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WHY WE DO WHAT WE DO

The Impact of School Facilities on Student Engagement

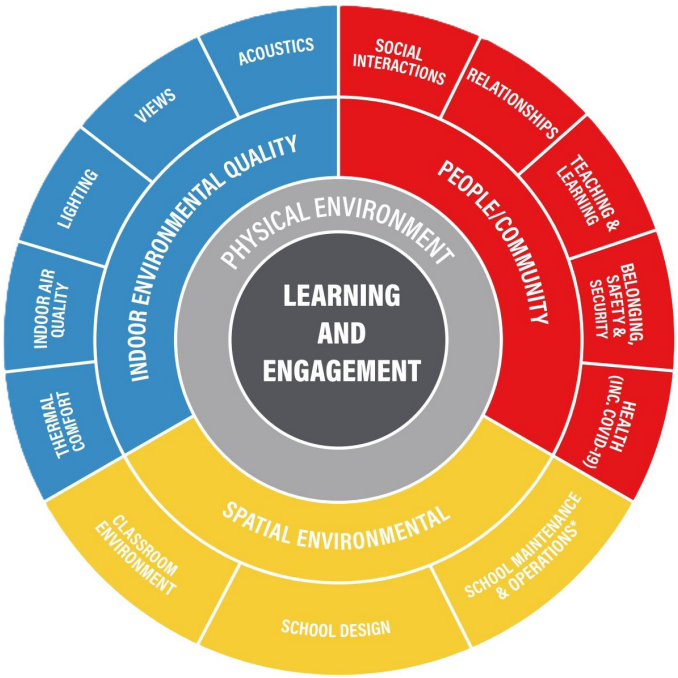
As a firm of designers who focus on creating learning environments, we know the design of educational facilities plays a pivotal role in shaping the learning experiences and outcomes of students.

INTRODUCTION

Historically school design has evolved out of experienced-based efforts by architects, school planners, and educators and has functioned to fulfill immediate and community local needs. Professional organizations have typically been a sounding board and a place to share best practices. Until recently, rigorous academic studies looking at the impacts of the built environment on learning have been few and not necessarily focused on performance outcomes.

As a firm of designers who focus on creating learning environments, we know the design of educational facilities plays a pivotal role in shaping the learning experiences and outcomes of students. By integrating research-backed design principles, we can cultivate spaces that inspire creativity, support diverse learning needs, and empower students for long-term success. The evidence reinforces the philosophy of designing with purpose—why we do what we do matters more than ever in shaping the next generation of learners.

Recent studies by the NetZED Case Study lab of the University of Oregon, and the California School Facilities Research Initiative have captured results from 750 peer-reviewed papers, reports, books and literature. These are organized into three sub-categories as they impact learning, engagement and performance and are summarized as follows:



INDOOR ENVIRONMENTAL QUALITY (IEQ)

1 Indoor Environmental Quality (IEQ) refers to all the factors that influence the occupants' sensory experience of place and includes thermal comfort, indoor air quality (IAQ), lighting (daylighting and electric), views, and acoustics.

KEY HIGHLIGHTS:

THERMAL COMFORT

- There is evidence that children prefer cooler temperatures than adults
- Thermal distraction, discomfort, and physiological responses may decrease student performance

Wargocki & Wyon (2007) found that reducing the air temperature in classrooms from 77ºF to 68ºF significantly improved the performance of children schoolwork in numerical, language, concentration, and logical thinking tasks in terms of speed ($p<0.05$).

INDOOR AIR QUALITY (IAQ)

- Increased ventilation rates increase student performance and low ventilation rates hinder concentration and performance
- Pollutants and microbes in schools are linked directly to student performance

Fisk (2017) found compelling evidence on an association of increased student performance with increased ventilation rates to as much as 15%.

Bako-Biro et al. (2012) developed 16 interventions in classrooms changing ventilation rates from 1L/s to 8L/s. Students' performance increased in choice reaction (2.2%), color word vigilance (2.7%), Picture memory (8%), and word recognition (15%) with the intervention.

VIEWS

- Views of nature decrease stress and increase student performance
- A good view out of windows is significantly associated with better student learning
- Indoor plants have a positive impact on student attention and perception of the classroom

LIGHTING

- Access to daylight and windows positively impacts student performance scores
- Lighting produces non-visual effects associated with mood and behavior

Li, D., & Sullivan, W.C. (2016) found that when comparing classrooms with now windows, barren windows, and windows with views of vegetation, students' attentional capacity was 14.33% higher in windows with views of nature than the other two combined and had an increase in 13.12% in attentional functioning. They also found that stress reduction was 1.36 units higher in the window with a view, when compared to the barren condition, and there was no significant difference between the no window and barren condition.

