curved walkway with a dark metal railing and a perforated metal mesh panel runs across the upper part of the frame. Below it, a large window looks out onto a lush green landscape with trees. Several thick, vertical wooden columns support the structure. The lighting is bright and natural, coming from the window.

DAYLIGHTING AND BIOPHILIC DESIGN

HOW NATURE CAN BENEFIT THE LEARNING ENVIRONMENT

by Mark Mitchell

Since we're surrounded every day by cell phones and computer screens, we often forget that up until the industrial revolution, humans spent most of their time outdoors and were acutely connected to their environment. Indoor spaces were certainly important for shelter and other activities, but our connection with nature was immediate and integral to our survival. A recent EPA study shows that the average American spends nearly 90% of their time indoors. With our hereditary connections to nature, we can see why incorporating elements of nature into indoor spaces can have a beneficial impact on our well-being.



What is Biophilic Design?

The term “biophilia” was first coined by social psychologist Eric Fromm in his book *The Heart of Man*, and was later made popular by biologist Edward Wilson. Biophilia refers to the common human desire to interact and be associated with natural forms. From early cave drawings, to stone carvings in ancient Rome, to a fish tank in an academic advising office, we feel more comfortable when we are presented with cues from the natural environment.

But these cues don’t necessarily have to be quite so obvious. In “14 Patterns of Biophilic Design: Improving Health and Well-being in the Built Environment”—created by the environmental consulting and strategic planning firm Terrapin Bright Green, LLC—a number of biophilic elements are presented. Some of these include visual connections with nature, dynamic and diffuse light, complexity and order, thermal airflow and variability, and a few others like “refuge” and “mystery” that go beyond literal interpretations of nature. Several of these elements can tie well into a learning environment; daylighting design can help play a part.

Our Connection to Nature

Visual connections with nature are somewhat self-explanatory—giving building occupants access to views of the outdoors. This strategy is often incorporated into a design through the use of windows, mixed glazed wall systems, and skylights. Studies show that having access to views of nature brings about reduced stress, more positive emotional functioning, and improved concentration—all of which can be beneficial in education, office, and athletic-focused settings. But while natural views are beneficial, designers must also determine the impact and issues light might cause in terms of hot-spots and glare. These issues can necessitate systems that incorporate some type of light control, like a translucent glazing material mixed with transparent windows. Outdoor views, accompanied by light mitigation techniques, can be beneficial in allowing glimpses of the outside world while also reducing eye strain for those reading or using electronic devices.

The use of different types of glazing materials can also have an effect on the biophilic design element of “dynamic and diffuse light.”

This biophilic strategy states that designers should accentuate and/or mimic natural light patterns and incorporate them into interior spaces, bringing a sense of the natural world indoors—even when it’s not directly related to a view of the outside. This goal is accomplished by using light and shadow to stimulate the eye and grab attention. These light and dark patterns also help people’s bodies maintain circadian rhythm function by signaling the time of day. While pattern and variations in light are important, designers should also be careful not to create glare or discomfort from extreme light/dark transitions, as the ultimate goal is balance.

Dynamic lighting can take form and be implemented in a variety of ways. One example might be to utilize translucent panel skylights and wall systems to provide soft, diffuse natural light to the space, then highlight specific areas with accent lighting and work areas with task lighting. Such a lighting array would allow for a variety of brightness and tones to help create visual interest while still being practical enough for a variety of uses.



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Daylighting systems can also be tied to another area of biophilic design—complexity and order. An empty space doesn't make us feel comfortable or relaxed, yet a space that's cluttered can make us feel additional stress. When spaces achieve a middle ground—something that is complex in design or pattern but also ordered—we feel more balanced. While there are many ways to achieve this balance, from floor tile designs to wall coverings, the patterns created by daylighting systems can also come into play. Translucent panel daylighting systems, for example, feature an internal grid core that is very geometric and can be both complex and ordered in design. Incorporating these types of systems, or mimicking their patterns in other elements of the design, has been shown to be beneficial to our mental well-being.

Beyond light, we also perceive natural patterns associated with airflow and the variability of air movement. Studies show that people tend to favor some variability in their indoor environments. According to Attention Restoration Theory, elements like light breezes or other natural movements can improve concentration. Other research indicates that introducing a variety of thermal conditions



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within a classroom can lead to better student performance. In these instances, a wall system with operable windows could be beneficial, as it would allow for user control of ventilation and provide some natural stimuli.

Biophilia also brings other “out-of-the-box” ideas into the design realm—topics like “refuge” and “mystery.” Refuge can best be described as a place where occupants can withdraw from the chaos of a space—something like a library cubicle or study

nook might be good examples. Also tying into this sense of refuge is another tenet of biophilic design, and that’s “mystery.” As humans, we’re intrigued by puzzles and are drawn into spaces that make us think and react. One way to achieve this sense of mystery is by partially obscuring views into interior spaces through the use of translucent panels or similar materials. Our brains are tuned to decipher the scene, and when we do so does we’re more engaged by the space and our surroundings.

Making a Change

Biophilic design includes a number of elements, and this overview has only touched on a few, but the connection between access to the outdoors and nature-inspired cues and our well-being and overall mood are clear. Striving for some type of synergy between indoor and outdoor spaces make sense—whether via a skylight or wall system that brings in natural light, an interior partition that provides a sense of privacy and refuge, or integrating operable windows into a space to allow for ventilation control. If done properly, students, faculty and staff all stand to benefit from this change in scenery.



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