

Back to the Future

Maintaining Healthy Schools Beyond COVID-19



IASBO Annual Conference

May 2022 - Schaumburg

 #iasboAC22



STRONGER TOGETHER. SMARTER TOGETHER.

Introductions

Stuart, Brodsky, AIA: Speaker

- *Principal, PK-12 Education, Wight & Company*



Arden Herrington: Speaker

- *Senior Account Manager, Frank Cooney Company*



Steven Kowalski: Speaker

- *Business Development Manager, Performance Services Inc.*



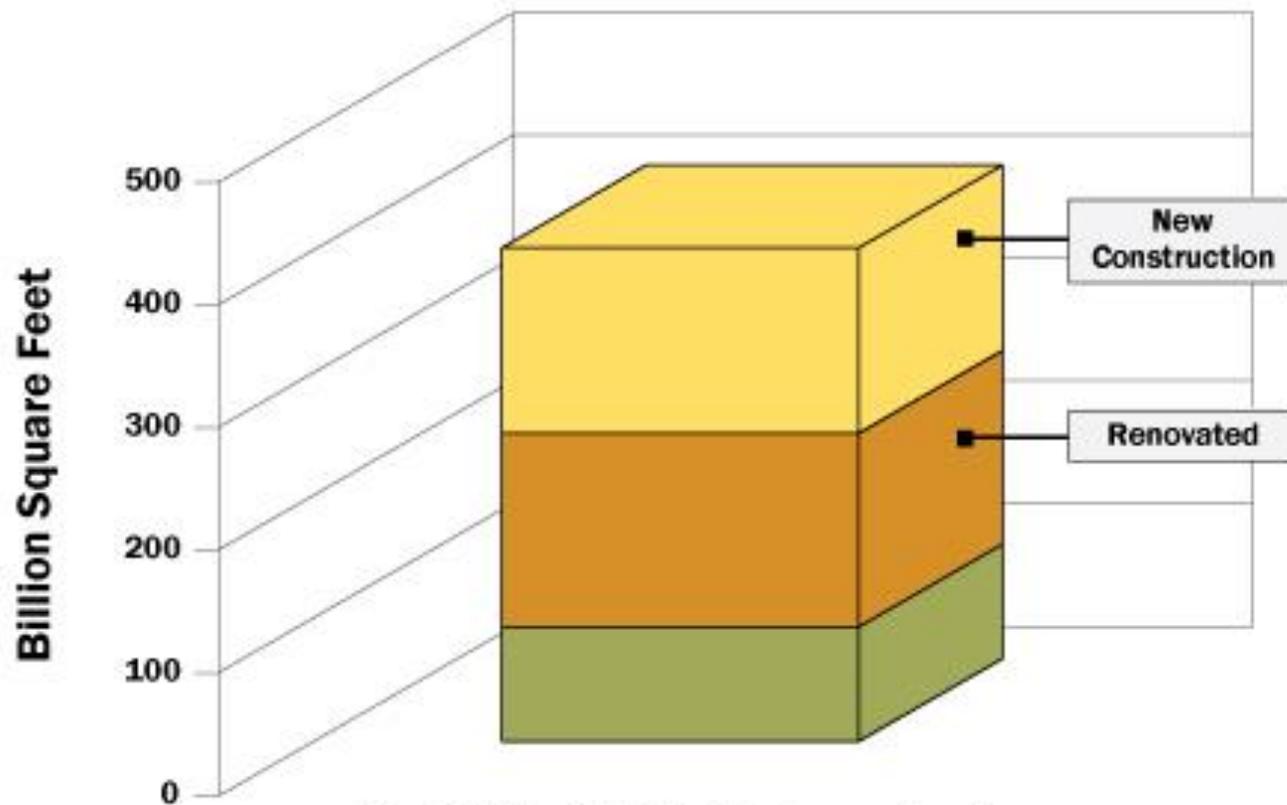
Whatever good things we
BUILD
end up building us

Jim Rohn



**MEDIAN AGE OF EDUCATION BUILDINGS IN THE U.S. IS 33.5
YEARS OLD; 50% BUILT BEFORE 1962**

SOURCE: ENERGY INFORMATION ADMINISTRATION



By 2035: A Historic Opportunity

Source: ©2010 2030, Inc / Architecture 2030. All Rights Reserved.
Data Source: U.S. Energy Information Administration.

By the year 2035, approximately **three-quarters** (75%) of the built environment will be either new or renovated



Good
Enjoy your outdoor activities.

ZIP Code, City, or State

Schaumburg, IL

North and West Suburbs (Chicago) Reporting Area

Monitors Near Me | Recent Trends

AQI Legend

US EPA Search x Improving Ventilation in Schools x +

ed.gov/coronavirus/improving-ventilation

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U.S. Department of Education

Search...

Student Loans Grants Laws Data

Improving Ventilation to Prevent COVID-19

Improving Ventilation in Schools, Colleges, and Universities to Prevent COVID-19

Did you know? You can use American Rescue Plan (ARP) education funds further described below to improve indoor air quality for in-person instruction, including through:

- Inspection, testing, and maintenance of current ventilation systems and approaches
- Purchasing portable air filtration units, such as HEPA air filters
- Purchasing MERV-13 (or higher) filters for your HVAC system and ACs
- Purchasing fans
- Repairing windows and/or doors so that they can open to let fresh air in
- Servicing or upgrading HVAC systems consistent with industry standards
- Purchasing equipment to run outdoor classes
- Purchasing carbon dioxide (CO2) monitors, air flow capture hoods, and anemometers for custodians and building personnel to assess ventilation
- Paying for increased heating/cooling costs due to increased use of heating/cooling systems
- Other spending that supports inspection, testing, maintenance, repair, replacement, and upgrade projects to improve the indoor air quality in school facilities, including mechanical and non-mechanical heating, ventilation, and air conditioning systems, filtering, purification and other air cleaning, fans, control systems, and window and door repair.

Clean air is essential for living and learning, and effective ventilation is an important part of COVID-19 prevention. We know that even before the pandemic, some schools, colleges, and universities had indoor air quality challenges, which many school, district, and higher education leaders worked to address as they reopened schools for in-person learning over the course of the last year.

As we move into the 2021-2022 school year, ventilation continues to be a top concern for many communities. Proper ventilation is a key prevention strategy for maintaining healthy environments and, along with other preventive actions, can reduce the likelihood of spreading disease. Wearing a well-fitting, multi-layer mask helps keep virus particles from entering the air and protects mask wearers. Good ventilation is another critical step to help reduce the number of airborne virus particles.

The ARP provided \$122 billion for the [Elementary and Secondary Schools Emergency Relief \(ESSER\) Fund](#) to help schools prevent the spread of COVID-19 and recover from its effects, including by improving indoor air quality, so school leaders across the country can act now to improve ventilation in their buildings. The ESSER funds and [Governors Emergency Education Relief \(GEER\) funds](#) provided under earlier appropriations can also support this work. In addition, [Higher Education Emergency Relief \(HEER\) funds](#) provided under

How Do I Find...?

- Student loans, forgiveness
- Higher Education Rulemaking
- College accreditation
- Every Student Succeeds Act (ESSA)
- FERPA
- FAFSA
- 1098, tax forms
- More...

Information About...

