



Color As A Design Tool For Children's Wayfinding Performances In Interior Spaces

İç Mekânlarda Çocukların Yön Bulmaları İçin Bir Tasarım Elemanı Olarak Renk

Assoc. Prof. Dr. Elif GÜNEŞ

Atılım University, School of Fine Arts, Design and Architecture, Department of Interior Architecture and Environmental Design, Ankara / Turkey
ORCID: 0000-0002-1884-8363

Asst. Prof. Dr. İpek MEMİKOĞLU

Atılım University, School of Fine Arts, Design and Architecture, Department of Interior Architecture and Environmental Design, Ankara / Turkey
ORCID: 0000-0002-0444-2944

Asst. Prof. Dr. Bülent ÜNAL

Atılım University, School of Fine Arts, Design and Architecture, Department Industrial Design, Ankara / Turkey
ORCID: 0000-0003-1721-7903

ABSTRACT

Wayfinding is a process of reaching a destination, whether in a familiar or unfamiliar environment. Environments need to be perceived selectively and the obtained information gained from the environment needs to be assessed as well. Color is one of the spatial characteristics that works as a supportive information for the wayfinding process. In addition to the spatial characteristics, individual differences influence wayfinding. Age is an important aspect as it influences the wayfinding performances. Unlike adults, children do not know how to behave in case of inaccurate orientation in an environment and they cannot control their psychology towards feeling lost. At this point, this study aims to underline the significance of use of color, which is one of the most important design elements for children, to reduce disorientation problem in children's spaces.

Keywords: Color, Wayfinding, Color and Wayfinding Associations, Interior Space, Children.

ÖZET

Yön bulma, ister tanıdık ister tanıdık olmayan bir ortamda, bir hedefe ulaşma sürecidir. Ortamların seçici olarak algılanması ve çevreden elde edilen bilgilerin de değerlendirilmesi bu süreç için gerekmektedir. Renk, yön bulma süreci için destekleyici bir bilgi olarak çalışan mekânsal özelliklerden biridir. Mekânsal özelliklere ek olarak, bireysel farklılıklar yön bulmayı etkilemektedir. Yaş, yön bulma performanslarını etkilediği için önemli bir unsurdur. Yetişkinlerin aksine çocuklar, bir ortamda yanlış yönelim olması durumunda nasıl davranacaklarını bilemezler ve kaybolmuş hissetmeye yönelik psikolojilerini kontrol edemezler. Bu noktada bu çalışma, çocuklar için en önemli tasarım unsurlarından biri olan renk kullanımının çocuk mekânlarındaki yönelim bozukluğu problemini azaltmak için öneminin altını çizmeyi amaçlamaktadır.

Anahtar Kelimeler: Renk, Yön Bulma, Renk ve Yön Bulma İlişkilendirmeleri, İç Mekân, Çocuk.

1. INTRODUCTION

The importance of wayfinding is increasing, especially in open and closed public environments, where spaces are increasingly carried to large scales and the crowd of people is increasing as well. Being lost, which occurs as a result of the inability of people to find their way in crowded and large complex places, increases the stress level of people and negatively affects their wellbeing. The wayfinding process is influenced by individual differences. Age is one of the most important individual differences that affects this process and constitutes one of the main topics of this study.

Adults develop their sense of spatial learning in years. They know how to behave in a case of an inaccurate orientation in an environment and they can control their psychology towards feeling lost. However, it is different for children; their first experiences are in their schools and these experiences can positively or negatively affect the children's psychology. Providing legible spaces

for children may also contribute to their psychological health. Finding one's way especially in unfamiliar environments supports the process by the use of environmental design elements. Physical characteristics such as color used in spaces have an important role on perception and navigation (Higgins et al., 2005) for both adults and children.

Wayfinding as a matter of spatial perception, the influence of color as an important environmental factor for wayfinding and the effects of color on children's wayfinding ability are discussed in the study. It is demonstrated that the use of color in children's environments especially in school environments can play a crucial role in children's spatial performances.

The main purpose of this study is to draw attention to color as a design tool in the context of its effectiveness on the wayfinding process. In addition, to draw attention to the positive effects of color in the design of children's spaces and the effects of the use of color on children's wayfinding process. In the study, firstly the concept of wayfinding is explained and then existing studies on the wayfinding process related to children are given. In the third part, firstly color and design, and then the contribution of color to the wayfinding process are explained with the support of sample space visuals. Finally, the importance of the concept of color in children's spaces and the positive effects of the use of color on the children's wayfinding process are conveyed by supporting them with visuals.

