
Assessing the integration of colour in selected children's museum

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ABSTRACT

The psychology of colour holds immense significance in creating captivating and stimulating environments for children, especially in children's museum. This study aims to explore how colour impacts children's emotions, behaviours, and overall experiences within these spaces. Understanding the psychological effects of different hues empowers designers and operators of children's museums to design spaces that optimize children's engagement, happiness, and well-being. To achieve this, a case study research approach was used, analysing five diverse case studies, including one local and four international children's museums. Thorough assessments of these case studies were conducted, considering colour parameters identified from relevant literature on colour psychology. The study revealed that the colours yellow, blue, orange, purple, and green were employed in both the exterior and interior of the buildings in the selected children's museums. These colours were strategically integrated to evoke specific emotional responses and influence children's experiences within the spaces. In conclusion, the study underscores the pivotal role of colour when designing functional and effective children's museums. The deliberate use of colour can significantly impact children's emotions, behaviours, and engagement levels. The careful selection and integration of colours into the design can create positive experiences, enhance children's overall well-being, and evoke a sense of joy and excitement during their visit. Ultimately, the thoughtful use of colour plays a pivotal role in shaping the quality of children's interactions and enriching their overall museum experience.

Keywords: case study, Children's museum, Colour psychology, colour use, subjective assessment,

INTRODUCTION

Colour is recognized as the most important part of design and holds special significance for young children in their environment. (Hackett et al., 2018). Infants may perceive colour changes and preferences at an early age. Children acquire visual cues from a range of colours, textures, and materials on the walls, floors, and ceiling while spending multiple hours at such development centres. Throughout the day, the design of the centre influences children's behaviour and perceptions. (Read & Upington, 2009).

Children possess a heightened sensitivity to colour and are naturally drawn to bright and warm hues. Colour also serves as a means for children to express their emotions. For instance, youngsters tend to opt for light colours when conveying pleasant emotions, while they choose dark colours to signify negative emotions (Thung & Ahmad, 2022). In a particular study, researchers made a noteworthy discovery regarding colour associations in youngsters. They found that yellow, pink, and blue are linked to happy emotions, while red and black are associated with negative emotions. (Ravishankar, 2020).

Children's museums are currently the most recent and rapidly expanding segment within the museum industry (Silav, 2014). According to the Association of Children's Museums (ACM), a children's museum is a community institution that aims to provide high-quality and age-appropriate learning experiences for children. These museums prioritize children as the focal point of their visits, encouraging their active engagement and initiative in the learning process. (Silav, 2014). Additionally, the collections are structured around concepts that cater to toddlers' ability to concentrate. The exhibitions, events, and activities are thoughtfully designed to captivate the interest of young children, ensuring an engaging and enriching experience for them (Silav, 2014). Play and learning often intertwine, particularly during early developmental stages, as children primarily learn through play (Parker et al., 2022).

Colour is a visual perception attribute that corresponds in humans to categories like red, blue, yellow, and more. It is formed when the spectrum of light interacts with the light receptors' spectral sensitivities in the eye. Colour serves as an intrinsic element of our daily lives, manifesting itself in everything we see. (Ravishankar, 2020). Colour is a constant in our psychological experiences. The human visual system creates a perceptual sense of colour based on light wavelengths reflected or emitted by the objects and surfaces around us (Boyun et al., 2019).

Colour plays a pivotal role as a vital signal for fundamental vision (Ravishankar, 2020). Colour contributes significantly to object perception and cognition as it aids in discriminating between objects of similar shapes, facilitates the visual separation of objects from their backgrounds, and aids in visual scene recognition (Maule et al., 2023).

Colours continuously envelop our surroundings, influencing our perceptual experiences and perpetuating an ongoing interpretive "event." Research suggests that our perception of colour can exert substantial effects on our emotional and psychological states (Hussain, 2021). Colour has the potential to influence how individuals perceive and experience space, as well as identify specific locations. Thoughtful utilization of colour in design can lead to a reduction in the amount of energy required for illumination. Designers and architects can strategically employ colour decor to shape occupants' perception of containment, space ownership, mood, expansion, and emotions within the environment they create (Adomi & Ephraim, 2015).

Colours possess the power to evoke happiness or unhappiness, as well as influence feelings of hunger or comfort. Understanding the psychological impact that colours can have on the average individual is crucial (Ravishankar, 2020). In essence, colour is a subtle yet powerful stimulation that has a huge impact on human lives on a daily basis—physically, psychologically, medically, and sociologically—an understanding now universally

acknowledged. Each person perceives colour differently, influenced by their unique interpretation of this phenomenon (Ab et al., 2012).

