

Research on the Interface Design of Children's APP from the Perspective of Color Cognition

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Abstract:

Analyze and research the interface design of children's apps based on color cognition. By introducing Piaget's theory of child cognitive development, children's color cognition is divided into four stages: infancy, preschool, school-age, and adolescence, and the color cognitive abilities of children at different stages are subdivided. Summarize the principles of color application in children's app interface design through case analysis.

Keywords:

Children, Color Cognition, Mobile Applications, Interface Design

1. Research Background Analysis

With the widespread application of the Internet, mobile apps have become inseparable from our daily lives. Both elderly and children are starting to use apps for learning and entertainment. According to the "2021 National Research Report on Internet Use among Minors", the scale of Internet use among minors in China has been increasing year by year from 2018 to 2021, reaching 191 million in 2021. The Internet penetration rate among minors has reached 96.8%, and the trend of younger age for minors to have access to the Internet is more evident. From this, it can be seen that using mobile apps for learning and entertainment has become a new way of children's education in China. Analyze the theme of the children's app STORE. At present, there are various types of children's apps on the market, including art and creativity, natural sciences, mathematics, early education, comprehensive puzzle, language reading, and games. As an effective learning method for children, the children's app has convenience, diversity, interactivity, and review assistance in functions, effectively promoting the development of children's learning interests, improving their knowledge level, exploration ability, innovative thinking, hands-on ability, and so on.

Out of curiosity about the world, children always have enough patience to observe and understand the world. Firstly, understanding the world through visual perception is of great significance for children's mental health and personality development. The

effective development of visual abilities can not only stimulate children's curiosity and observation sensitivity, but also promote their ability to explore and appreciate things. At the same time, childhood is also the peak period of aesthetic thinking, which includes factors such as observation, cognition, association, and creation. In the interface design of children's apps, visual experience can bring children the first impression. Good visual effects can enhance children's user experience, while poor visual experience not only reduces children's visual experience but also causes visual confusion, leading to children's resistance and boredom towards the app. In the interface design of apps, colors play a crucial role in visual perception. Different colors can bring different feelings to children. Colors not only enrich children's emotions and reduce negative emotions, but also allow them to feel the beauty between things through colors, bringing them a space for spiritual imagination [1].

2. Children's Color Cognitive Development

The famous Swiss psychologist Piaget proposed the theory of children's cognitive development, which divides children's development into four stages: the perceptual motor stage; Pre-operational stage; Specific operational stages; Formal operation stage [2]. Piaget believes that children's cognitive abilities gradually develop in aspects such as sensory perception, memory, and thinking. The interaction between children and apps mainly considers visual and auditory aspects, with visual dominance [3]. With the development of children's cognitive abilities, their receptivity gradually improves, the accuracy of distinguishing colors and chromaticity increases, and their aesthetic ability also improves. In terms of perception, as children age, they begin to develop logical perception, and their accuracy and generalization also improve accordingly. At the same time, children's preference for color gradually begins to be mixed with gender factors. Therefore, the development of children's color cognition is divided into four stages for analysis, namely: infancy, preschool, school-age, and adolescence.

2.1. Infancy and infancy

Children in the early stages of infancy can only recognize blurry images around 17-70 centimeters, able to distinguish between light and dark, and have a relatively sensitive recognition of areas where red and light intersect, but cannot recognize colors. Many parents mistakenly believe that babies like color and decorate their baby rooms in a colorful manner, neglecting visual coordination and aesthetics. With the stimulation of rich and colorful patterns on young children, it accelerates the development of their visual areas in the brain. At the same time, the visual system of young children is enhanced in its ability to perceive edges and contrast, thus inspiring higher levels of cognitive ability in their vision. At this stage, young children have the fastest eye development and already have colorful visual cognition. A child of one and a half years old can already put items of the same color together. With the improvement of children's mobility, they begin to have more understanding of three-dimensional spaces such as front and back, left and right, far and near, and high and low visually. At this point, young children's vision gradually develops from flat vision to stereoscopic vision. At the same time, the author began to grasp the relationship between color and objects, such as bananas being yellow and oranges being orange. In early childhood, a visual environment that is in line with children's cognition is very important. Guiding color design can promote the development of

children's imagination, discrimination, and selection abilities, as well as promote the development of children's visual space and intelligence level.

2.2. Preschool period

Preschool children have gradually mastered basic abilities in daily life and have a rich visual experience. Almost all visual perception abilities have developed and matured, and they can also distinguish between light and dark changes in colors, as well as cool and warm tones and color equivalence. During this period, children were no longer limited to a single color and began to be interested in color mixing. Starting to recognize the combination and application of colors. At this point, children further focus on themselves to feel the surrounding environment and gradually develop the concept of space. However, their attention retention time is limited and their attention is easily distracted. Only colorful color schemes can attract their attention [4]. The experiment by Australian psychologist Werner has shown that children, especially preschool children, recognize, distinguish, and choose things mostly based on colors that have a strong visual appeal.