2. WAYFINDING AND CHILDREN

2.1. Wayfinding

Kevin Lynch as an urban planner first used the term "wayfinding" in his book "The Image of the City" (1960) that comprised how the characteristics of urban space were influenced by the features in it. The term was later described as a matter of spatial perception and cognition by Arthur and Passini (1992). They described the term as a process of reaching a destination, whether in a familiar or unfamiliar environment (Arthur & Passini, 1992: 25). According to them wayfinding was a problem solving process that comprised making a journey and reaching a destination.

Wayfinding process happens in spaces. The spatial characteristics of an environment with the organization and the circulation systems contribute to wayfinding and problem solving performances (Arthur & Passini, 1992). Therefore, environments need to be perceived selectively and the information gained from the environment needs to be assessed as well. If people have some practical difficulties in processing environmental information while finding their way, they feel anxious and stressful. According to Passini (1984: 90) information can be obtained from different wayfinding support systems "such as information booths, signs, maps, and also from the architectural and spatial characteristics of a setting". Complexity, mystery, legibility, organization, landmarks, signage, pathway configuration, color, lighting are some of the architectural and spatial characteristics that work as supporting elements (Evans & McCoy, 1998).

In addition to the spatial characteristics, individual differences influence wayfinding as well. Various aspects of individual differences such as familiarity, gender and age have been examined through previous studies. Cubukcu and Nasar (2005) found that age produced a significant effect on navigation errors; as age increased, performance declined. Likewise, Galea and Kimura (1993) found that younger participants scored higher than older adults did on wayfinding processes, the focus was on the wayfinding performance of children as one of the most important age groups.

2.2. Children's Wayfinding

Especially young children have an inner need to be influenced from their environments. They learn by interacting with their environments. Places that provide positive experiences offer opportunities for children to explore, to manipulate, and to be involved (Wilson, 1997). A disorganized environment suggests to children that they are not valued or respected. These kinds of messages

affect children's perception of themselves as learners and explorers, their self-esteem and their feelings of competence. Children's understanding and communicating with spatial information can provide critical information on how well spatial concepts are understood (Bell, 2002). Thus, places that are provided to children have a crucial role in their personal and environmental education. It is important to analyze the environments provided for young children as the nature and the quality of the setting are influential on how and what they perceive to find their way around.

Visual recognition process can inform children that they are not on-route by the absence of familiar or expected cues and by noticing something on route that the child is sure that s/he has never seen it before (Cornell & Hill, 2004). Most school-aged children are able to walk to school, to a friend's house, and local stores in familiar neighborhoods. This daily walking helps children to improve the concepts and skills they need to remain oriented in environments, therefore few children get lost in their familiar environments. However, it is not the same for unfamiliar environments (Ambrose, 2000). Parents try to provide their children many kinds of instructions to help them in everyday wayfinding tasks; such as 'pay attention', 'look around', etc. (Heth et al., 1997). Read and colleagues (1999) stated that children are active perceivers, stimulated by various source of information that existed in their environments and they tried to discover, explore, and attend this information. Gouteux and Spelke (2001: 145) claimed that when young children are disoriented, "they appear to reorient themselves by analyzing the shape of the surroundings' surface layout, but not by analyzing either the shapes of configurations of objects or the distinctive coloring of the surface layout".

In the literature, there are many studies on children's wayfinding performances, factors affecting these performances and children's awareness of the environment they live in:

A child, around the age of eight, starts to understand the world in which s/he moved as a metric system; a two-dimensional structure that remains constant. Young children (school-aged children) do not have a meta-knowledge that refers to "knowing what you know". Therefore, they do not know what they do not know, and they can get lost (Hill, 1998).

Children under seven have to be watched in their environment as they can get lost; however, children under ten can easily become lost as well. Spatial orientation skills develop very rapidly through the years. Ten-years-old children can walk about their neighborhood almost as well as adults (Hunt & Waller, 1999). Eight-years-old children can remember the places and events that are at the beginning and end. They are at the beginning of route learning (Cornell et al., 1996).

The ability to control a reference system that refers to selecting and maintaining a consistent frame of reference was studied between 3 to 8 years old children (Allen, 1999). It was reported that there was a period during which children could more easily select and maintain an object as a reference point, between the ages of 3 and 8 years old. The 3-year-old children had more difficulty than did the others in evaluation of feedbacks got from the objects.

The effect of age on a child's awareness of place and on the manner, style, and composition of representation of space was studied by Matthews (1984) with map drawings between ages 6 to 11. It was reported that with increasing age the young children acquired more information about places and their ability to depict changes in space improved. The sketches of the youngest group were simple with only a few routes; however, older children were able to describe the surround area with details.