Colours can be categorized into two main groups which are warm and soft hues (Ravishankar, 2020). Warm hues are often linked with feelings of happiness, optimism, and energy (Demir, 2020). Cool hues are known for their peaceful and comforting nature, although they can also evoke feelings of grief. The relationship between colour and emotion closely influences colour preferences. Individuals tend to favour certain colours based on whether those colours elicit positive or negative feelings within them (Ulusoy, 2020).

Colour psychology delves into the examination of human emotions and behaviours as affected by colour. Whether consciously aware of it or not, colour exerts an emotional influence on people's moods, behaviours, and even their psychological well-being. (Thung & Ahmad, 2022). Psychological responses to colour emerge as the colour is perceived by the eyes and transmitted to the brain. Subsequently, the brain releases hormones in response to the perceived colour, leading to mood alterations (Vakili et al., 2019). As a result, the use of different colors in a location can influence people's feelings and moods as shown in Table 1 (Sebastian, 2020).

Table 1: Children Psychological response to Primary colours

Colour	Psychological meaning	Response in the Environment	Impact on Children
Red	Passion, love, power	People will become aggressive	Negative emotion
Yellow	Joy, happiness, energy	Give a sense of welcoming	Positive emotion, feel welcoming
Blue	Peaceful, calmness, tranquility	Let people feel calm and relax	Positive emotion; can let children rest well

Source: Sebastian (2020)

Impact of individual colour on human

Different colors emit different wavelength frequencies, and these frequencies have varying effects on human being (Sebastian, 2020). Unfortunately, the concept of colour is frequently overlooked or explored at a later stage of design. As a result, the settings may not have the desired effect or may fall short of expectations. Its effect on human being is discussed below

- **Red:** The colour red symbolizes energy, war, danger, strength, power, and determination, while also representing passion, desire, and love (Krisnawati et al., 2019). Red, being a physical colour, has the ability to elevate heart rates and create the illusion of time passing quickly. It also holds the potential to aid in alleviating depression. Red is known to ignite conversations and leave a powerful first impression. Moreover, it has a positive impact on human metabolism. According to colour psychologists, red is believed to stimulate appetite (Tekirdağ, 2015). Consequently, it serves as an excellent choice for spaces that demand high activity levels or in rooms that aim to encourage communication and conversation.
- **Yellow:** Yellow stands out as the most prominent colour in the visible spectrum, catching the human eye with exceptional visibility. It is closely linked to happiness, optimism, and energy, radiating a vivid, warm, and inviting aura (Lei Zhang & Chunnan

Ca 2022)

Therefore, it makes for an excellent choice for entrance halls due to its welcoming nature. Yellow is considered the optimal colour for boosting enthusiasm, instilling confidence, and fostering optimism (Cupkova et al., 2019).

Yellow is recognized as the "knowledge colour" linked to the logical or left side of the brain. It acts as a stimulant for the mind, fostering fresh ideas, and aiding in overcoming mental obstacles. The reflective nature of yellow results in a higher light intensity, which can lead to overstimulation and eye irritation in some individuals. Prolonged exposure to bright yellow may cause irritability in certain people.

- **Orange:** Orange is a delightful combination of red and yellow, inheriting the energy of red and the happiness of yellow. It emanates a welcoming and warm vibe that serves as both a physical and mental stimulant. The colour orange encourages thought, conversation, and even boosts appetite. While sharing some qualities with red, orange is a subtler hue. It can assist in the healing process from disappointments, mending a broken heart, or overcoming a blow to one's pride. (Sebastian, 2020).

Research indicates that the colour orange can trigger various physical effects, including heightened hunger, increased activity levels, enhanced social interaction, elevated motivation, stimulated mental activity, improved oxygen supply to the brain, increased feelings of contentment, and boosted confidence (Gupta & Delhi, 2021). In addition, orange aids in decision-making and enhances enjoyment, confidence, and understanding. It exerts an energizing impact, stimulating mental activity, and promoting an increased supply of oxygen to the brain.

