

# Lighting in Education

LED Lighting Retrofits for Schools  
Best Practices and Guidance 2022



Future Proof Your Lighting  
Smart, Selectable & Controllable LED Lighting



The Department of Energy describes the next generation of integrated classroom lighting systems as “a highly energy efficient, fully-dimmable, tunable/selectable white-LED lighting system, noting that classroom lighting must be flexible and easy to use to accommodate different teaching methods, and serve how students of all ages learn.

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## **Classroom Lighting Design / LED Light Fixtures for Schools and Educational Facilities**

The role of lighting in knowledge acquisition and the process of learning is fundamental. Proper lighting design and application is critical in providing an environment that meets the needs of students and instructors, classroom lighting should support health, well-being and performance within the classroom. The priority of classroom lighting is to satisfy human needs such as visibility, task performance, visual comfort, social communication, health, safety and well-being. Proper color temperature, intensity (wattage), reduction of glare and the ability to eliminate flicker are essential in the design and application of lighting for a classroom.

Because lighting profoundly impacts numerous levels of human functioning such as vision, circadian rhythms, mood and cognition, its implicit effects on learning and classroom achievement cannot be dismissed. Studies have addressed how the quality and color of lighting can either impair or enhance students’ visual skills and thus academic performance. Classroom studies have shown proper LED lighting design and application can improve cognitive skills, lower error rates and boost productivity. Visual impairments alone can induce behavioral problems in students as well as level of concentration and motivation in the classroom.

Studies have shown that proper lighting design and application can drastically improve the behavior of students who are hyperactive or have learning disadvantages.

For years the question facing lighting designers and school administration has been, are we designing the lighting for students or for teachers. Proper application of white LED at 5,000 kelvin stops the production of melatonin and causes the students to be more alert and responsive in class. Its often referred to as “alert lighting”. Though this application may be the most appropriate for students, it may not be the most comfortable for teachers and administrators. The ability to provide the right application of lighting in different areas, considering all persons is crucial in developing a successful lighting project.

# What to Know and What to Look for When Choosing to do an LED Retrofit of Your Facilities

## 1. Improved Student Concentration and Performance

One of the most important benefits of installing LED lights in a classrooms is the improved academic performance of students. Studies have found that quality LED lighting can improve concentration and boost a students learning ability. Dynamic Control, Selectable and Tunable LED Lighting can improve listening, verbal communication, social skill development and comprehension. As a critical element of the design that greatly influences how well the classroom meets the needs of students and teachers.

Quality white-LED provided with wattage options, color (kelvin) options, dimming capable and controls compatible, is critical in delivering the best lighting for the health, well-being, and highest level of performance for both students and teachers.

***NetZero USAs' White-LED retrofit solutions offer options for on-board wattage switching and color (kelvin) switching, are dimmable and controls compatible. From our Lensed Retrofit Kit to our Flat panel and Center Basket Panel Retrofits, fast and easy to install, these units provide the ability to tune every classroom or any room to exactly the right combinations of wattage and color (kelvin) to maximize energy savings and performance.***

## 2. Less Irritation for Special Needs and Autistic Students by Eliminating Sub-Visible Flicker

According to the CDC, ***1 in 44 children born today has some sort of Autism Spectrum Disorder (ASD).*** Autistic students are especially susceptible to the effects of fluorescent lighting with specific sensitivity to the sub-visible flicker. Flicker is also an issue for teachers and other students that have photophobia or photosensitivity and are prone to migraines. Many LEDs and especially TLEDs flicker at a faster rate than fluorescents and produce the same disruptive sub-visible discomfort.

***NetZero USA's LED retrofit products and new construction fixtures are designed and warrantied to operate with no-sub-visible or strobing, providing an improved learning environment.***

## 3. Reduction in Hyperactivity

Color temperature (kelvins) has been shown to play an important role in students' health and performance. Studies show that cool color temperature can improve the behavior of students with learning disadvantages or hyperactivity disorder. Cool light color allows them to concentrate on projects and task more effectively. Hyperactivity is related to stress conditions, which can be aggravated by the radiation produced by the fluorescent lights. When the exposure to the radiation is decreased, performance and behavior improve.