ACOUSTICS

- Children are a high-risk group for chronic noise exposure
- Poor acoustics affect students' learning and communication
- High reverberation times and background noise decrease student performance

SPATIAL ENVIRONMENT

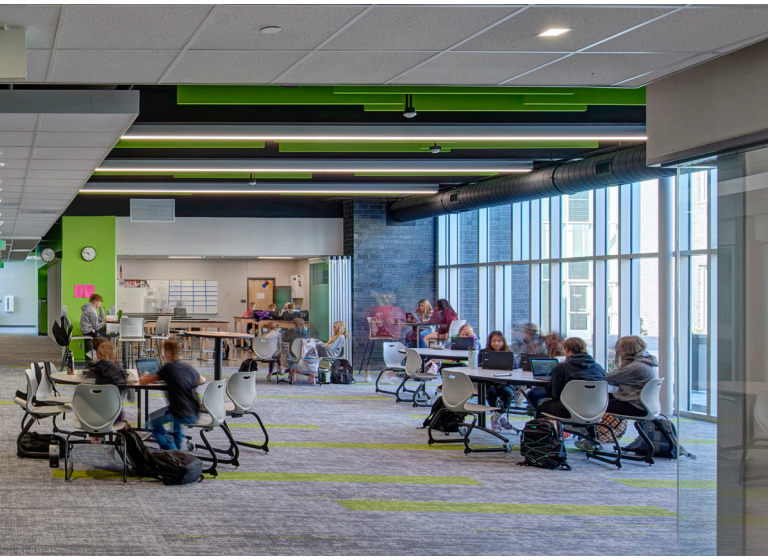
2 Spatial Environment includes school design characteristics of a building and grounds, school operations of building systems and surroundings, as well as the spatial design of classrooms and within classrooms such as furnishings and arrangements.

KEY HIGHLIGHTS:

SCHOOL DESIGN CHARACTERISTICS

- Schools' outdoor greenspace has a significant positive impact on health, learning and academic achievement.
- Schools should be flexible and accommodate for a variety of learning situations and activities: social/ private, noisy/quiet
- Less dense classrooms are related with increased student ownership and better student-teacher connection

Kuo et al. (2019) found that nature-based learning increased interest in uninterested students, improved grades, reduced dropout rates, disruptive episodes and helped to close income-related gaps. In group settings, nature allowed for less fidgeting for students with attention disorders, allowing for less distraction and a better learning environment. Low-performing students improved and increased leadership skills in nature-based environments.



SCHOOL MAINTENANCE & OPERATIONS

- Ventilation investments are a necessary and long-lasting measure to prevent COVID-19 and support student performance and general health
- Building disrepair has been associated with student performance and absenteeism

Mendell et al. (2013) calculated that by increasing California schools' average ventilation rates to the state standard, school absence would decrease by 3.4% in the state. This upgrade would cost $4 million, but they could increase annual attendance-linked funding by $33 million, making the upgrades cost effective.

A report from the John Hopkins School of Public Health (2021) concluded that ventilation investments can be cost-effective, and better than deep cleaning as a measure to prevent COVID-19. Investing in healthy air now can create benefits that outlast the pandemic.

CLASSROOM ENVIRONMENT

- Flexible learning spaces allow students to be less sedentary, enable improved student performance, but may present pedagogical challenges
- Classrooms that incorporate technology, such as Active Learning Classrooms may increase student engagement and performance
- Ergonomic furniture positively impacts student health

PEOPLE AND COMMUNITY

3 People and Community include social interactions, relationships, teaching/learning, belonging, safety and security, health, and recent innovations and impacts of the design planning around the pandemic.

KEY HIGHLIGHTS:

SOCIAL INTERACTIONS

- The influence of the greater community around the school indirectly impacts the student due to the economic, social, and physical stressors on parents, teachers, and school staff
- Neighborhoods and built environment surrounding the school can create spaces for youth to participate in activities which have shown to help develop social-emotional health and encourage prosocial behaviors
- Creating and sense of community with strong access to services helps children to engage in healthy behaviors

RELATIONSHIPS

- Teacher support (training, physical space, and supportive relationships) contributes to a better workplace and effective teaching
- The student-teacher relationship is key in supporting social-emotional learning, encouraging prosocial behaviors, and creating more engaged and motivated learning
- When students feel supported, have a sense of belonging, and have opportunities to engage in activities, they can have increased well-being as well as better completion and academic outcomes

Research supports the importance of symbols in the school and classroom. For example, women of color in science can signal a space of belonging for female students studying computer science. In addition, highlighting student achievements can influence student performance and aspirations by improving student outcomes, increasing engagement and reducing disruptive behavior (Cheryan, et. al. 2014)

BELONGING, SAFETY, AND SECURITY

- Safety and security encompass the environmental and spatial visual cues from departure from the home, on the way to school and on school grounds and the physical building
- Students who feel a sense of ownership and belonging to the school and community have social and academic success as well as long-term trajectories of individual well-being and contributions to society
- Familiarity with the physical layout and uses of school buildings encourages activity that contributes to the feeling of community and pride in the school, also yielding a sense of security during emergencies

Many studies suggest that school belonging and academic achievement measured with longitudinal and cross-sectional samples have a significant positive relationship. It has also been shown that school belonging is associated with higher levels of academic engagement. (Allen, et al., 2017)

TEACHING & LEARNING

- Teachers need flexible and adaptable teaching spaces to accommodate changing pedagogy, new cohorts, as well as enhancing creativity for learning experiences
- Physical space for positive interactions as well as visual promotion of activities, awards, and future aspirations contribute to school belonging
- Engagement and motivation, social and emotional skills, and prosocial behavior which encourages learning is influenced by the relationship of people, physical space, and time

HEALTH AND WELL-BEING

- Buildings and grounds used within and outside of school hours contribute to student well-being, increased physical and mental health, positive relationships, and increased access to student services
- The number of students participating in high-risk and unhealthy behaviors can be decreased by having monitored activities in and out of school hours
- The long-term and educational trajectories of youth can be influenced by the school community and resources it provides

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