2.3. School age

The improvement of concentration and intentional attention abilities in school-age children can already enable them to complete tasks independently. At the same time, children's curiosity and analytical abilities at this stage also increase, with children aged 9-11 showing a decrease in interest in simple things and gradually developing an interest in regular and logical visuals. At the same time, school-age is an important stage for children to enrich their imagination. At this time, children have reached a mature stage of color cognition and have rich experience in the application of color [5]. At the same time, school-age children's preference for color gradually incorporates gender factors, such as boys preferring cold tones and girls preferring warm tones. As children age, the idea of "detachment from childhood" begins to emerge. At this time, children no longer need bright colors to maintain their attention, develop an interest in complex and logical color schemes, and gradually develop their own unique aesthetic characteristics.

2.4. Adolescence

Adolescent children's color cognition ability has become more adult. They prefer to pursue individuality, stimulation, etc. visually, do not like to be constrained, do not like to follow the crowd, and crave personalization. So when designing, they should respect their perception and ideas of color more.

3. Analysis of Color Application Cases

Through research on the current children's apps on the market, it was found that a large number of children's apps have interface designs that do not conform to children's cognitive development. Many app developers prioritize commercial value over experiential value, neglecting children's ability to accept and demand the interface. Many children's apps are imitating competitors and rarely incorporating rational thinking and innovation. The design did not focus on children's user experience. The design did not take children as the main body, did not fully consider their characteristics, and did not design from the perspective of children.

The ‘Fun Animals’ app is a popular science app for children aged 3 to 4, aimed at making it easy for children to learn about animals. The process of using the app is easy and interesting. Children can slide different parts of the animal’s body to make choices, recognize them through the background color of the interface and the color and pattern of the animal’s body, and then assemble a complete small animal, as shown in Figure 1. The operation method of the app is very simple, and the interface color is bright. Various small animals are flat and have cute and cute shapes, which can effectively attract children’s attention and give them enough patience to complete the game. Children have gained a deeper understanding of colors, patterns, and the physical characteristics of small animals while recognizing them again, which has also improved their exploration ability.



Figure 1. Fun Animals.

“Shanye Diary” is a children’s interactive picture book app, as shown in Figure 2. It presents the natural scenery of the four seasons in a beautiful and lovely way of painting, and each season has its own unique colors and beauty. In terms of color, it adopts the colors of the four seasons in reality. Overall, each season selects a main color and uses similar colors for color matching, such as choosing yellow as the main color tone in autumn, and orange, yellow brown, etc. as the color matching. In winter, white is the main color tone, and light blue, light gray, etc. are used as color schemes. Enable children to clearly distinguish the four seasons, experience their differences, and experience their different experiences. Unlike traditional picture books, “The Diary of Mountains and Wilderness” places more emphasis on children’s feelings, adopting an anthropomorphic approach to transform the natural landscapes, every plant, and every tree into “natural friends” who can speak, laugh, and move. Through beautiful background music and immature guiding voice acting, children can interact and exchange ideas with them. Children can freely explore according to their own ideas, and can discover the changes in natural mountains, rivers, and interact with them by moving their fingers. Experience nature with ease, allowing children to easily immerse themselves in the changes of the four seasons.



Figure 2. Shanye Diary.

“Guangyu” is a beautiful mobile game app from NetEase. as shown in Figure 3. The interface of this app embodies a beautiful feeling everywhere. Fantasy and aestheticism are the evaluations of most users. This app no longer relies on rich and vibrant color schemes to attract children’s attention, nor does it use a single color to express itself. Instead, it uses a large area of different colors and shades to express the brilliance of the world. The overall rhythm of the screen and the tendency to use the same color scheme make every frame of the screen look like an artwork. In terms of hearing, the rhythm of sound changes with visual changes. The designer has designed the sound layer by layer, such as the corresponding footstep sound effect when the characters in the picture are on the beach, grass, or seawater. This visual based auditory design allows children to be more immersed.

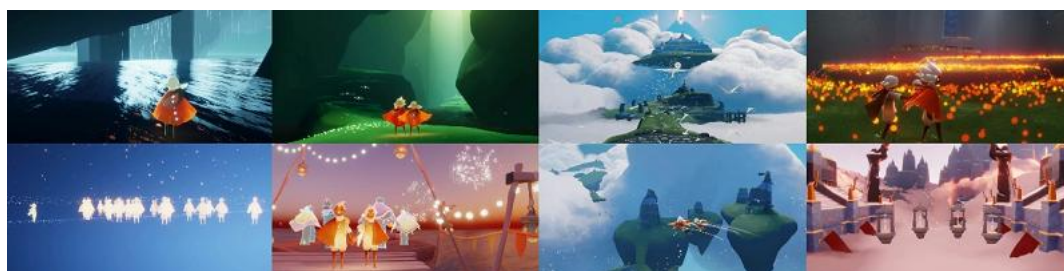


Figure 3. Guangyu.

