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Environments



THE BENEFITS OF DAYLIGHTING IN ARCHITECTURAL DESIGN

Daylighting in Education and Sports Facilities

There is a wide body of research evidencing the profound impact that daylighting can have on human performance. However, did you know that **children under 18 have a higher sensitivity to light than adults**, and the lighting quality can have a notable effect on their learning rates, mood and activity levels in and out of school hours?

In this article, we'll explore why daylighting is so fundamental for effective education and sports facilities, the considerations that must be factored into specifications, and how some schools in the United States are creating inspiring facilities for their students.

Daylighting and Pupil Performance

In 1999, **Heschong Mahone Group** released the results of its landmark study into the connection between daylighting levels in classrooms and academic achievement. It examined 21,000 school records from three school districts in three states and daylighting conditions in over 2,000 classrooms. It found that students who worked in spaces with high levels of daylight progressed 20% faster in math tests and 26% faster on reading tests than those working with the least amount.



From here, the body of studies into how exposure to natural light can positively influence student health, wellbeing and performance has grown, further compounded by research in other settings such as workplaces and healthcare facilities. For example, research has shown that students demonstrate **significantly higher oral reading fluency when exposed to high intensity light, with especially positive results for students that could be considered 'at risk.'**

Students exposed to the natural colors and rhythms of daylight are also **less likely to make errors and show higher levels of concentration.**

All these things are easily transferrable to sports facilities, which require students to demonstrate considerable readiness to engage with their surroundings and peers. Incorporating natural daylighting strategies can also help to create bright, energetic spaces that set a positive tone for both the participants and spectators of all kinds of exciting indoor sports — from basketball to gymnastics.

There are several reasons why daylighting and education go hand in hand:

- Daylight from windows and skylights is more diffused than electric lighting, creating more even illumination of objects and people.
- Electric lights, particularly those containing fluorescent tubes, can also have a noticeable flicker that is distracting and can result in headaches and eye strain.
- As natural daylight contains all the color wavelengths visible to the human eye, it is the ideal lighting source for color rendition, helping students to better understand and engage with various educational resources.
- Humans are programmed to be more active and alert during daylight hours, tiring as it becomes darker. Therefore, access to high levels of natural light will reinforce children's natural circadian rhythms, making them feel more alert during the day and consequently sleep better at night.
- Exposure to natural light offers numerous other health benefits, including improved mood and reduced absenteeism. It helps eliminate certain viruses, supports vitamin D production, and alleviates symptoms of seasonal affective disorder (SAD)¹.



Any daylighting solutions must also work with the overall design scheme for the buildings, enhancing their look and feel to create inspiring spaces for personal development.

¹Mead, M. N. (2008). Benefits of sunlight: A bright spot for human health. *Environmental Health Perspectives*, 116(4), A160-A167.
Penckofer, S., Kouba, J., Byrn, M., & Estwing Ferrans, C. (2010). Vitamin D and depression: where is all the sunshine?. *Issues in Mental Health Nursing*, 31(6), 385-393.

Five Key Considerations for Daylighting Solutions in Education and Sports Facilities

1. Diffusion

Natural light is extremely variable and requires careful management. While artificial lighting can help to meet the demand in times of low light, excessive levels of sunlight can cause disruptive glare. In classrooms, this can result in teachers counteractively having to pull down the blinds and turn on the lights.

In sports facilities, this may render the space unsafe, especially where contact sports are being played. Daylight solutions can be specified with translucent glazing or blinds to provide glare-free and shadow-free illumination.

2. Solar Heat Gain Prevention (Solar Heat Gain Coefficient -SHGC)

Similarly, too much direct sunlight can cause 'hotspots' which can be uncomfortable and disrupt learning or play. For example, in a classroom setting, students may need to be moved around the space or the teacher may have to open windows, potentially causing further thermal or acoustic disruption.

Choosing skylights or tubular daylighting devices (TDDs) with glazing that can limit heat gains, or incorporating shading methods into the design of the building — either via dedicated solutions such as brise soleil or architectural or landscaping strategies — can help to prevent this issue.

