

## **RESEARCH BRIEFS:**

### **THE CONNECTION BETWEEN THE CONDITION OF SCHOOL FACILITIES AND STUDENT ACHIEVEMENT.**

#### **Safety and Security**

- A safe school environment is crucial to the healthy academic and social development of students and it is, most importantly, a student's perception of safety which effects their academic achievement. (Readiness and Emergency Management for Schools, 2015)
- When students feel safe, they are better able to focus on learning, which in turn leads to increased academic achievement. (Readiness and Emergency Management for Schools, 2015)
- Student attendance is positively or negatively impacted by students' perceptions of being safe or unsafe at school. (British Research Association, A Review of the Literature, Benjamin Kutsyuruba, 2015)
- Students who do not feel safe at school tend to score lower on reading, math and science tests than their peers. (A Review of the Literature, Benjamin Kutsyuruba, 2015)
- Insofar as teaching, attendance, assessment and evaluation are important aspects in the overall students' academic achievement picture, they are all governed by the way students feel in their school environment. School security issues that are not hospitable to learning are detrimental to student achievement. (A Review of the Literature, Benjamin Kutsyuruba, 2015)
- The institutional environment (physical surrounding) and classroom design are essential areas of focus when identifying safety and security issues for students. (Florida Safe School Design Guidelines, 2015)

- The quality of school physical buildings has been related to student attitudes and behaviors, including vandalism, suspensions, disciplinary incidents, violence and smoking in research findings. Additionally, research demonstrates that there is a clear link between environmental quality of schools and educational performance. (A Review of the Literature, Benjamin Kutsyuruba, 2015)

### **21st Century Classrooms**

- The signature characteristic of 21st century schools is “students at work” with the teacher as the facilitator. School renovations, repairs and new construction must focus on the needs of the 21st century learner and the world of work they will enter after they leave the classroom. (21st Century Skills; The New Learning Environment, Bob Pearlman, 2010)
- Classrooms will be designed or reconstructed to be flexible environments in terms of space and furnishings to allow the teacher to serve as a facilitator. The classroom space will invite and support creativity, critical thinking and performance based learning. (21st Century Skills; The New Learning Environment, Bob Pearlman, 2010)
- Flexible settings will support project based work, cooperative/ collaborative learning, peer tutoring, group projects, problem solving, and movement. (21st Century Skills; The New Learning Environment, Bob Pearlman, 2010)
- Space for technology integration, ubiquitously available when and where needed. Work stations will be available, providing areas for independent study. (21st Century Skills; The New Learning Environment, Bob Pearlman, 2010)
- Multi-room sharing and collaborative environments will lend themselves to interdisciplinary projects, team teaching and will maximize space. (21st Century Skills; The New Learning Environment, Bob Pearlman, 2010)

- Well lit classrooms and lighting controls easily accessible to the teacher will compliment the technological needs of the 21st century classroom. (21st Century Skills; The New Learning Environment, Bob Pearlman, 2010)
- Electric outlets, and furnishings with outlets will meet the needs of student technology in the classroom. (21st Century Skills; The New Learning Environment, Bob Pearlman, 2010)

### **Thermal Control, Ventilation and Indoor Air Quality**

- There is a large body of research measuring and evaluating the impact of thermal control, ventilation and IAQ in the classroom with concrete and consensual results. (Designing Classrooms to Maximize Student Achievement, Cheryan, Ziegler, Plout, Meltzoff, 2014)
- The greatest building condition variable that influences achievement is air conditioning. (School Facility Conditions and Student Academic Achievement, Earthman, 2002)
- The ideal temperature range for effective learning in reading and mathematics is between 68 and 74 degrees Fahrenheit. Temperatures above 74 degrees adversely effect reading and math skill instruction and learning. (School Facility Conditions and Student Academic Achievement, Earthman, 2002)
- Maintaining adequate ventilation and thermal comfort in classrooms provides an optimal environment for successful learning and progression for students of all ages and supports daily attendance. (Center for Evaluation and Education Policy, 2015)
- When classrooms are not maintained within the narrow band of temperature and humidity tolerances, there are more reported cases of student illnesses than in properly controlled thermal classroom environments. (School Facility Conditions and Student Academic Achievement, Earthman, 2002)

- Upgrades to heating, ventilation, and air-conditioning (HVAC) systems correlate significantly with thermal comfort and students' measurable academic achievement. (School Facility Conditions and Student Academic Achievement, Earthman, 2002)
- Poor indoor air quality results in increased student absenteeism due to illnesses, including asthma. This attendance issue, in turn, effects student achievement. (Center for Evaluation and Education Policy, 2015)
- Adequate thermal control and ventilation has a positive psychological impact on the student and teacher, and conversely, inadequate thermal control can have a negative impact on instruction, morale and achievement. (Effects of School Facility Quality on Teacher Retention, National Clearinghouse for Educational Facilities, 2014)

### **Lighting**

- Classroom lighting plays a particularly critical role in student performance and development. In schools, light enables visual performance, regulates alertness and is essential for cognition and mood in students. (Investing in our Future, Jauregui, Herbert, Chmielwski, 2018).
- Inefficient lighting in schools can result in impaired visual performance, tracking and literacy issues.(Illuminating the Effects of Dynamic Lighting on Student Learning, Mott, Robinson, Walden, 2012)
- Inadequate or inappropriate lighting can be the cause of headaches, stimulates hyperactivity, and effects mood. (Illuminating the Effects of Dynamic Lighting on Student Learning, Mott, Robinson, Walden, 2012)
- Studies agree that appropriate lighting improves student achievement and test scores, reduces off task behavior and plays a significant role in the overall school experience for students. (Center for Evaluation and Education Policy Analysis, 2015)