- **Green:** Green embodies harmony and balance, representing the essence of nature. Regarded as the most soothing colour for the eyes, it can even improve vision. When incorporated into interior design, green evokes a sense of tranquillity and security, creating a serene ambiance within the space (Bryndin E. G. & Bryndina, 2019). Green possesses calming, relaxing, and rejuvenating properties, and it is believed to be beneficial in alleviating anxiety, despair, and uneasiness (Jhangra & Rao, 2021). Green contributes to improved vision, stability, and endurance. Being the dominant colour in nature and occupying a significant portion of the visible spectrum, it holds immense significance to the human eye. However, while an appropriate amount of green can be beneficial, an excess of it can lead to feelings of placidity, sleepiness, sluggishness, moodiness, unhappiness, and lethargy. Striking the right balance with green is essential to avoid such negative effects.

- **Blue:** Blue holds the distinction of being the most renowned colour globally, representing the vastness of the sky and the depth of the sea. It is believed to be beneficial for both the intellect and the body. With remarkable healing properties, its serene and tranquil essence can act as a potent sedative. While often associated with calmness, blue has the ability to evoke positive emotions and instil a sense of happiness (Güneş & Olguntürk, 2020). Soft hues of blue, like sky blue, have the ability to craft a cheerful and uplifting

atmosphere. Such an ambiance can significantly contribute to fostering a positive mood and enriching children's overall enjoyment of their leisure centre experience (van Ewijk et al., 2020).

- **Purple:** Purple harmoniously blends the calm steadiness of blue with the fierce intensity of red. It is often associated with qualities such as wisdom, dignity, independence, creativity, mystery, and enchantment (Sebastian, 2020). Purple strikes the perfect balance between stimulation and relaxation, encompassing both warm and cool qualities. Similar to other cool colours, purple is renowned for its peaceful and soothing nature (Sulatra & Eka Pratiwi, 2020).

Hence, designers must carefully select an appropriate colour scheme that complements the design and effectively caters to the specific needs of individuals (Thung & Ahmad, 2022). Colour psychology in architecture is a relatively recent field of research, and as a result, most learning places for kids are designed without a clear incorporation of this understanding (Wan et al., 2020). In view of this study the is set out to understand how colour can be effectively used in the design of children museum by assessing the effectiveness of utilization of colour scheme in selected children museum internationally and locally.

RESEARCH METHODOLOGY

This study is a qualitative study that employed case study research approach. According to Zainal (2007) case study research approach has been used to critically evaluate the standards, constraints, moral, and practical concerns that could be raised by architectural research and findings. In this study, current building colour typologies are compared and contrasted. Five case studies were selected, one local and four international namely, children's museum of Indianapolis, United States, Miami children's museum, United States, children's museum Houston, Texas, Boston children's museum United States and mindscapes children's museum Lekki, Lagos. The assessment of use of colour was done by subjecting the interior and the exterior of the selected case studies to an assessment based on the following scale where 1 – poor use, 2 – fair use, 3 – good use, 4 – very good use and 5 –excellent use. The study was subjected to descriptive analysis and results were presented descriptively with tables and figures.

RESULT AND DISCUSSION

Use of yellow colour in the selected 5 case studies

Table 2 revealed that yellow colour was excellently utilized in Case study 1, 2 & 3, however, in Case Study 4 and 5, its usage was considered averagely good. The application of yellow colour across the assessed case studies is presented with few pictures in Fig 1 to 5.



Fig 1: Yellow in Children's Museum of Indianapolis
Source: The Children's Museum Indianapolis– ddotts.com



Fig 2: Yellow in Miami Children Museum
Source: Exhibits - Miami Children's Museum



Fig 3: Yellow in Children museum of Houston
Source: Exhibits at the Children's Museum Houston
Museum



Fig 4: Yellow in Boston Children Museum
Source: Virtual Tour – Boston Children's



Fig 5: Yellow in Mindscapes children Museum, Lagos, Nigeria
Source: Researchers fieldwork

Based on result as presented Table 2 and Fig 1-5, it is evident that case study 1 (Children’s Museum of Indianapolis), case study 2 (Miami Children’s Museum), and case study 3 (Children’s Museum of Houston) prominently utilized the colour yellow. This suggests that children within these environments may experience positive effects, such as increased engagement, enthusiasm, happiness, optimism, and energy; as yellow is a vivid, warm, and welcoming colour that could lead to active participation in various activities also as mentioned by Lei Zhang & Chunnan Cao (2022). In case study 4 (Boston Children’s Museum) and case study 5 (Mindscapes Children’s Museum), the usage of yellow was still considered good, indicating that despite its relatively lower presence, children within these settings are likely to still experience positive outcomes.