***NetZero USA's Dynamic Control LED Retrofit Panels allow on-board controllability with 3 different wattage options and 3 different color (kelvin) options. Additionally, they are dimmable and controls compatible. Available in both Flat Panel and Center Basket designs, they provide the most options to install one retrofit product in most if not all arears with 9 different wattage and color (kelvin) combinations for tuning the light to each specific area and task.***

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## 4. Alert Lighting (Stops the production of Melatonin)

Our bodies have an internal clock called circadian rhythms that regulates our sleep, wake and other bodily processes. Our bodies contain an important gland called the pineal gland, which produces melatonin and serotonin, two hormones critical to the sleep cycle. Serotonin is responsible for keeping us alert, awake and aware, while melatonin is the hormone that helps us fall asleep. In the school year most children are inside during the pivotal morning hours, and most schools do not provide adequate “daylight” lighting inside, so students are not reaching their full potential of performance, health and well-being. Research has shown that students who are not exposed to full spectrum, or daylight, lighting early in the morning test poorer than students who have been exposed.

***NetZero USA only uses the highest level of “Matching Binned Diodes” for consistency, that produce “TURE” color temperatures (kelvins) with consistent power to provide “TRUE” colors (kelvins) in the 5000 kelvin range (alert lighting) to stop the production of Melatonin.***

In many schools districts, energy cost are second only to salaries. Schools that install high quality LED lighting retrofits won't just see increased academic performance, they'll also see significantly decreased energy bills. All LEDs though don't save money or at least don't produce the energy savings anticipated. Most LED products are affected by the power quality of the facility they're being installed in. Many LED products can run much higher wattage than claimed in their specifications. For an LED product to perform and provide the energy savings expected, there are many considerations from the diode milliamp capacity to the milliamps driven, the heat synch, type of driver, the quality of the internal components and wiring.

***NetZero USA's LED retrofit products and new fixtures are built to perform 24/7/365 and the provide consistent and long-life energy savings. NetZero USA provides a written “PERFORMANCE GAURANTEE”, stating that we guarantee that our products will perform in your facility at or below the stated wattage in their respective specifications, regardless of the facilities power quality or other factors.***

## 5. Maintenance Savings

Every classroom , hallway, bathroom and office has lighting and the number of ballast and lamps in a school that maintenance workers have to replace can number into the thousands and in some cases into the tens of thousands. Schools using fluorescent lamps and ballast require maintenance crews to spend a significant portion of their working hours replacing lamps and ballast. Those lights not easily accessible, like those found in gyms and other spaces with high ceilings often require lifts and equipment or contracting out to an electrician.

***NetZero USA's Warranties provide not only for material but also for ON-SITE warranty fulfillment. If any NZUSA light fails for any reason (no small print) during its warranty period, NZUSA will replace it ON-SITE at your facility through our NZUSA Maintenance Division.***

# What to Know and What to Look for When Choosing to do an LED Retrofit of Your Facilities

## 6. LED Driver Replacement

In any LED product, the driver is the weakest component. Driver replacement has become a huge issue within the LED industry. Most manufacturers now provide a pass-through OEM warranty on the driver and exclude it from their warranty. Additionally, LED drivers are unlike fluorescent ballast in that, when a driver fails, you can't just simply purchase new driver as a replacement. Every LED product, light, retrofit, new fixture, etc., has a very specific power configuration of volts and amps that drive that particular LED product. Installing a new driver that doesn't match the original driver configuration will either over or under drive the LEDs and dramatically shorten the life and performance.

***NetZero USA has addressed this issue by providing the first "LEGACY DRIVER GAURANTEE" in the industry. NZUSA warrants ALL Components of our products and has no OEM pass-through warranties. We manufacture our own products and warranty 100% of all the components.***

***Our "LEGACY DRIVER GAURANTEE". Guarantees that we will have the correct driver for you to purchase after the warranty period for an additional five years after the warranty expires. Having access to the correct driver replacement allows you to realize the maximum life expectancy of the technology and in some cases up to 30 years.***

## 7. Emergency Lighting Compatible

Most TLEDs and some LED Retrofits are not compatible with emergency lighting and are not UL924 compliant.