- Transforming Teaching
- Family and Community Engagement
- Early Learning
- Constitution Day



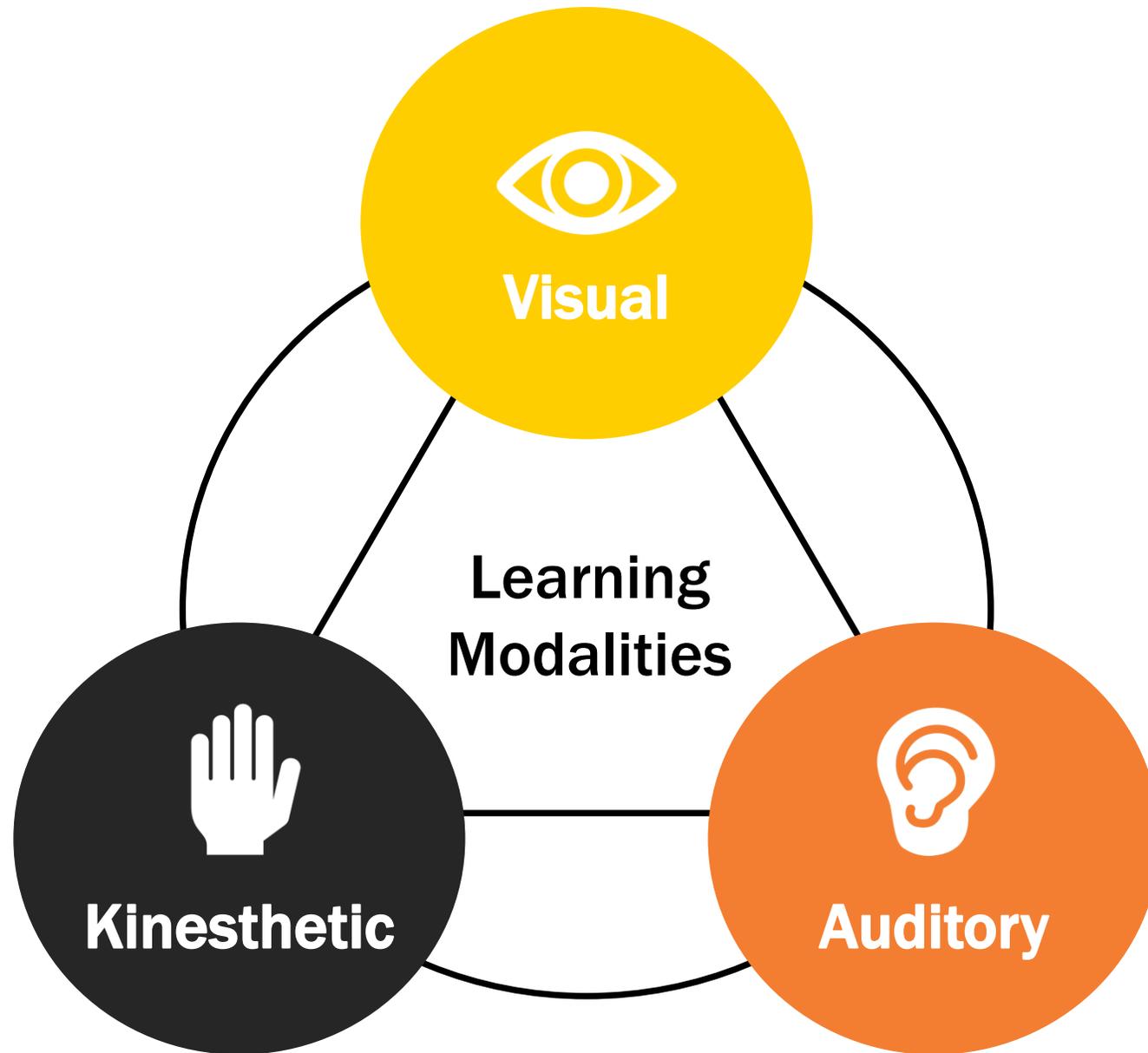
30% of students have attended **counseling** at some point either before or during college.

60% of college students have **disturbed sleep-wake patterns.**

Social anxiety and **academic stress** ranked high among students' concerns.

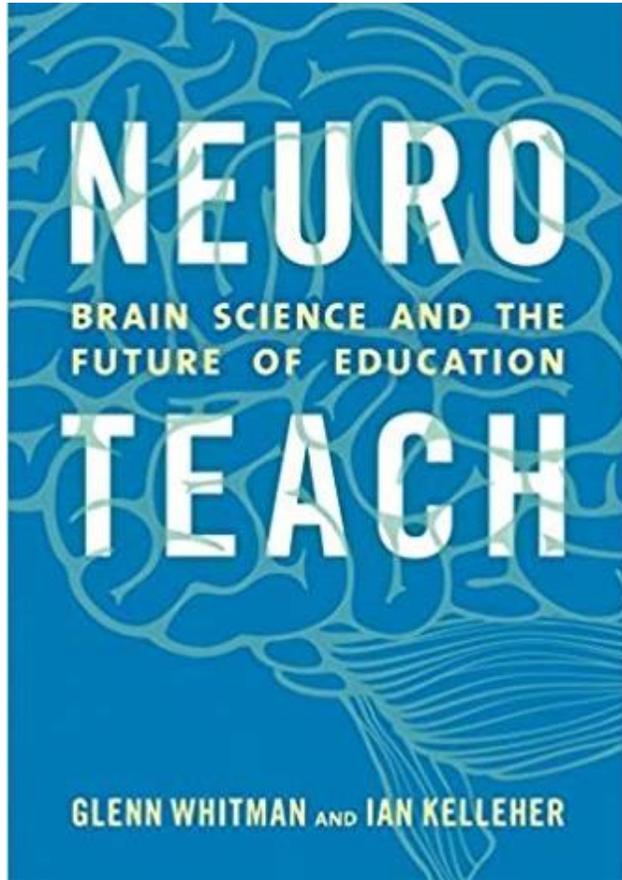
Only **3 in 10 adults** get the recommended amount of **physical activity.**

*Source: American College Health Association
and the Journal of Adolescent Health*

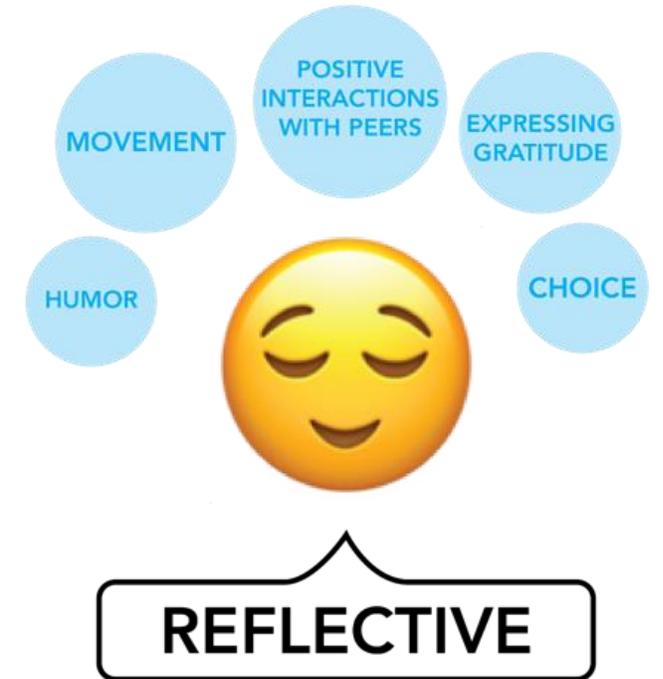


“Our analysis shows that the impact of the pandemic on K–12 student learning was significant, **leaving students on average five months behind** in mathematics and four months behind in reading by the end of the school year.”

Source: Mckinsey & Company, COVID-19 and Education: The lingering effects of unfinished learning”



Fight, Flight, Freeze
Brain Response



Thinking Brain
Response

“Tech is not the future of personalized learning. Human contact and attention are. Remote teaching might not have been a perfect laboratory experiment for it, but it certainly showed that **students and teachers need human contact, caring, and connection.....”**

*Source: Education Week, What Teachers Have Learned
Since the Pandemic Closed Schools, July 2021*



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1M3 2,310 KGS
5,090 LBS

41 24,310 KGS
53,550 LBS

ED. CAP. 1,100 KGS
2,420 LBS

RENT ME
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MAXGROSS 30,480 KGS
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TARE 3,460 KGS
8,070 LBS