Spatial competence improves markedly between 2 and 5 years of age. Foreman and colleagues (1990) reported that there were age differences significantly both in performances of reference memory skills and in accuracy in environmental differentiation of spatial locations. The youngest group (2 years old) performed poorer than the intermediate (3-4 years old) and the oldest group (5 years old).

To compare the performances in spatial knowledge, 10 years old children displayed more confidence while walking, with their knowledge of their environments and the awareness of their location than 6 years old. However, there was no significant difference between boys and girls in these performances. In addition, it was indicated that both age groups used landmarks in describing the locations and in the wayfinding process (Ambrose, 2000).

Lehning and colleagues (1998) studied the types of information children used when orienting in a new environment when proximal and distal landmarks were given with 5, 7 and 10 years old children. The study showed that children with different ages used different orientation strategies. Five-years-old children used cue strategy by orienting towards the proximal cues; 10-years-old children displayed much more complex place strategy by use of distal landmarks; 7-years-old children showed a transition in between cue and place strategy.

The role of landmarks for the development of spatial cognition in children was studied by Osmann and Fuchs (2006). The differences in the effect of landmark information on wayfinding behavior and spatial knowledge were examined between second graders, sixth graders and adults. It was reported that the existence of landmarks influenced wayfinding performances of adults and children in the same way. Younger children's performances were poorer than adults and older children; they needed more trials (Osmann & Fuchs, 2006). It was demonstrated that children at school age were able to use landmark information like adults during learning an unknown environmental space.

Heth and colleagues (1997) examined how children were affected by changes of landmarks - in the position and orientation- by assessing place recognition and path choices at intersections, during a route reversal. Eight and 12 years-old children were firstly escorted on a walk across a university campus and then they escorted the tester to the starting point. Children were instructed to pay attention to the landmarks at intersections and some of the landmarks were moved prior to the child's return trip. Twelve year-old children outperformed 8 year-old children on route recognition, navigation accuracy and recognition of changes on landmarks.

Seven-eight years-old, 11-12 years-old and adults (26 years-old) learned a route by a slide presentation in a computer-simulated environment (Osmann & Wiedenbauer, 2004). They had to recall the inherent landmarks and they had to walk through the empty maze recalling the names and the positions of the landmarks (animals). The age group influenced the numbers of recalled landmark names. Seven-eight years-old recalled fewer landmarks than older children and adults. Youngest boys recalled more landmarks than the girls did at the same age but men recalled fewer landmarks than women did.

Bell (2002) reported that although children at 7 and 9 years-old and adults had difficulties on recalling the location of an arbitrarily selected object, in both 'landmark free' location recall task and 'relative' location recall task, adults recalled object locations better than both 7 and 9 years-old children, and 9 years-old recalled better than 7 years-old children.

The effect of verbal description of spaces on children's ability to make spatial inferences was examined by Ondracek and Allen (2000). Children between 6 to 9 years of age showed very accurate memory in recognizing spatial and non-spatial information after oral description of the spaces.

According to the findings stated above as summary information, environments are characterized by affordances that have a very important role on children's perception and learning within that environment. Affordance means "the functional qualities of an environment that helps people meet important goals" (Gifford, 2002: 72). It may be anything that enables it to be used in a particular way by a particular group of people (Lang, 1987). Color is such an affordance that ease the wayfinding process for children.

3. WAYFINDING AND COLOR

The appropriate use of environmental factors in indoor and outdoor environment positively influences the perceptions, behavioral decisions, spatial orientation and wayfinding of users (Hidayetoğlu et al., 2012). Color, as a powerful design element is examined in this study as a tool that positively affects wayfinding process by supporting the users.

Color in Design

Color is a flexible and powerful design element. It plays an essential role in design and it touches everything. Colors that people perceive work as a kind of language as they serve as tools of communication between people and the objects surrounding those (Hard & Sivik, 2001). Therefore, colors should be used to give the right message to people through the built environment (Kaya & Crosby, 2006).

Environmental color plays a variety of roles in our everyday lives. It has a crucial role not only in the creation of place through its design aspect, but also in improvement of environmental meaning. In the creation of places, it is an aspect to be considered in design as it is used to shape space, enhance and diminish volume or assign position to an object in the visual field. Therefore, it combines design process and the creation of place (Smith, 2003). In addition, it is indicated that color is relevant for the perception of space, building form, wayfinding, ambience, and image. It is an indicator of environmental variables such as theme, function, built form, location and direction. Color can be used in design to differentiate different areas, to identify crucial features, to show spaces that are functionally related and to highlight some information in the environment by color-coding. For color-coding, there should be a conservative approach such as using as few colors as possible to prevent confusion (Smith, 2003).

