Impact of led lighting on Age 3-6 while they are painting, Playroom and library (LUX, color temperature, Glare, CRI and uniformity in school

1. **Illuminance (Lux):** For young children while painting and playing, recommended light levels are typically around 300-500 lux. This illuminance supports good visibility without causing eye strain or fatigue. It ensures children can see colors and details clearly when engaged in fine motor tasks like painting or sorting, without harsh brightness.
2. **Color Temperature:** Soft, warm white light (around 2700K to 3500K) tends to create a cozy, calming atmosphere that is conducive to concentration and creativity, reducing stress and agitation in young children. Cooler temperatures (above 4000K) may be more stimulating but can cause discomfort if too harsh. Balanced lighting close to natural daylight (4000-5000K) can enhance color perception for art activities without causing glare or eye strain.
3. **Glare:** Minimizing glare is critical. Harsh direct light or reflection on surfaces (like paper or light panels used during painting/play) can cause eye strain and distract children. Diffused LED lighting or using light panels that spread illumination evenly can reduce glare and create a visually comfortable environment, supporting longer engagement and focus on activities.
4. **Color Rendering Index (CRI):** A high CRI (80 or above, ideally 90+) is important in playrooms and art areas to render colors vividly and accurately. This helps children distinguish subtle color differences in paints and materials, which can enhance art creativity and learning about colors.
5. **Uniformity:** Even distribution of light across the play or painting area is essential to prevent shadows and uneven lighting, which may impede children's ability to see clearly or distort colors. Uniform LED lighting setups or well-positioned light panels ensure consistent illumination, promoting engagement and comfort

The relevant standard for lighting in playrooms and nurseries, including LED lighting parameters like lux, glare, CRI, and uniformity, is provided by the European standard **EN 12464-1:2021**. Key parameters from this standard for playrooms are:

- **Illuminance (Lux):** 300 to 500 lux
- **Glare Rating (UGR):** ≤ 19
- **Uniformity (U0):** ≥ 0.4
- **Color Rendering Index (Ra):** ≥ 80 (preferably 90 or above for color accuracy in creative activities)
- **Specific Notes:** High luminance should be avoided in viewing directions from below, which can be managed by using diffuse covers on luminaires to reduce glare.

Additional recommendations for playrooms highlight:

- Flexible and adaptable lighting to suit various activities such as relaxation, reading, and art.
- Use of tunable white luminaires to alter color temperature, beneficial for children's concentration and reducing hyperactivity.
- A recommended color temperature range around 3000K to 4000K to balance comfort and alertness.
- Avoidance of direct glare through diffusion or indirect lighting methods to enhance visual comfort

Type of task / activity area	Lux-level (E_m)		Glare rating (UGR_L)	Uniformity (U_0)	Colour rendition (R_a)	$E_{m,z}$	$E_{m,wall}$	$E_{m,ceiling}$	Specific requirements
	required	modified				$U_0 \geq 0{,}10$			
Play room	300	500	22	0,40	80	100	100	75	High luminances should be avoided in viewing directions from below by use of diffuse covers
Nursery	300	500	22	0,40	80	100	100	75	High luminances should be avoided in viewing directions from below by use of diffuse covers
Handicraft room	300	500	19	0,60	80	100	100	75	Illuminance at floor level

Lighting requirements in EN 12464-1:2021

Type of task / activity area	**Lux-level (E_m)**		**Glare rating (UGR_L)**	**Uniformity (U_0)**	**Colour rendition (R_a)**	**$E_{m,z}$**	**$E_{m,wall}$**	**$E_{m,ceiling}$**	**Specific requirements**
	Required	**Modified**				**$U_0 \geq 0{,}10$**			
Library: bookshelves	200	300	19	0,60	80	-	-	-	Vertical illuminance on shelves
Library: reading areas	500	750	19	0,60	80	100	100	50	