PAYLOAD 26,820 KGS
59,130 LBS

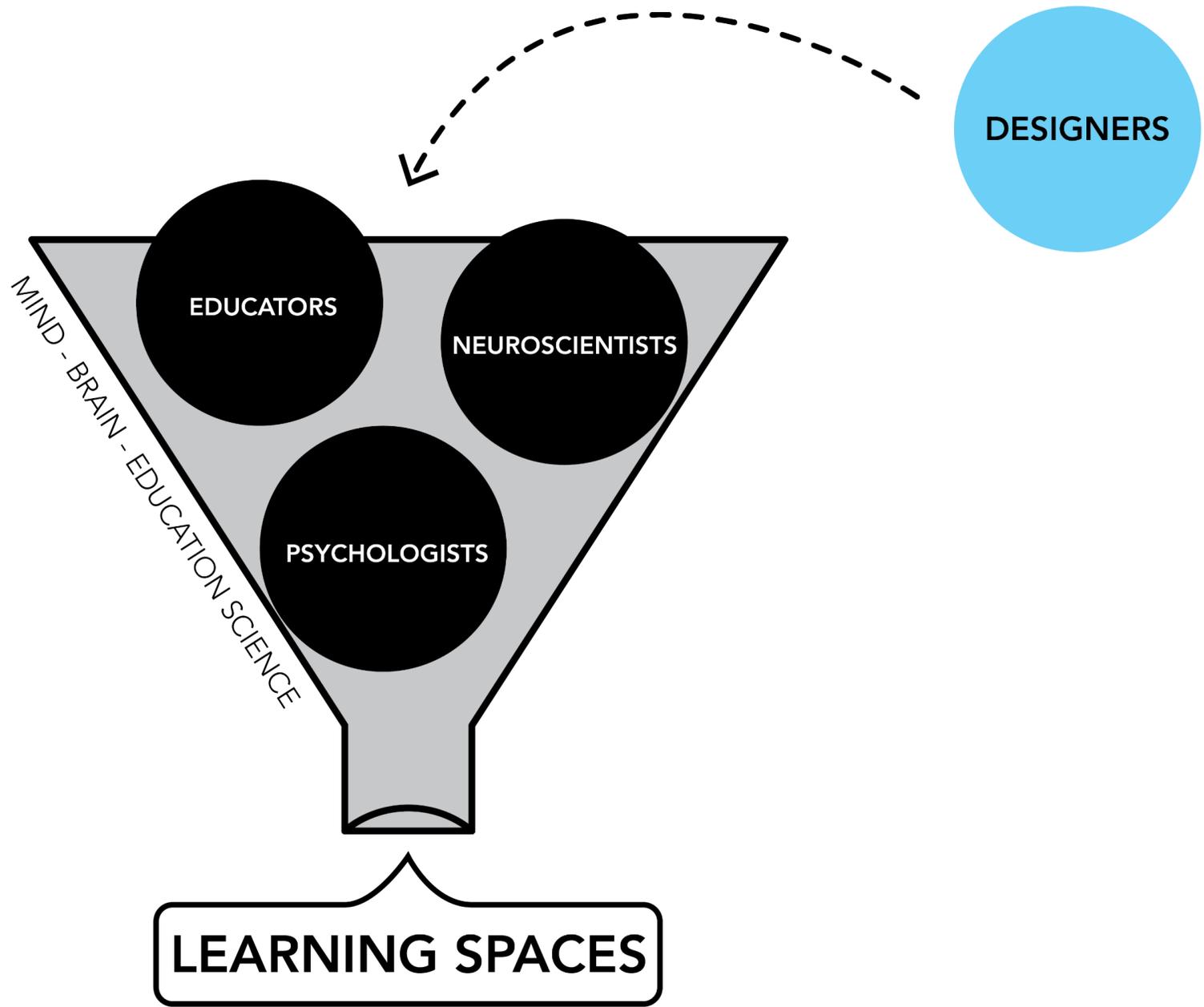
CUB. CAP. 67.7 CUM
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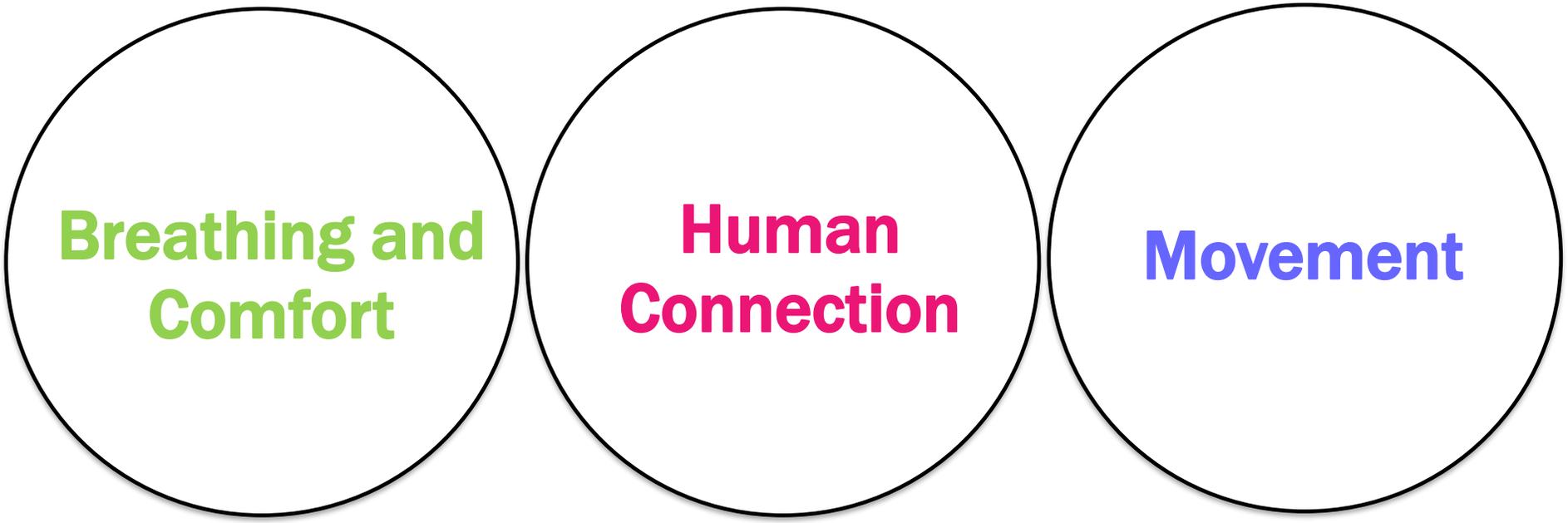


Five things we learned about schools in the pandemic

- Schools can transform themselves.
- The digital divide shaped everything.
- Schools provide so much more to students, particularly a food safety net, than many realized.
- Relationships are critical.
- Schools are political entities — and engines of the economy.

Source: Chalkbeat: Five things we learned about schools in the pandemic, March 2021





**Breathing and
Comfort**

**Human
Connection**

Movement

The Impact of School Buildings on Student Health and Performance

Authors

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University of California, Berkeley
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at the U.S. Green Building Council