Colors are used in design for different purposes and for showing different meanings in environments such as aesthetic meaning, symbolic meaning and cultural meaning. Harmony of colors is an important subject in an aesthetic point of view because a person wants to see the balance in colors whether they are closely related or opposite. Color can distinguish spaces to make information clearer by which it adds meaning. Cultural meaning is important in design because color has different meanings in different societies. Therefore, it is important not to force a particular color on users (Shehata, 2000). Tradition can also influence the integration of certain colors with certain emotions, such as in many cultures white traditionally symbolizes purity that is why many brides wear white dresses (Kaya & Crosby, 2006). In aesthetic point of view, color has a crucial role in the creation of a pleasant, ambient environment with its different effects on people's emotions (Dalke et al., 2005). The incorrect use of color can impair the user's ability to interact with their environment seriously. Too much color can have the effect of making something more difficult, rather than easier to use (Shehata, 2000). One of the issues supported by the method of using color in space is wayfinding.

Color and Wayfinding

Users' successful wayfinding abilities depend on the availability of environmental information. "Color can be used in clever, creative, and inspiring methods of application for wayfinding and orientation throughout the settings" (Read, 2003: 237). Color can be used as a visual cue, to help individuals focus on a particular area of the built structure. It can be applied as a wayfinding tool for not only interiors but also for exterior spaces in environments. Because of its easy manipulation in a variety of design materials, color is an ideal design element for creating environments that support users' wayfinding abilities (Read, 2003).

Color can be applied as a design element for visual identification in environments. It can be used on signage, walls, columns, and architectural features. It can also be added for simplicity, for example, placing large flower planters on any side of the building (Read, 2003). Color can develop the definition of the architectural environment by reinforcing the hierarchy of spaces and landmarks, and by clarifying the destinations and prominent features. It helps to understand the form and starts to act as a signage in the building (Dalke et al., 2005). Color also plays a significant role during encoding and the recognition processes. It helps to improve visual memory of images in the building environment. It is reported that color enhances recognition memory by providing an advantage during encoding and strengthening the encoding-specificity effect (Spence et al., 2006). Especially for the complex buildings, color-coding can be very useful by zoning the spaces of the building. It should be obvious for easy recognition, the used colors should be limited for eliminating confusion and should be unique in their descriptive words (red, blue, yellow are acceptable, but turquoise can be confusing because it contains both blue and green hues) (Dalke et al., 2005). Evans and colleagues (1980) reported that people in the color-coded condition made significantly fewer errors in wayfinding tasks. They located specific targets in the building more accurately and had higher recall and recognition memory for floor plans of the building when compared to people in non-color-coded condition. See Figures 1-6 for color coded wayfinding systems. As it can be seen from the examples in the figures, the use of color emerges as one of the most specific design elements in interior and exterior to identify and distinguish the location, and to code between spaces while routing.

Osmann and Wiedenbauer (2004) studied the effect of color on performance in a wayfinding task, the wayfinding strategies used and the acquisition of survey knowledge by comparing the colored and colorless conditions. They found that structuring of space through coloring helped children at school age and adults in the same manner to find their way around. In addition, it was reported that color had an influence on the wayfinding strategies used, but not on the acquisition of spatial knowledge. Hidayetoğlu and colleagues (2012) reported that warm colors can be effectively used as landmarks for wayfinding purposes. While warm colors are more attractive and provide orientation, cool colors have significant orientation advantages.



Figure 1. Color coding for treatment rooms in clinic design
(<https://tr.pinterest.com/pin/765400899151064826/>)



Figure 2. Colorful balconies in library with room numbers
(<https://tr.pinterest.com/pin/347551296249620353/>)

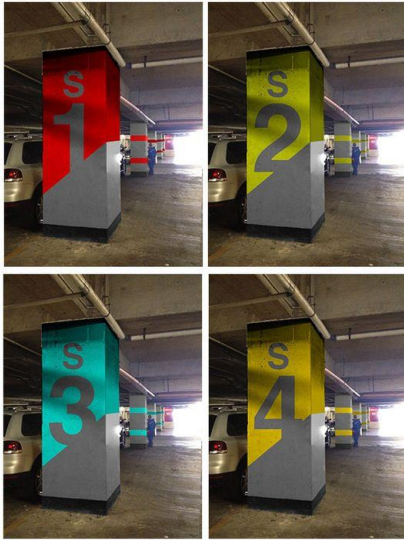


Figure 3. An indoor parking colored signs represents floor numbers
(<https://tr.pinterest.com/pin/257690409905389683/>)



