Cognitive-Psychology-Based Study on Interactive Design of Preschool Children's Picture Books

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Abstract. The interactive picture book for children is the extension and development of the traditional picture book in the digital age. It is a multimedia picture book that children can read and interact with independently. Based on the research of the existing interactive picture books and the analysis of preschool children's cognitive psychology, this article presents the main points of interactive design for preschool children's picture books from the perspectives of usability and fun, and summarizes the design elements of interactive interface based on preschool children's cognition and the fun design methods.

Keywords: Children's cognitive psychology · Preschool children
Interactive picture book

1 Introduction

Picture books account for seventy percent of preschool children's books. Picture books dominated by pictures reading are suitable for the cognitive psychological characteristics of children, able to stimulate children's interest in reading, and benefiting the enhancement of logic thinking, artistic aesthetics, creativity and other aspects of children. Technology has changed lives, and it has also changed the way children are educated. Knowledge has shifted from traditional publications to electronic publications, and consumers' propensity to consume has shifted from single paper publications to interactive electronic publications. Children's interactive picture books are extension and development of traditional picture books in digital age, and the multimedia picture books that children can read independently and have interactive experiences, which are widely applied to the early education field.

After the investigation in the bookstore and on the Internet, I found that for the forms of preschool children's picture books, excluding the influence of electronic products on preschool children's eyesight, parents tend to choose low-cost alternative electronic picture books. Large-capacity, fast-renewal, easy to carry, environmental protection, and low cost are the main reasons for parents' favorite. At the same time, interactive e-books are more attractive to children. From the contents of the picture books, they also have the advantages of strong interactivity, full of interest, and the development of the children sensory system in all aspects.

Therefore, the author believes that electronic pictures of preschool children with interactive nature can meet parents' expectations and children's needs at the same time. This article takes the children's interactive picture book as the research object, takes the cognitive psychology of preschool children as the theoretical basis, and seeks an effective interaction design method from the perspectives of usability and fun.

Therefore, I believe, preschool picture books with interactive electronic properties will meet the needs and expectations of parents of children at the same time. This article takes the children's interactive picture book as the research object and the cognitive psychology of preschool children as the theoretical basis, and seeks an effective interaction design method from the perspectives of usability and fun.

2   Preschool Children's Cognitive Psychology

Users of this study are set to be preschool children, meaning the children that haven't reached school age yet. Such group of children is at the germination stage of imaginal thinking and intuitive thinking, they are able to use representational symbols to replace external things, and use representational system to reflect the objective world. This stage is the golden stage for the growth of linguistic, intelligent and thinking habits of children, so their picture books and digital publications are gaining more and more attentions, the operating characteristics of children in different age groups when using interactive modules and the attractiveness of children to different interactive methods are still the issues that need to be considered in current picture book design.

The cognitive development stage theory of the Swiss child psychologist, Piaget, divided the cognitive development characteristics of young children into four stages. Preschool children are in the "pre-computation stage". Their main features are as follows: Attention is not concentrated, and they cannot concentrate on the same thing for a long time; the abstract thinking is weak, and more intuitive, visual, and plot contents are needed to guide learning; the ability to express words is gradually strengthened, and simple communication and retelling can be performed; The purpose of the behavior is enhanced, but lack of thought before acting. Based on this, the author proposes that the interactive design of children's picture books should pay attention to the two key points: usability and fun.

3   Usability of Picture Books Interaction Design

3.1   Visual Design

The visual interface design including color, text, graphics and layout features and other important elements.

1. Add vivid color elements to attract children's attention. When using higher purity lightness and saturation, add mixed colors, pay attention to the color area ratio, and ensure the overall color harmony. The contrast between foreground color and background color is to cultivate spatial cognition of preschool children [1].

2. Minimize the boring sensation of the page brought by the text, use simple and straightforward, identifiable graphical and interesting words, and accompanied by appropriate voice prompts.
3. Pattern design should be more interesting. Make the abstract concept more concrete and the animals and plants anthropomorphic to meet children's cognitive characteristics.
4. The operation interface should be relatively simple and clear, adopt full-screen game scenes and peripheral function icons, and ensure the arrangement and size of each element.