Harvey Bernstein

Vice President,
Industry Insights & Alliances
McGraw Hill Construction

February 27, 2012

www.mcgraw-hillresearchfoundation.org



McGraw-Hill
Research Foundation

In partnership with



<http://www.centerforgreenschools.org/resources>

How students — **HEAR**

How students — **FEEL**

How students — **BREATHE**

How students — **SEE**

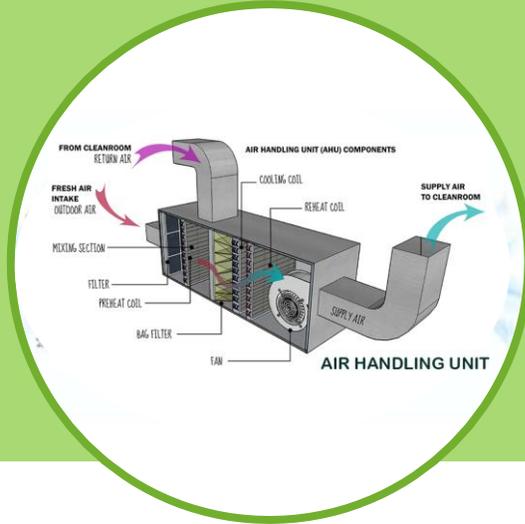
How students — **THINK & LEARN**

How students — **MOVE**

Breathing and Comfort

HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs



Indoor Air Quality

HVAC Systems Play a Major Role in Proper IAQ



Temp and Humidity

Temperature and Humidity Affect Comfort



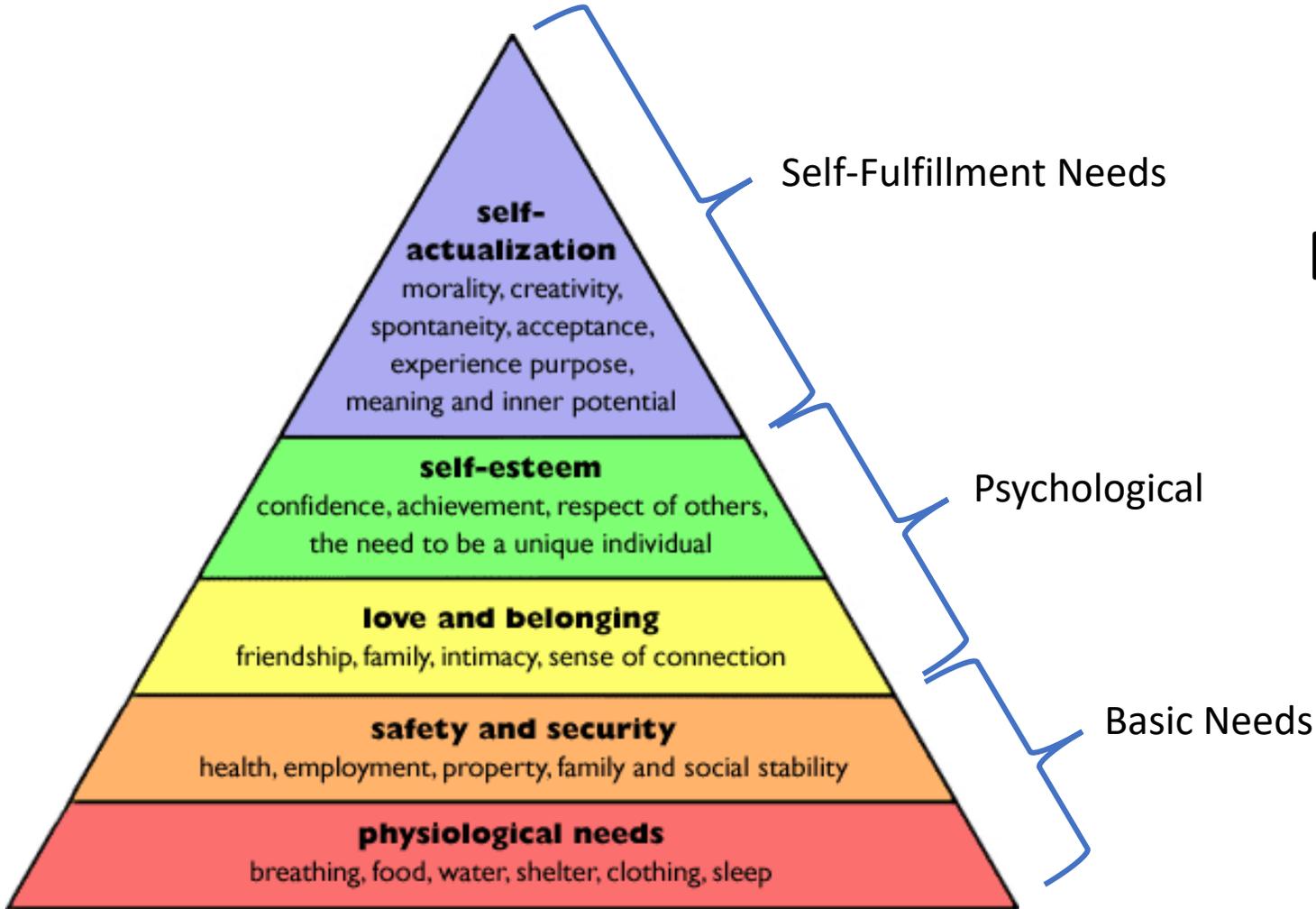
Health and Learning

Indoor Air Quality and Comfort are Proven to Positively Affect Learning and Health

HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs

Maslow Hierarchy of Needs



**Breathing and Comfort are
Basic Physiological Needs**

HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs

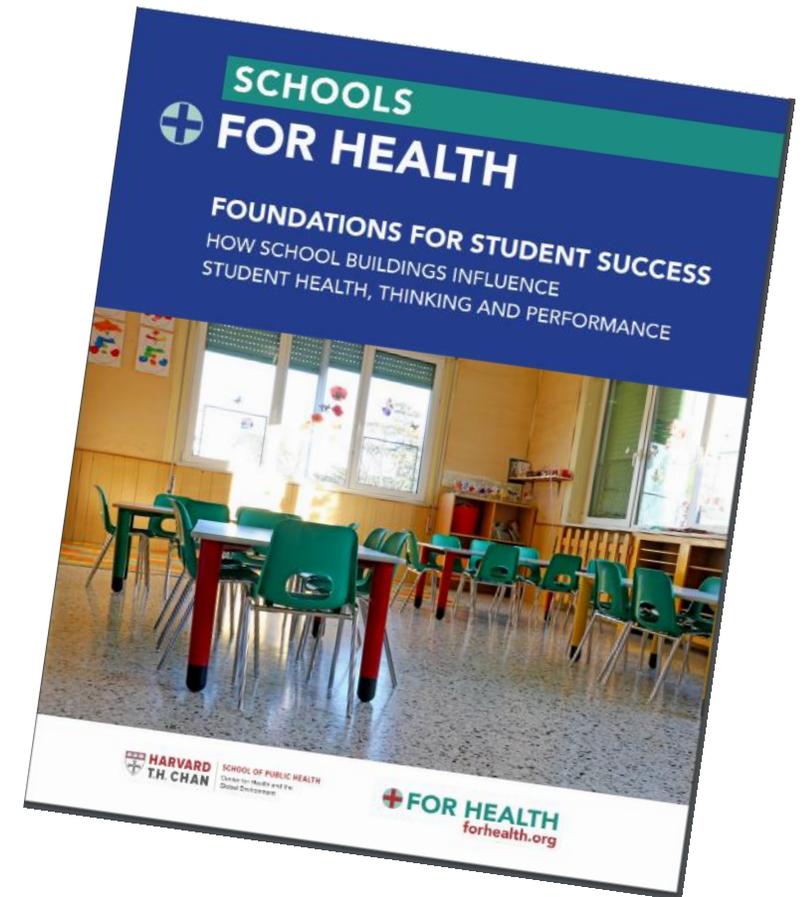
Indoor Air Quality – How we Breathe

50 million K-12 students in United States

15,600 hours inside a school

60,000 schools (about 46%) poor IAQ

13.8 million missed school days a year
due to asthma



HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs

Indoor Air Quality – How we Breathe

Poor Indoor Air Quality (IAQ) has short and long-term impacts on staff and students

- Coughing
- Eye Irritation
- Headaches
- Allergic Reaction
- Fatigue
- Aggravating Asthma or other respiratory issues



HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs

Indoor Air Quality –How we Breathe

Why do we Get Sick in the Winter?



