



---

# **County School Facilities Consortium 2021 Virtual Annual Summit**

September 23-24, 2021

**Striving for Indoor Air Quality Improvements**

***Joshua Jorn***

Chief Officer of General Services and Business Support  
Monterey County Office of Education

***Bill Hayward***

Hayward Lumber, Hayward Score  
and Hayward Foundation

## **Speaker Biography**

**Joshua Jorn, CSFC Chair  
Chief Officer of General Services and Business Support  
Monterey COE**

---

Mr. Jorn served as the Executive Director of General Services with MCOE since 2010, and is currently the Chief Officer of General Services and Business Support. In this capacity he oversees maintenance, operations, transportation, mail service, warehousing, county wide school safety, fleet management, and school facility planning and funding to ensure students and staff are housed in the best possible learning environments. In August 2017, Mr. Jorn began development and implementation of contracts and form agreements for MCOE programs in coordination with Finance and Business. He works directly with our local educational agencies in the area of developer fees, developer studies and local bond review and implementation.

**Bill Hayward  
Hayward Lumber, Hayward Score and Hayward Foundation**

---

Bill Hayward is the CEO and Chief Sustainability Officer of Hayward, a 101-year-old California lumber and building material supplier. It is our mission to provide builders with solutions to build healthy, durable and energy efficient homes. Over the past 10 years we developed the Hayward Healthy Home Principles as well as a web based assessment tool for housing called HaywardScore.com. Having Scored over 80,000 homes, we have now created the largest data base correlating housing attributes, occupant habits and self-reported symptoms. We understand health and housing and we show our builders how to build them in a cost-effective manner. The experience of staying at home during a pandemic is a triggering effect accelerating homeowners' awareness and desire to live in healthy homes. Join us in the revolution that will soon make Healthy Home construction mainstream.

LMB Journal, the leading magazine for the lumber/building material distribution channel, named him Entrepreneur of the Year (2015). In addition, he was named "20 Most Influential Leaders in the Industry" and Hayward Lumber was named "Dealer of the Year" for their work in driving sustainability in the industry. On the non-profit side, he is Chairman Emeritus of FSC US and Chaired the Forest Stewardship Council US for 5 years. He received his BS from UCLA and graduated from the Stanford Executive Program (2006).