***All of NetZero USA's LED Retrofit options are emergency compatible and conform to UL924.***

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## 11. Lens Browning and Color Shifting

Two of the biggest issues in the LED industry are the problems of “lens browning” and “color shifting”. TLEDs, LED Retrofits and new LED fixtures are subject to lens browning or developing brown or black random spotting on the lens. Lens browning occurs when an LED manufacture chooses to cut cost and pricing by using recycled plastics or low quality plastic lens in their lens manufacturing. Several factors, including but not limited to poor heat synch, over driving the diodes will cause the recycled plastic to react and brown across the lens.

***NetZero USA only uses “Virgin Acrylic Powder” in the production of its lenses and warranties against lens browning.***

# What to Know and What to Look for When Choosing to do an LED Retrofit of Your Facilities

## 12. Lens Browning and Color Shifting (Continued)

Color shift, also known as color maintenance and chromaticity shift, has been a issue in the lighting industry for a long time. Cheap, poorly made LED solutions and TLEDs are notorious for color shifting after just a few hundred hours of operation. A row of lights emitting a slightly different color is a common sight when these products are used. With all the benefits in providing a quality LED lighting retrofit can bring to a learning environment, all those benefits will be negated and the result will be a more difficult environment to focus and perform in.

*NetZero USA's LED retrofits and new fixtures avoid any color shift by using quality components. All of NZUSAs products are manufactured with the highest grade of "Binned Diodes. Binned diodes are diodes that are individually tested for voltage, color and output and then grouped together for manufacturing. Additionally, NZUSA products deliver WHITE-LED by using a higher level of phosphorus in the chip package, turning the blue light emitted by the diode into white LED light. Advanced thermal design and providing consistent current to the diodes assures that NZUSA LED lighting will not color shift. NZUSA warranties against color shift.*

## 13. Dimming and Controls Compatible

Most TLEDs and many LED fixtures and retrofits are not dimmable and therefore are not controls compatible. As stated by the **U.S. DOE**, "**the next generation of integrated classroom lighting systems as a highly energy efficient, fully dimmable, tunable/selectable white-LED lighting system**". With the long life a quality LED retrofit offers, its critical to be able to integrate with controls today and/or in the future.

*All of NetZero USA's products including its LED Retrofit Kits and Panels are dimmable and controls compatible. More and more advanced control systems are being developed constantly. Integrating NetZero USA LED lighting retrofits now provides for the best environment for learning and working now and provides for integration into your existing or future control system.*

## 14. Warranties (The biggest Issue in the Industry)

Warranties in the LED industry have become almost laughable. Many if not most manufacturers have changed their warranties significantly. In many cases, if you read the small print, they're warranting the housing and not the components or parts. Some won't even warranty the paint on the housing. Current warranties use pass-through OEM warranties from the component manufactures, such as the driver manufacturer and/or chip/diode manufacturer. **For many, their warranties directly say, "they in no way represent any energy savings"**. Their warranties include multiple exclusions, including but not limited to a maximum of operating hours, ambient temperatures, a minimum of 15% to 20% of the diodes must fail before to be consider as warrantable, environmental issues, power quality issues, and always state, that the warranty is the exclusive decision of the manufacturer. Their warranties do not include labor and require you to take the fixture down, pack it up and ship it to them for their testing and determination of warranty. Labor is not covered and in most cases, the labor cost to take it down and replace it plus shipping, exceeds to original cost of the light or retrofit.

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## 14 . Warranties (continued)

Many distributors now suggest that a customer purchase a third-party after market warranty since the manufacturers warranties do not provide for inclusive coverage, which adds to the exclusions and project cost.

*NetZero USA has the first Warranty of its kind in the industry, covering 100% of all the components and has no-exclusions or small print. If a NZUSA LED light and/or retrofit goes out for any reason, NZUSA will replace it and replace it on-site at your facility, through our NetZero USA Maintenance Division.*



## Advanced LED & GUV Lighting

For additional information, please contact:

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