Cold Air Holds Less Water Vapor –
Low Humidity



Low Humidity Increases Effectiveness
of Viruses



Low Humidity Reduces Effectiveness of
Immune System



Spend More Time Indoors

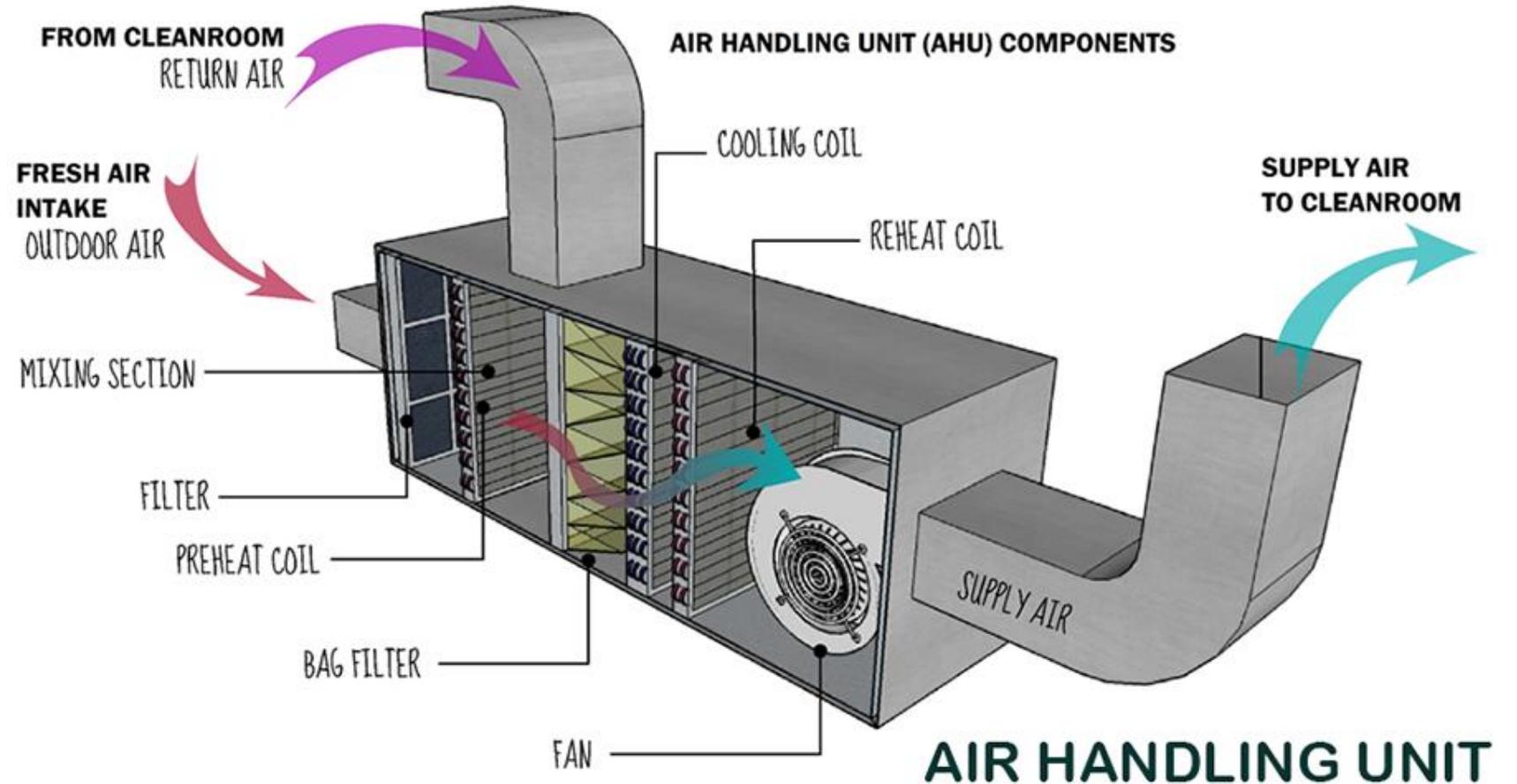


HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs

How Do We Provide Air Quality and Comfort

- Air ventilation
- Air filtration
- Humidity
- Temperature
- HVAC maintenance and controls



HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs

Indoor Air Quality –How we Feel

2017 Harvard Study – 4.5 million High School Exit Exams

“Taking an exam on a 90°F day leads to a 10.9% lower likelihood of passing that exam for the median student”

2018 Study - 10 Million PSAT Students

“Without air conditioning, each 1°F increase in school year temperature reduces the amount learned that year by 1%.”

2015 Study of 140 Fifth-grade Classrooms

The study found fifth-grade students’ math scores increased 2.799% along with decreasing temperature, ranging from the highest observed temperature of 78° to the lowest observed 67°.

https://scholar.harvard.edu/files/jisungpark/files/temperature_test_scores_and_human_capital_production_-_j_park_-_2-26-17.pdf
<https://scholar.harvard.edu/files/joshuagoodman/files/w24639.pdf>
<https://engineering.utulsa.edu/classroom-air-quality/>



HOW STUDENTS BREATHE AND FEEL

Basic Physiological Needs

How Do We Provide Air Quality and Comfort



Have a Professional Analyze the IAQ and Comfort Systems



Leverage Savings to Pay for Improvements



Promotes a Healthy Breathable Learning Environment



Increases Health, Test Scores, Engagement and Attendance

Human Connection

HOW STUDENTS HEAR

acoustics are fundamental to learning



MECHANICAL SYSTEMS

Background Noise Levels must be 15 decibels quieter than speech



MATERIAL CHOICES

*Reverberation Time and Noise Reduction Coefficient (NRC) affects **speech intelligibility***



CONNECTION / ADJACENCIES

*Sound Transmission Coefficient (STC) determines how effectively walls and doors **separate sound***



*Classroom studies find that there is a significant negative impact on **short-term memory and speech perception** as reverberation time increases. (Klatte et al, 2011)*

HOW STUDENTS SEE

classroom lighting and the visual experience



DAYLIGHTING

Natural light improves student performance



GLARE CONTROL / SHADING

When utilizing natural light, glare control, shading, and heat gain control are all factors to be considered



LIGHTING CONTROLS

Lighting controls can create different zones within a single space

Lighting & Learning

Students in daylit classrooms had greater improvement over the course of one school year in math and reading standardized tests than students in windowless classrooms.

*Source: Heschong
Mahone Group, 1999*



CARRIE BUSEY
ELEMENTARY SCHOOL

*Elementary school students in classrooms with the most **daylight** showed a **21% improvement in learning rates** compared to students in classrooms with the least daylight. (**Heschong Mahone Group, 2001**)*



CARRIE BUSEY
ELEMENTARY SCHOOL

*In another study by the Heschong Mahone Group, **Windows and Classrooms**, researchers found an **association between academic achievement and classroom views to the outdoors** (Heschong, 2003)*



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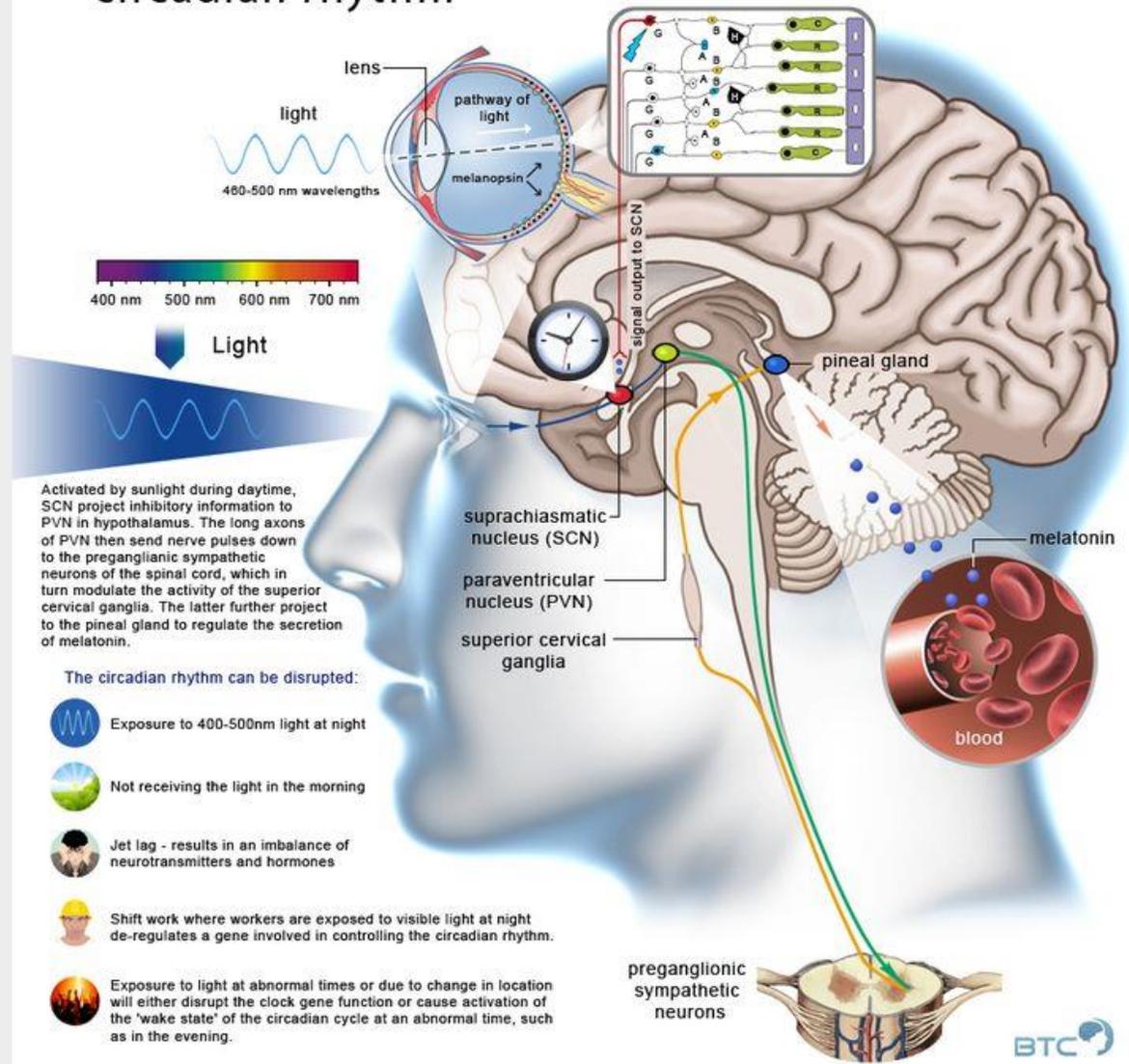
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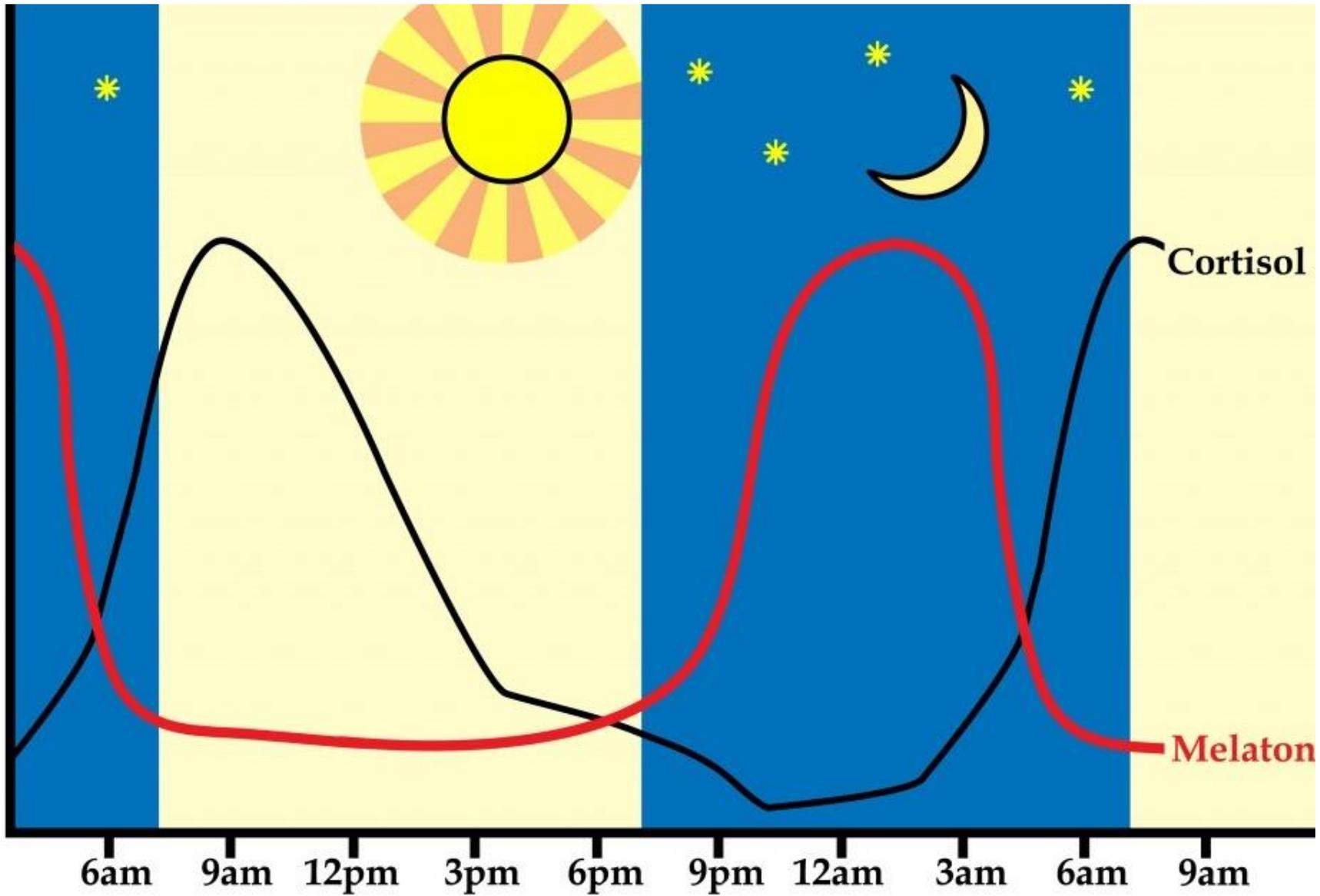
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circadian rhythm