- Students exposed to more natural light (sunlight) in their classrooms progressed faster, academically, than students exposed to less natural light. (Center for Evaluation and Education Analysis, 2015)
- The higher the amount of natural lighting in a classroom or artificial light that mimics natural lighting, the greater the students' overall health and attendance. (Learning Environments: Why Learning Space Matters, Ramona Persaud, 2014)

### **Acoustics**

- Adequate acoustical quality in classrooms is critical for student achievement. Research has shown that proper and accurate hearing is essential to students' ability to learn and process information. Exposure to excessive noise effects student progress at every level in school and a large body of research provides evidence to support this finding. (Green Schools National Network: Attributes For Health and Learning, 2007)
- Excessive noise can interfere with learning by effecting memory and acting as a distraction that impairs students' ability to pay attention. The ability to pay attention is most important when students are engaged in tasks that demand higher mental processes, such as new concepts, or when teachers are presenting new or complex information. (Green Schools National Network: Attributes For Health and Learning, 2007)
- Excessive background noise in a classroom can come from outside the building (aircraft, traffic, lawn mowers and other equipment, or students engaged in outside activities such as sports) or from within (heating, ventilation, air conditioning, adjacent classrooms, hallways, gymnasiums or music rooms). It may also come from the students themselves. The level of residual noise from the students may be dominant, but is strongly related to the ambient noise in the classroom. That is, the student chatter may increase as the general level of ambient noise increases. Thus, it is important to minimize all other sources of noise to ensure lower levels of student noise. (Green Schools National Network: Attributes For Health and Learning, 2007)

- Effects of excessive background noise and/or reverberation on students' listening, learning and behavior has been significantly researched and documented. Auditory immaturity causes young children to experience greater listening problems and less coping ability than the mature auditory system of adults and is often a reason for academic progress issues. (Green Schools National Network: Attributes For Health and Learning, 2007)
- Speech perception studies have investigated how interference from noise and reverberation influences the recognition of syllables, words, or sentences in classrooms, requiring efficient acoustics, especially in the K-2 classrooms when these critical skills are being taught and listening, hearing, speaking and reading skills are being developed. (Green Schools National Network: Attributes For Health and Learning, 2007)
- Noise distraction is a cause of tension, distraction and emotional distress in some students. (Center for Evaluation and Educational Policy Analysis, 2015)
- Studies have concluded that students perform higher on math and reading tests when extraneous noise levels are minimized. (Green Schools National Network: Attributes For Health and Learning, 2007)

### **In Summary**

#### **How do school buildings contribute to student achievement?**

Quality school buildings have a direct, positive, and measurable impact on student performance when:

- They are built to maximize student security and safety in today's unpredictable world. When students know they are in a safe space, they can better focus on learning and will attend school regularly.
- They offer learning spaces that are inviting, flexible, comfortable and meet their 21st century learning needs.
- They provide light, acoustics, ventilation, and air quality that directly impact learning.

- They provide technology and technology integration that optimize instruction and prepares students for today's workplace.
- They communicate to students that their community values education.

### Attributions

Investing in Our Future, How School Modernization Impacts Indoor Environmental Quality and Occupants: H. Jauregui, K. Herber, and E. Chmielewski, 2018

Florida Safe School Design Guidelines, Strategies to Enhance Security and Reduce Vandalism: Florida Department of Education, 2003

Design for Learning Forum, School Design and Student Learning in the 21st Century-A Report of Findings, 2005

Designing Classroom to Maximize Student Achievement: Sapna Cheryl, Sianna A. Ziegler, Victoria C. Plaut, Andrew Meltzoff, 2014

Acoustical Quality, Student Learning, and Teacher Health in Green Schools: Attributes for Health and Learning, 2007

Relationships Among School Climate, School Safety, and Student Achievement and Well-being: A Review of the Literature, Benjamin Kutsyuruba, Don Klinger and Alicia Hussain in Review of Education, 2015

Illuminating the Effects of Dynamic Lighting on Student Learning, Mott, Robinson, Walden, 2012.

21st Century Skills; Designing New Learning Environments, Bob Pearlman, 2010

Learning Environments: Why Learning Space Matters, Ramona Persaud

National Best Practices Manual for Building High Performance Schools: <http://www.doe.gov/bridge>

Effects of Classroom Ventilation Rate and Temperature on Students' Test Scores, Ulla Haverinen-Shaughnessy, Richard Shaughnessy: <https://pubmed.ncbi.nlm.nih.gov/263176431>

Student Perceptions of Safety and Their Impact on Creating a Safe School Environment, Readiness and Emergency Management for Schools (REMS) Technical Assistance (TA) Center: [info@remstacenter.org](mailto:info@remstacenter.org).

Effects of School Facility Quality on Teacher Retention, 2004, National Clearinghouse for Educational Facilities: [www.ncef.org](http://www.ncef.org)

New Research: Effects of Indoor Environmental Quality on Students' Test Scores and Health, Green Schools National Network, 2016: <http://greenschoolsnationalnetwork.org>

The Importance of School Facilities in Improving Student Outcomes, Center for Evaluation and Education Policy Analysis, 2015: <http://sites.psu.edu/ceepa/2015/06/07>

School Facility Conditions and Student Academic Achievement, Glen Earthman, 2002: [www.ucla-idea.org](http://www.ucla-idea.org)

Center for Evaluation and Education Policy Analysis, <https://sites.psu.edu/ceepa/2015/06/07/the-importance-of-school-facilities-in-improving-student-outcomes>

-----

This research report was compiled by Kerry Eshleman of Voss & Associates.