This result shows that the designers of these selected case studies have applied yellow colour appropriately in different spaces both on the interior and exterior walls, on the furniture, floors, equipment and the roof. These impact of colour will extend beyond its physical manifestation, its presence contributes to creating a vibrant and engaging atmosphere thus, fostering positive experiences for the children. This aligns with findings from Cupkova et al. (2019) which mentioned that yellow proves to be an excellent choice for entrance halls, exuding a welcoming and inviting ambiance in children designed environment. Its warm and energetic qualities make it the finest colour for increasing enthusiasm, instilling confidence, and promoting optimism among children.

Use of blue colour in the selected 5 case studies

Table 2 reveals that blue colour was excellently used in case study 1,2,3 & 4. Fig 6-9 shows pictures of spaces where blue colour was used in case study 1 to 4. It was observed that blue colour was used prominently in the interior spaces in the selected buildings. Specifically used in the hallway, gift shops, some exhibition rooms. For case study 5 its use was good as shown in Fig 10 this could be because the building is a mixed used building and the floor housing the children museum was redesigned to fit its purpose.



Fig 6: Blue in Children’s Museum of Indianapolis
Source: The Children's Museum Indianapolis– ddotts.com



Fig 7: Blue in Miami Children Museum
Source: Exhibits - Miami Children's Museum



Fig 7: Blue in Children museum of Houston
Source: Exhibits at the Children's Museum Houston Museum



Fig 9: Blue in Boston Children Museum
Source: Virtual Tour – Boston Children's



Fig 10: Blue in Mindscapes Children Museum, Lagos, Nigeria
Source: Researchers fieldwork

From Table 2 and pictures presented in Fig 6 to 10, it is obvious that case study 1 (Children's Museum of Indianapolis), case study 2 (Miami Children's Museum), case study 3 (Children's Museum of Houston), and case study 4 (Boston Children's Museum) prominently incorporated the colour blue. This deliberate usage of blue suggests that children within these environments are likely to experience an enhanced sense of stability and mental clarity as van Ewijk et al. (2020) also mentioned, perhaps that is one of the reason why its use is prominent in the interior spaces of the children museums understudied than the exterior spaces. Furthermore, the colour blue is the colour of the sky and the sea and has been revealed to be good to both the intellect and the body as mentioned by Güneş & Olguntürk (2020), this could also indicate why its use in the selected case study has been observed to be obvious especially in the interior spaces, In case study 5 (Mindscapes Children's Museum, Lagos, Nigeria), its use of blue was considered good although not as high as the international case studies this could be because the space housing the museum is not purpose built.

Use of purple colour in the selected 5 case studies

Result from Table 2 shows that in case study 2 & 3 the use of purple colour was very good while its use can be considered to be good in case study 1. While in case study 4 (Boston children's museum) and case study 5 (Mindscapes children's museum, Lagos Nigeria), its use was fair. The application of the colour purple in each case study is presented in Fig. 11- 15.



Figure 8: Purple in Children's Museum of Indianapolis
Source: The Children's Museum Indianapolis– ddotts.com



Fig 12: Purple in Miami Children Museum
Source: Exhibits - Miami Children's Museum



Figure 93: Purple in Children museum of Houston
Source: Exhibits at the Children's Museum Houston



Fig 14: Purple in Boston Children Museum
Source: Virtual Tour – Boston Children's Museum



Fig 15: Purple in Mindscapes Children Museum, Lagos, Nigeria
Source: Researchers fieldwork

From Table 2, it is evident that in case study 2 (Miami Children's Museum) and case study 3 (Children's Museum of Houston), the use of the colour purple was very good. This suggests that children are likely to experience a sense of creativity and relaxation in these environments. The incorporation of purple fosters an atmosphere that encourages imagination and provides a calming ambience for the children in the surroundings. In case study 1 (Children's Museum of Indianapolis), the use of purple was considered averagely good. However, in case study 4 (Boston Children's Museum) and case study 5 (Mindscapes Children's Museum), its use was rated fair. This result aligns with findings from Sulatra & Eka Pratiwi (2020) which mentioned that Purple strikes the perfect balance between stimulation and relaxation, encompassing both warm and cool qualities.