Source:
<http://www.sleepdisordersresource.com/circadian-rhythm-sleep>



Source:
<https://www.thepaleomom.com/regulating-circadian-rhythm/>



Biological Focus

Fixed Color Temperature and Single Wavelength (the “good blue”)

- Support robust daytime cycle
- Cool light to align with sustained daytime circadian rhythm (suppressed melatonin response)



Behavioral Focus

“Tunable” Variable Color Temperature and Wavelength

- Immediate and/or scheduled adjustability
- Dual Biological (increased or decreased melatonin response)
- Selective daytime adjustment to illicit short-term behavioral responses
 - Cool light to achieve alertness
 - Warm light to achieve calmness

LUTHER BURBANK
ELEMENTARY SCHOOL



Language of Growing

Aa Bb Cc Dd Ee

Ff Gg Hh Ii Jj

Kk Ll Mm Nn Oo

Pp Qq Rr Ss Tt Uu

Vv Ww Xx Yy Zz

1 2 3 4 5 6 7 8 9 0

DIALECTIC

THE WORLD OF
A FUTURE LEADER



“The natural lighting throughout the building has made staff and students feel happier. Teachers have commented on how happy they feel when they are in the building.”



HOW STUDENTS CONSUME

Connecting stewardship, education, and health



WASTE REDUCTION

Waste reduction efforts usually start in the lunchroom - **reduce costs and environmental impact, and engage the students**



ENVIRONMENTAL LITERACY

understanding, skills and motivation to make responsible decisions that considers their relationship to natural systems, communities and future generations



HEALTHY FOOD CHOICES

Prevent certain health conditions like heart disease and diabetes and can lower cholesterol. **Provide more energy, help you focus, and improve your mood.**

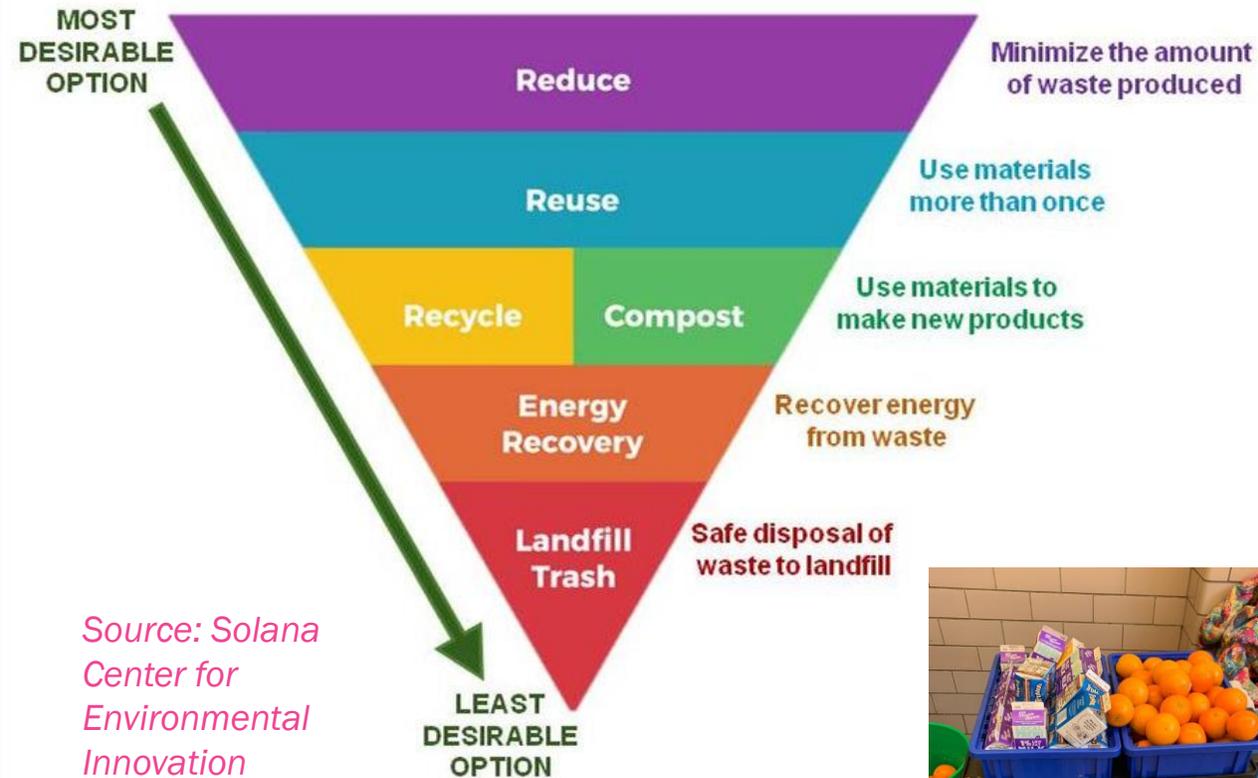


The **lunchroom** is one of the areas of greatest waste in a school and, therefore, **waste reduction initiatives** can have the most impact.