4. The Application Principles of Color in the Interface Design of Children’s APP

The prerequisite for flexible use of colors is to understand the symbolic meaning, associations, and emotions of colors. Therefore, when designing the interface of children’s apps, we should not only focus on the meaning of the colors themselves, but also consider the audience of the app’s users. Compared to adults, children’s perception of color is a gradual process from scratch. During this process, children’s visual abilities gradually improve, their understanding of colors becomes clearer, and their preferences for colors become more diverse and personalized.

Every element of interface design reflects the role of color, from icons and buttons to the overall background, which is closely related to color design [6]. Color plays a crucial role in the interface design of children’s apps, mainly reflected in its ability to assist children’s cognitive operations, meet their emotional needs, and enhance their artistic aesthetics.

4.1. Auxiliary cognition

Due to children’s limited cognitive abilities, it is difficult to remember a large number of tasks and processes in a short period of time. At the same time, children’s acceptance of the interface gradually increases from simplicity to complexity. Therefore, in interface design, colors can be used to reduce children’s memory burden and enhance their user experience. Effectively reducing cognitive burden through continuous development.

4.1.1. The spatial relationship of colors

When designing colors, it is possible to create a visual relationship that is easy to understand through the rational use of colors, such as using a gradient process of colors from light to deep to indicate changes in difficulty levels. Colors can also be

used to attract children's attention, allowing them to quickly find the information they need in complex interfaces; On the other hand, different colors can be used to divide the areas of the interface, usually divided into functional areas, display areas, and operation areas. When dividing, it is also important to maintain a reasonable visual hierarchy, such as similar background and foreground colors, which can cause visual confusion. At the same time, colors should be used to create clear primary and secondary relationships, avoiding confusion in children's visual logic.

4.1.2. Unification of color and style

Excessive color matching can cause visual fatigue and memory confusion in children, so it is important to maintain a unified style in interface design; Maintain relative consistency across different pages as a whole; The pattern, buttons, and scene of the interface are similar.

4.1.3. Simplify color thinking

Due to the limited attention, patience, and thinking abilities of children, as well as their ability to understand words, it is necessary to simplify thinking in the design process, making complexity simpler and abstraction more concrete [7].

4.2. Meeting emotional needs

Children of different age groups have different aesthetic tendencies, and even among children of the same age, there are certain aesthetic differences between boys and girls. When designing, full consideration should be given to aesthetic differences and personalized needs. It is necessary to integrate elements such as gender, age, interests, etc. to adjust the level, layout, and style of personalization.

4.2.1. Aesthetic needs

Due to the different cognitive levels of color among children at different stages, their color preferences also vary. For example, preschool children prefer colors with higher saturation, brightness, and purity. Compared to cool and dark colors, they tend to prefer warm and bright colors; The preference for color among school-age children began to be mixed with gender factors. Children over 9 years old may develop an aversion to childish color schemes; Adolescent children do not like popular color schemes, they focus on personalization and uniqueness. So when designing, it is important to have a clear understanding of children's age groups and make targeted designs. If multiple age groups are included, custom functions can be added to increase children's ability to choose interface colors.

4.2.2. Audio-visual

Due to the limited cognitive ability of children but their sensitivity to sound, many children's apps currently adopt a combination of audio and visual methods. The addition of sound effects not only enriches the app, but also reduces the difficulty for children to understand the interface. Improved children's user experience and emotional experience.

4.2.3. Color creation psychology

In the process of interface design, different colors and combinations are usually used to create an atmosphere, create specific color tones, resonate with people's psychology, and enhance users' visual, emotional, and spiritual experience [8].

4.3. Enhancing artistic aesthetics

Children's aesthetic cognition is a process from scratch, which includes: aesthetic emotions, aesthetic perception, and aesthetic imagination. Childhood, as an important stage in the development of aesthetic thinking, should be cultivated from both external culture and individual internalization. As an interface design for children's products, it should establish a good aesthetic foundation for children.

4.3.1. Aesthetic needs

In the standard color ring of colors, there are four categories: same color system, approximate color, contrasting color, and complementary color [9]. The use of the same color scheme and adjacent color schemes can enrich the functionality and colors of the app, while the use of contrasting colors can.

4.3.2. Combination of color and culture

Different colors and combinations contain different cultures and histories. When designing the interface of children's apps, colors and culture can be combined to convey strong cultural heritage to children through color matching, which invisibly enhances their cultural and aesthetic literacy.

5. Conclusions

Children's lives cannot be separated from color, as long as we grasp the changes in children's color cognitive ability, we can better serve children. In the interface design of children's apps, color is crucial and largely determines children's direct feelings towards the app. Only by applying color reasonably in the interface design can children be effectively assisted and their user experience and aesthetic literacy be effectively improved.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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