Figure 4. Color coding for floor numbers
(<https://tr.pinterest.com/pin/271482683761913582/>)



Figure 5. 3 Dimensional outdoor signage system
(<https://tr.pinterest.com/pin/129971139222423703/>)



Figure 6. 2 Dimensional outdoor signage system
(<https://tr.pinterest.com/pin/45176802496449891/>)

4. COLOR FOR CHILDREN'S WAYFINDING

Children need their environment to be interesting. Young children make associations with color and shapes rather than form. Therefore, using color in their environment can provide visual interest to supply maximum efficiency in navigation by providing visual dominancy in key building elements (Dalke et al., 2005). For this reason, in spaces designed for children, adhering to the use of colors that are suitable for the function (for example, because the library is a place where children need to gather their attention and concentration, using lighter colors instead of very vivid colors; increasing the desire of children to do activities by using vivid colors in playgrounds) is very important to create colorful spaces (see Figures 7 and 8).



Figure 7. Colorful interior educational space
(<https://tr.pinterest.com/pin/317292736251069186/>)



Figure 8. Aldinga Children Library
(<https://tr.pinterest.com/pin/462674561718274698/>)

School buildings are the first public places for children that they use and come to know instantly (Orr, 1992). At this time, the experience of school starts to be a dominant force in their lives. According to Thompson (2003) the function of a space is very important in using colors in school environments. He suggested that in classrooms painting the teaching wall deeper and in brighter shade than the sidewalls helped to attract attention to the front of the classroom and helped the eyes to get a visual break when looking at the sidewalls; in libraries using warm colors and brighter spaces encouraged students to read; in auditoriums, gymnasium and cafeterias using lighter warm tones or neutral colors helped to prevent the overwhelming effect of the space; in corridors and stairwells using combinations of color for creating color code sections of the building helped navigation and traffic flow. The choice of color used in schools can either improve or impair learning, morale and behavior. It can reduce absenteeism and vandalism, affect a student's attention span, and perception of time (Thompson, 2003). Engelbrecht (2003) recommended cool colors for upper grade and secondary classrooms to aid their ability to focus while elementary schools prefer warm, bright color schemes.

Osmann and Wiedenbauer (2004) claimed that structuring of space through coloring helped children at school age to find their way around. They proposed to register color in wayfinding designs as for the architects choosing the right tool for orientation was difficult due to user group may not use the same features as orienting landmark in public buildings. The contribution of color to children's wayfinding performance in school environments, and the differences between colors in terms of their remembrance and usability in route learning process were explored by Helvacioğlu and Olguntürk (2011). The results of the study proved not only the effect of color on children's route learning performances, but also the effect of color on children's pointing task performances (Helvacioğlu, 2007). Read (2003: 233) reported that "color is a useful design element for wayfinding, spatial orientation, and space definition in children's environment". The application of color is used to improve children's wayfinding and spatial orientation abilities in their environment (see Figures 9-12). In the Figures it is seen that color is used for coding in children's spaces to make it easier for them to find the classroom or room they want to go. Thanks to these codes, the process of wayfinding becomes easier and even fun, by telling the children which colored room they should go instead of the room number or room name.



Figure 9. Corridor view of a school with color coded class entrances
(<https://tr.pinterest.com/pin/15692298675839863/>)



Figure 10. Corridor view of a children clinic with color coded room entrances
(<https://tr.pinterest.com/pin/684054630887128872/>)



Figure 11. Colored door sign for children's restrooms
(<https://tr.pinterest.com/pin/836402962045213640/>)



Figure 12. Colorful booths in school for children
(<https://tr.pinterest.com/pin/700732023251784958/>)

5. DISCUSSION AND CONCLUSION

Wayfinding as a matter of spatial perception, the influence of color as an important environmental factor for wayfinding and the effects of color on children's wayfinding ability were discussed in the study. It was demonstrated that the use of color in children's environments especially in school environments can play a crucial role in children's spatial performances. Read (2003) showed that color helped children to improve their wayfinding and spatial orientation abilities especially in their school environment and Dalke and colleagues (2005) supported the idea by indicating that using color in children's environment can provide visual interest that affects the efficiency in navigation by providing visual cues in the building.

The analyses comprised in the study and the stated results from the literature should be taken into account to provide more legible and healthy environments to the children. Architects, interior architects, environmental planners, sign makers, educators and parents should communicate and work together for providing safe and aesthetically pleasing environments to children.

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