Source: Seven Generations Ahead



Zero Waste Hierarchy



Source: Solana Center for Environmental Innovation



Eliminate Individual Condiment Packets



Reusable Food Ware



Share Tables



Unbundle spork packets

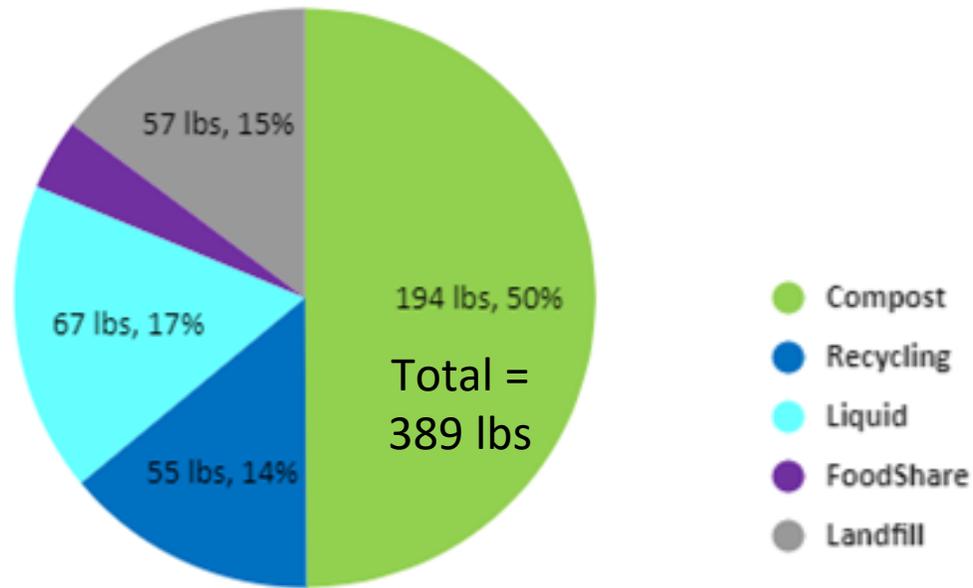


Reusable Trays

Source: Seven Generations Ahead

Commercial composting and recycling

Composting and recycling in the lunchroom can divert up to 90% of materials from the landfill

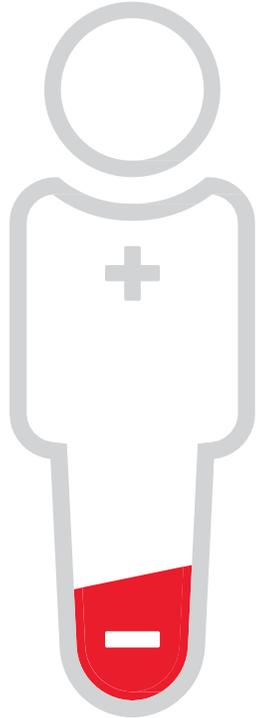


Source: Seven Generations Ahead



Waste Station Examples

Nutrition Impact on Academic Performance



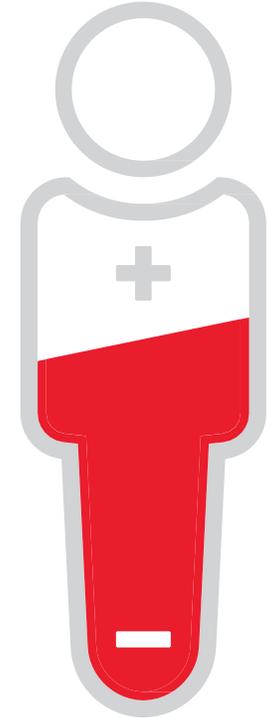
Poor nutrition, obesity, & hunger

Over one-third of U.S. children are overweight or obese

Nutritional deficiencies negatively affect cognitive development

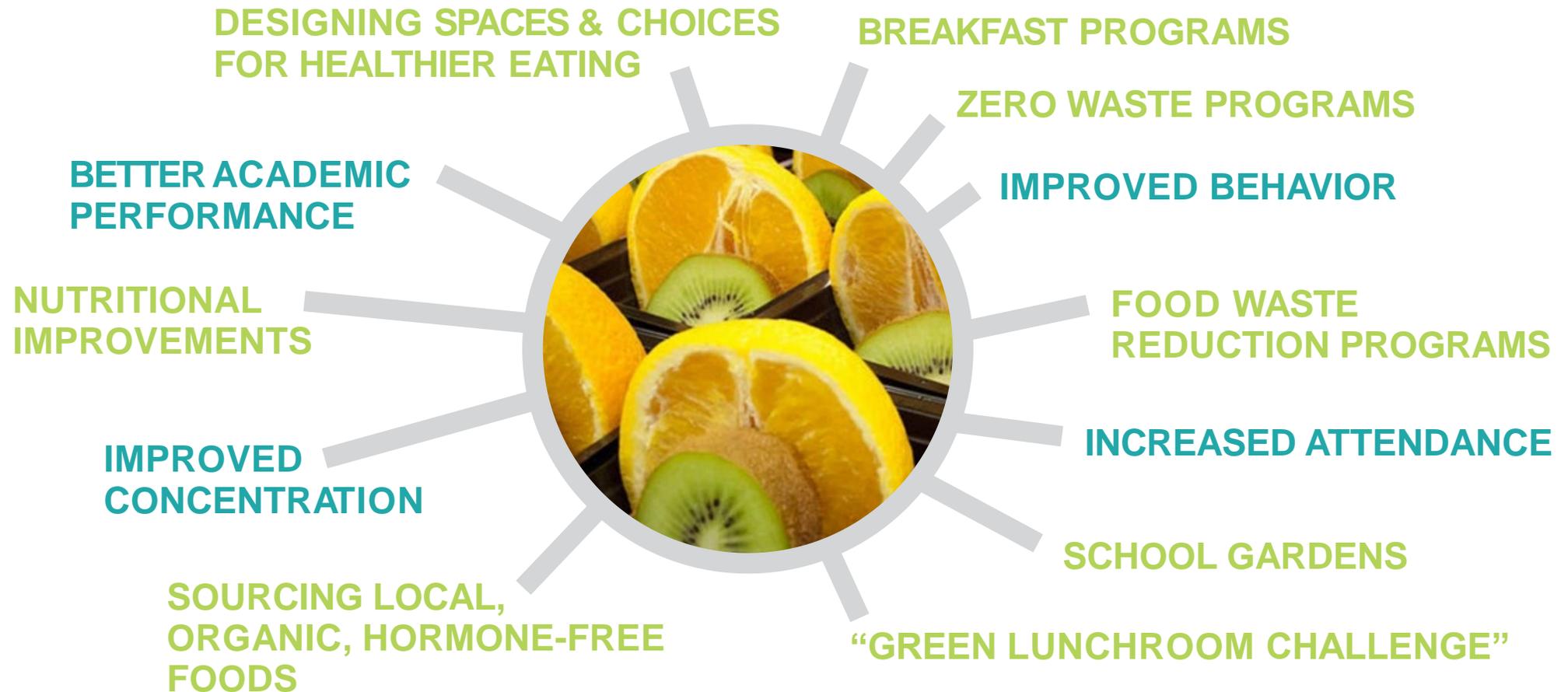
High trans/saturated fats negatively impact learning & memory

Access to proper nutrition improves student's cognition, concentration, and energy.



Nutrition Impact on Academic Performance

Improve nutrition, reduce obesity, & improve access to lunch and breakfast programs.