## County School Facilities Consortium Summit: Air Quality for California's Classrooms

**Bill Hayward**, President Hayward Score/Hayward Lumber

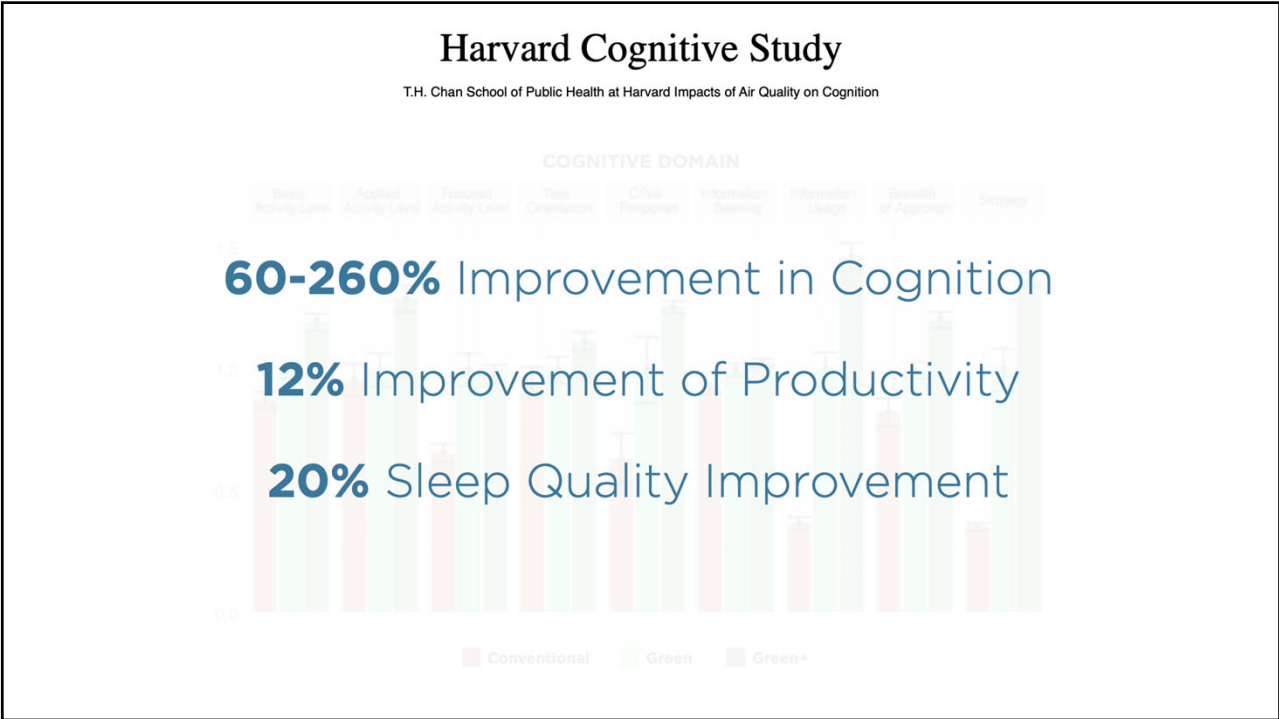
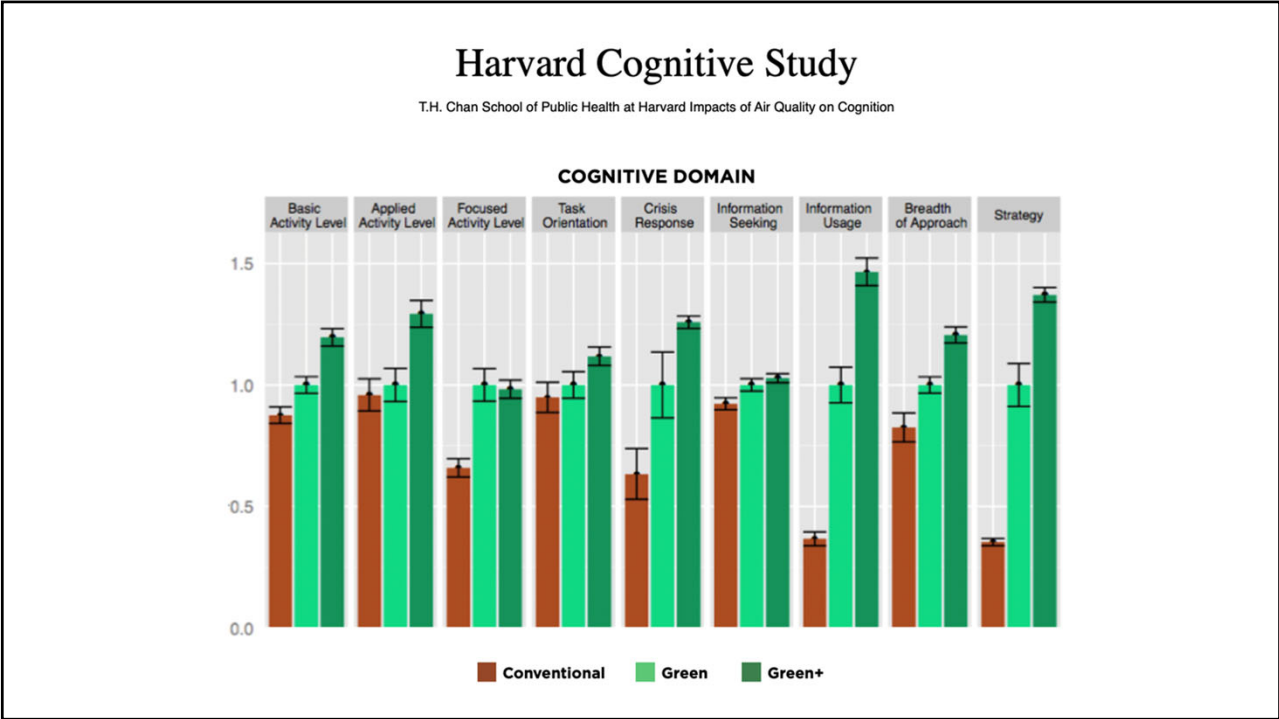
**Joshua Jorn**, Chair, County School Facilities Consortium / Monterey County Office of Education