Use of orange colour in the selected 5 case studies

The use of orange colour in case study 4 was very good. its use in case study 3&2 and 5 was good. While its use in case study 1 was fair. The application of the colour in the selected case is shown in the Fig 16 to 20. Figures 16 to 20 shows that orange colour was used mostly for interior and the exterior walls. Although it surprising that in the Children Museum of Indianapolis its use was sparingly as this case study has been observed to have used other colours elaborately.



Fig 16: Orange in Children’s Museum of Indianapolis
Source: The Children's Museum Indianapolis– ddotts.com
Museum



Fig 17: Orange in Miami Children Museum
Source: Exhibits - Miami Children's



Figure 108: Orange in Children museum of Houston
Source: Exhibits at the Children's Museum Houston



Fig 19: Orange in Boston Children Museum
Source: Virtual Tour – Boston Children's Museum



Fig 20: Orange in Mindscapes Children Museum, Lagos, Nigeria
Source: Researchers fieldwork

Based on the result presented in Table 2 and Fig from 16 to 20, it is evident that the use of the colour orange varied across the case studies. For case studies where its use was very good or good it suggests that the facilities will create an engaging and lively atmosphere. This is because the vibrant nature of orange has the potential to encourage children to actively participate in various activities within the space, infusing energy and enthusiasm into their experiences. As this is in line with Gupta & Delhi (2021) which indicated that orange colour can prompt numerous physical effects such as, increased activity levels, enhanced social interaction, stimulated mental activity, elevated motivation, boosted confidence, etc.

Use of green colour in the selected 5 case studies

The use of green colour in case study 1 & 3 very good. Its use in case study 2 & 5 was good. While in case study 4 its use was fair. The application of the green colour across the case studies is shown with some pictures in Fig 21 to 25. Its application was seen its used in green elements, such as green walls or natural-themed exhibits.



Fig 21: Green in Children's Museum of Indianapolis
Source: The Children's Museum Indianapolis– ddotts.com



Fig 22: Green in Miami Children Museum
Source: Exhibits - Miami Children's Museum



Figure 23: Green in Children museum of Houston
Source: Exhibits at the Children's Museum Houston
Museum



Fig 24: Green in Boston Children Museum
Source: Virtual Tour – Boston Children's



Fig 25: Green in Mindscapes Children Museum, Lagos, Nigeria

Source: Researchers fieldwork

Based on the result presented in Table 2, the use of the colour green varied across the case studies. In cases where the use of green colour was very good and good which are Children's Museum of Indianapolis, Children's Museum of Houston and Miami Children's Museum respectively. There is an indication that its use contributed to creating a serene and tranquil ambiance within the space, fostering a harmonious and calming experience as the children explores the museums. This aligns with findings from Bryndin & Bryndina (2019) which mentioned that when green elements are incorporated into interior design, it evokes a sense of tranquillity and security. This result further aligns with findings from Jhangra & Rao (2021) stating that green possesses calming, relaxing, and rejuvenating properties, and it is believed to be beneficial in alleviating anxiety, despair, and uneasiness.

Table 2 present the assessment conducted on the use of colour in the five selected case studies. This assessment was conducted on the entire facility, examining the use of colour in the interior and exterior spaces which included the floor, ceiling, furniture and equipment on earlier mentioned scale poor use (1) to excellent use (5).

Table 2: Assessment of colour usage in selected case study

Colour	Case study 1: Children's museum of Indianapolis)					Case study 2: Miami children's museum					Case study 3: Children's museum of Houston					Case study 4: Boston children's museum					Case study 5: Mindscapes children's museum				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Yellow				✓						✓					✓			✓					✓		
Blue				✓						✓					✓					✓			✓		
Purple			✓						✓					✓				✓					✓		
Orange		✓						✓					✓						✓				✓		
Green				✓				✓						✓				✓					✓		

Source: Researchers Fieldwork

CONCLUSION

In summary, the five case studies showcased the effective integration of colours, with particular emphasis on the prominent use of yellow and blue. This implies that children exposed to these colourful environments are likely to exhibit positive outcomes, including increased activity

levels, heightened happiness, and a willingness to engage in learning new things. Moreover, the incorporation of these vibrant hues is associated with fostering creativity and promoting an overall enjoyable experience during their visit to the museum. It is recommended that professional involved in the design or redesign of children's museums, should incorporate the identified colours (blue, yellow, orange, purple and green) that stimulates positive psychological responses in children into their proposed architectural designs design as this will significantly contribute to making these spaces memorable and impactful for children, thus, inspiring a lifelong love for learning and exploration.

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