HOW STUDENTS THINK & LEARN

cognitive functioning and the environment



PERSONALIZED LEARNING

Encourage a pedagogy that allows each student to achieve their full potential, through movement, visual stimulus, and even food



FLEXIBLE AND AGILE SPACES

Design and furnishings create multi-use spaces for different learning environments



COMMUNITY AND SOCIAL SPACES

Break out of the traditional classroom and promote a natural flow and mingling of people and ideas



CARIE BUSEY ELEMENTARY
SCHOOL NEIGHBORHOOD

*There is a 25% contribution to better learning due to classroom design that integrates design features within a neuroscience framework.
(Barrett, 2013)*



PRAIRIE GROVE
LEARNING CENTER

*A study looked at one school district in Connecticut and found that when **school space improvement projects** were undertaken by the district, test scores across renovated schools went up noticeably afterward (Neilson and Zimmerman, 2011)*



NORTHWOOD MIDDLE
SCHOOL



PRAIRIE GROVE
JUNIOR HIGH SCHOOL



Movement

HOW STUDENTS MOVE

physical activity affects cognitive function



PHYSICAL HEALTH

Preventing and combating childhood obesity helps students live longer, healthier lives



REGULAR PARTICIPATION

Schools play a big role in ensuring that students participate in physical activity every day



ACADEMIC PERFORMANCE

Health benefits of physical activity extend past the body to the brain itself



BOOKER T. WASHINGTON
STEM ACADEMY

Children respond faster and with greater accuracy to a variety of cognitive tasks after participating in a session of physical activity. A single bout of moderate-intensity physical activity can increase neural and behavioral concomitants associated with the allocation of attention to a specific cognitive task. (Hillman et al., 2009)



Sight
Sound
Smell
Taste
Touch

Sight
Sound
Smell
Taste
Touch

Proprioception



(Image: www.childrensfactory.com)



MUSCLE ACTIVITY = NOURISHMENT FOR THE BRAIN

(Breithecker, 2017)



(Image: www.lemonlimeadventures.com)



RECOMMENDATIONS FOR STUDENTS

(Image: VS America)



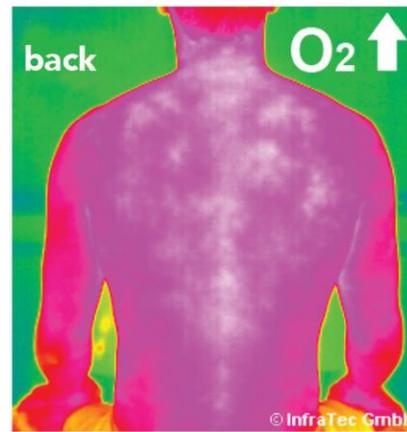
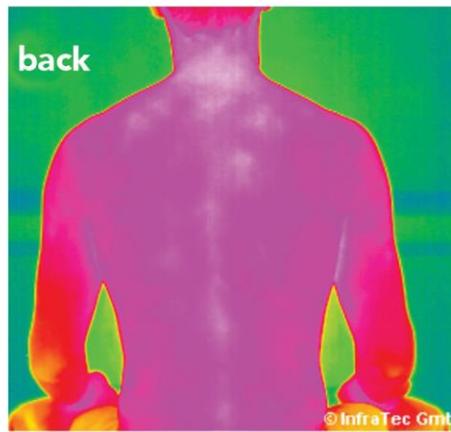
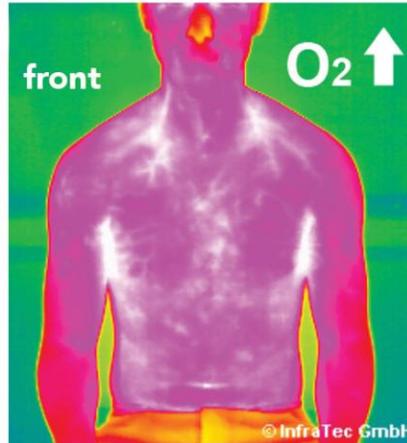
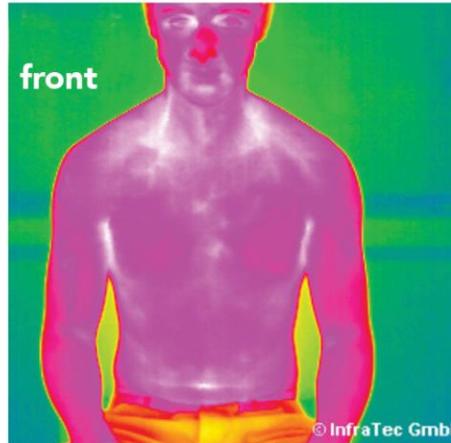
SEATING OPTIONS

(Image: VS America)

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RIGID CHAIR

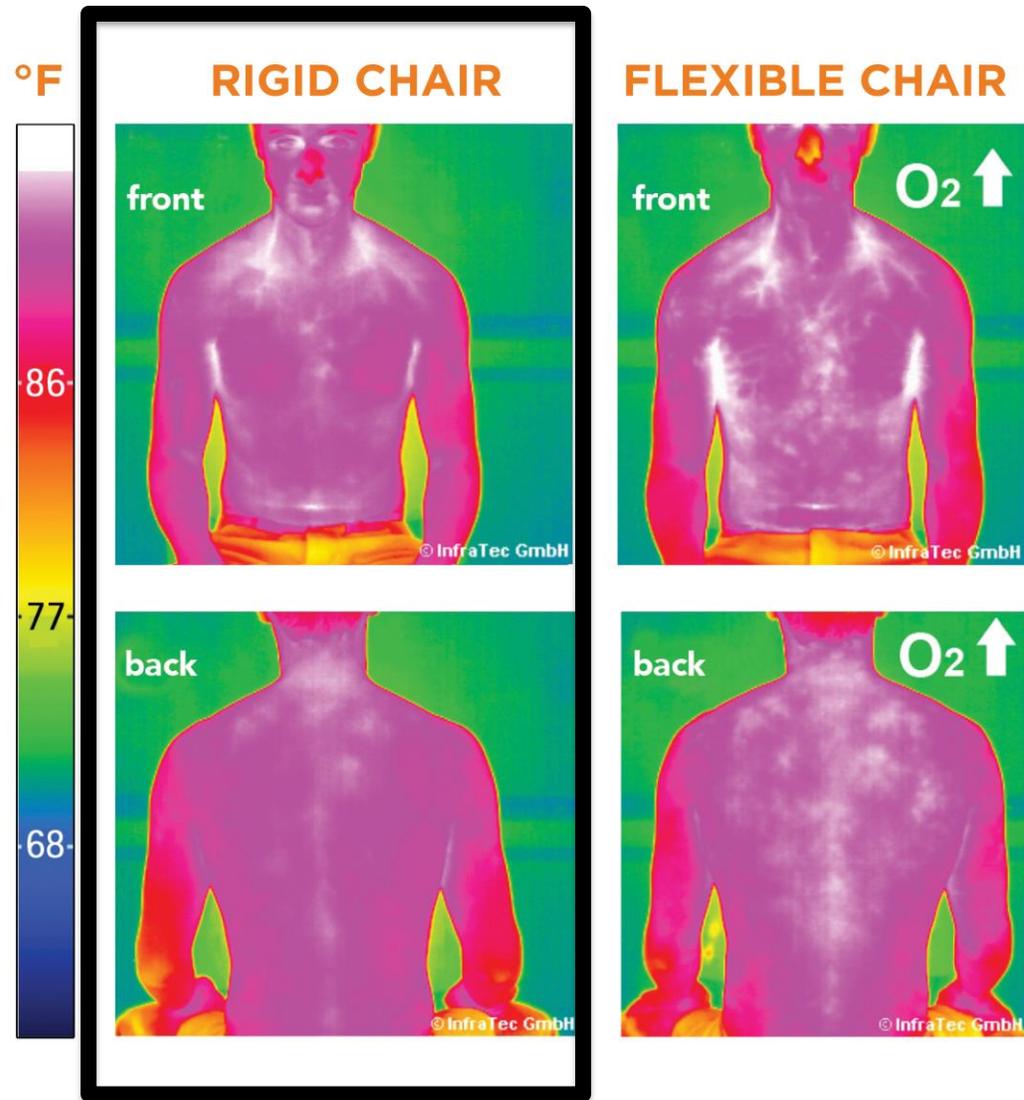
FLEXIBLE CHAIR



SEATING OPTIONS

(Image: Ludwig, Breithecker, 2008)

SEATING OPTIONS



(Image: Ludwig, Breithecker, 2008)



SEATING OPTIONS

(Image: VS America)



TABLE OPTIONS

(Image: VS America)

Flexible learning environments with agile furniture maximize the interplay between positive learning outcomes, physical wellness, and self-regulation. (Ackers, 2022)



1.

Whole group instruction allows the teacher to create cultural, community, and social-emotional connections.

2.

Small group experiences promote positive interdependence, individual accountability, and social interactions.





3.

Distributed mobile storage helps teachers allocate classroom resources based on rotations, plus offers privacy for one-on-one instruction.

(Image: VS America)



4.

Small groups foster social belonging through interactive peer supports and promote the love of learning.

2.

Small group experiences promote positive interdependence, individual accountability, and social interactions.

3.

Distributed mobile storage helps teachers allocate classroom resources based on rotations, plus offers privacy for one-on-one instruction.

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Questions and Answers

We thank you for your time!

Stuart, Brodsky, AIA

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