**Rebekah Cearley**, Murdoch Walrath and Holmes



## Indoor Air Quality and Student Performance

- Indoor air quality and student learning and performance are synonymous
- Research shows high levels of particulate matter (PM) in classrooms can contribute to low levels of performance
  - Carbon dioxide (CO<sub>2</sub>), Volatile Organic Compounds (VOC), other particulate matter, aerosols from humans, and droplets from human respiratory systems that may contain infectious viruses; all contribute to the indoor air makeup our students breath
- High levels of PM can lead to student and faculty viral and bacterial infections, which can lead to loss of learning and instruction
- Current classrooms systems can deliver only 1-2 air changes per hour (ACH)
  - Outdoor air is often times only 10-20% of the air delivered to a classroom
- Simple concept
  - Introduce more direct outside air + indoor units designed to mix the stagnant air = higher cognitive learning environment and less loss of learning and instructional time



## Monterey COE and The Hayward Score

- Monterey COE had the opportunity to work with Bill Hayward of The Hayward Score/Hayward Lumber and Dr. Mark Hernandez from the University of Boulder on an indoor air quality study and guidance tools.
- The study was developed for Denver City Schools and Post Ranch, Big Sur and initially proposed proper calculation of clean air delivery and ventilation rates.
- How do we calculate the ventilation rates, add the right amount of HEPA based on rated clean air delivery rate (CADR) at the planned operating speed and achieve energy efficiency?
- The Hayward Score has extensive experience with these tools from years of teaching the industry to build healthy, energy efficient and resilient housing.
- The working group had the honor of bringing these tools to the schools in Denver City and Monterey County in the hopes of mitigating exposure risk.
- The plan was to leave our schools with the legacy benefit of increased average daily attendance, lower energy cost, higher learning outcomes and resilience to environmental factors like agriculture and forest fires.
- MCOE has held a variety of online sessions with Monterey and San Benito County Schools on the use of these tools and mitigation strategies.

### Goal

Reduce the exposure risk in the classroom to be equal or less than being outdoors

### Process

Utilize the National Best Practices to implement an effective 6 eACH in the classroom by optimizing outdoor air, cleaning indoor air with a network of HEPA filters, mixing the indoor air and monitoring

The Clean Air Formula - 6eACH - **Bill to Insert Graphic**

## System Limitations

- Antiquated and inefficient school mechanical systems
  - Two-Pipe boiler and chiller systems
  - Dual package gas/electric units
  - Direct heat pump/condensing units on portables (e.g. Bard)
- Low air change per hour (ACH)
  - 2-3 ACH (most classrooms are nowhere near this high - usually under 1 ACH)
  - Strive for 6ACH
- Poor filtration
  - HEPA and MERV13 as a minimum
  - Routine filter changes or cleaning
- No mixing
  - Stagnant warm air sits up high, cold dense air sits down low
  - PM is stagnant when released and not flushed from the room quickly
- All issues lead to higher level of infectious disease which are small PM2.5 COVID-19

## Implementation Plan

**Goal:** create an environment in the classroom that is similar to an outdoor eating environment with maximum amount of air changes per hour and proper mixing.

1. Increase outside air flow with the use of economizers
    - Open to 50% (on RTU's)
    - Use operable windows and box fans to create better circulation.
  2. Better filtration
    - MERV-13 filters must be installed, however all units that do not comply with current 2019 CBC requirements will have issues with the MERV-13's as there will be a much higher static pressure than designed.
      - This can be mitigated with more routine (2-3 month) filter changes.
    - MCOE has tested this concept on all units at MCOE (8 RTU's, 2 Air Handlers, and 39 Bard units) and we have not seen any issue with motor, belt, noisy ductwork, or systems failure.
  3. Installing SensWare air monitors in all classrooms to monitor the baseline.
- These are quick and relatively inexpensive steps Monterey County and surrounding counties have already implemented to improve the indoor air in our schools.
  - All of this has been adopted as Board Policy, added to current Administrative Regulations, and inserted as priority in all Comprehensive School Safety Plans in Monterey County.



### Exposure Reduction in Bathrooms Summary

- Increase ventilation (>6 ACH)**
- Operate exhaust fans in bathrooms continuously
  - Maintain negative pressure with dedicated separate local exhausts venting directly outdoors for each bathroom (at a minimum).
  - Keep bathroom window and doors closed

- Reduce exposure from fecal cloud**
- Add lids to all toilets



M E N U  
COVID-19 Strategies  
Reduce Exposure Sources - Bathrooms

Joseph Allen - [It's time to talk about how toilets may be spreading covid-19](#)  
Hayward Score ©2020



## Case Study in Classroom

How many CFM of air exchange do we need in Classroom #1 and #2?



# Case Study in Classroom

How do we obtain the required 800 CFM of air exchange with what we have in place?



# Questions