3. Robustness

With their heavy usage, education and sports facilities have to work hard. It is also vital that they remain safe structures, protecting occupants and contents from the elements or unauthorized individuals trying to enter the building. Therefore, any daylighting product specified must be robust enough to stand up to the local requirements.

Daylighting systems also need to stand up to everyday use and abuse from students, sporting activities and more. Whether you're looking to add daylight to a hallway, classroom, gymnasium or natatorium, be sure to consider both the glazing material used and system placement to ensure optimal performance.

4. Longevity

In addition to being structurally sound, it is also important that the chosen daylighting products can provide reliable high quality light transmission for their lifetime. As well as ensuring they are regularly cleaned and maintained, specifying solutions that are UV-resistant can help to maintain not only light transmission but the quality of light coming through the glazing, since studies have shown that how colors and shades are perceived can lead to reduced energy, negative moods and lower productivity in students.

5. Aesthetics

Any daylighting solutions must also work with the overall design scheme for the buildings, enhancing their look and feel to create inspiring spaces for personal development— whether that's in the classroom or on the courtyard. With a wide range of both wall light, skylight and tubular daylighting options, designers have the freedom to find the best options to fit within their project's aims, architectural context and desired aesthetic.





Case study: New London Educational Learning Center (ELC), Minnesota

The New London Educational Learning Center (ELC) was specifically designed to provide up to 50 students with additional learning and behavioral needs with a safe, functional, and aesthetically pleasing environment to learn and play.

Ensuring effective daylighting throughout the learning and sports facilities was central to this strategy. However, there were several challenges to overcome, such as how to bring in daylight to spaces where traditional windows or skylights were not viable and — most critically — how to illuminate the recreation area which also serves as the building's storm shelter.

The design team, led by Hay Dobbs Architects and BCI Construction, collaborated closely with Solatube distributor Daylight Specialists to integrate 12 Solatube SolaMaster 750 DS-O TDDs in the gym. The 750 DS-O complies with Minnesota's strict building codes, meeting both ICC 500 and FEMA P-361 standards. This makes it the optimal choice for storm shelters, with no need for costly protective measures.

In addition to meeting the required structural standards, the Solatube TDDs allowed each space to be infused with diffused daylight, whilst blocking out UV-rays — a vital consideration for UV sensitive students.

[Explore the full case study here.](#)

“I found myself looking for a light switch to turn off before realizing the brightness was simply natural daylight!”

BCI Construction's Project Manager, Jennifer Colton

By utilizing both translucent wall and skylight systems, the campus is illuminated with soft, diffused natural light.



Case study: Grover Cleveland Charter High School, Los Angeles

PBWS Architects created a comprehensive modernization of Grover Cleveland Senior High School, transforming the 1961 campus into a contemporary and light-filled 21st-century learning environment that pays homage to its mid-century heritage while improving campus life for both students and faculty through biophilic design—all while meeting the school district's stringent requirements for security, ease of maintenance and durability.

To assist in bringing natural light into the new spaces, as well as being true to the biophilic design goals, PBWS Architects used Kingspan Light + Air's UniQuad® wall systems, QuadSpan™ translucent skylights and Briteway® canopies alongside other materials. These modern systems helped create clean lines that complement the facility's external geometric design while providing effective daylighting throughout the campus. The design team also used UniQuad® wall systems around classrooms and seating areas where students will congregate to provide ample natural lighting without excessive glare.

Kingspan Light + Air products are engineered for long-term durability and can be custom designed to fit your project's needs, including easy maintenance. The translucent walls and skylights feature removable skin technology, which is particularly useful in situations where access to a system is limited or challenging. With removable skin technology, individual exterior or interior panels can be removed and replaced without disturbing the surrounding panels or structure—making maintenance and replacement easier.

By utilizing both translucent wall and skylight systems, the campus is illuminated with soft, diffused natural light, avoiding harsh glare or heat caused by direct sunlight. Additionally, the exterior canopy shields students, faculty and staff from the weather while creating a bright and welcoming multi-use space.

[Explore the full case study here.](#)

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