As shown in Fig. 1, children's games hippo fishing, the overall picture is bright, with blue as the main color, and a high purity and saturation of the mixed colors, so that the screen is rich in color and no confusion to attract children's eyes. The interface graphic elements include various fishes and pieces, which are presented in an anthropomorphic and interesting form. The text elements are large and clear. The icon design is clear and the lines are rounded. The overall layout is reasonable, easy to operate and understand for children.

Fig. 1. Children's game hippo fishing interface design (Color figure online)

3.2 Rationalization of Animation and Sound Effects

Animation and sound effects are important ways to enrich children's perception through multi-channel interaction. The two factors complement each other. Through the feedback and prompts of voice and animation in the picture books, children's attention is drawn to help them understand the picture book frame and content. Adopt appropriate animation effects in the virtual reality world, and use a cheerful rhythm and beating notes to enhance the user experience.

3.3   Interactive Behavior

By analyzing children's tactile and physical characteristics and observing children's use of touch-screen devices, the author found that children mainly clicked contents, drew with their fingers on the screen or copy, dragged or slid the page. There are many gesture operations on the touch screen, such as clicking, swiping, long pressing, dragging, and double tapping. Clicking gently is the most natural interactive gesture used by children in the subconscious. If an element is fun, they will click repeatedly for a long time. Designing for children requires the user interface to reflect their input methods. The child's natural gesture is to press continuously after clicking, instead of releasing it after clicking. Avoid double-clicking at the same time. The timeliness of interaction must be taken into account when designing. Using double-clicking is an interactive gesture that requires learning, which can cause problems for children.

As shown in Fig. 2, the children's dinosaur puzzle interface, the interaction flow of the game is: click to enter the interface, click on the icon and continue to press, drag to the appropriate position and then let go, click to complete or return to leave the interface. These operations are tailored to the child's psychological expectations and minimize the cost of interactive learning, thereby maintaining children's interest in using the interface.
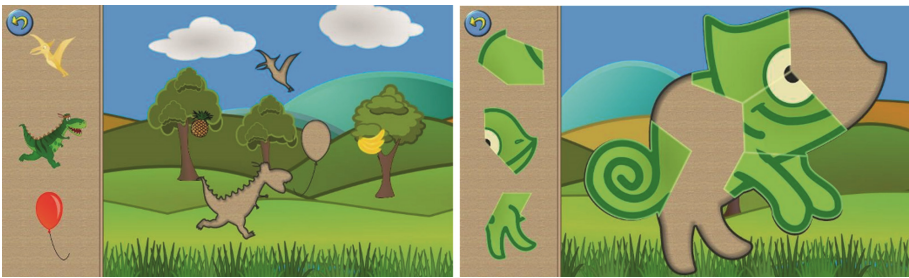

Fig. 2. Children's dinosaur puzzle interface design

4   Fun Interaction Design of Picture Books

4.1   Gamification of Book Contents

The famous linguist James Paul Gee observed that the game can give information embodied and contextualized presentation style, which is convenient for children's cognition and understanding [2]. And Raf. Coster proposed: "The game is to learn a certain skill in happiness." Nowadays, the concept of "light games" has also emerged. Light games are the intrinsic motivation of educational software plus mainstream games. Educational components are used as the main content, and they also possess certain characteristics of mainstream games, making full use of the intrinsic motivation of mainstream games, such as challenges, curiosities, goals, controls, etc. Pursue the intrinsic features of the game instead of the external form [3]. The game has four decisive characteristics: goals, rules, feedback systems and voluntary participation. In addition to voluntary participation, the other three features can be used to abstract the three basic

modules of the gamification picture books design, namely to set key points, formulate key points in the series of rules, and timely feedback in multiple channels to build a picture book content framework.

Most of the picture books on the market are mainly popular science, art perception and story pictures. For any type of picture books, you can use the basic gamification module to build the content framework. Set The main knowledge points or storylines as key points, and conduct concatenation of key points according to the corresponding rules, such as completing tasks to promote plot development. By demonstrating progress and growth, people are motivated to learn new skills. Kindergarten uses small stars to reward children's good performance, although not in kind, the children are still keen, and it also shows that the sense of progress and accomplishment attracts preschoolers [4]. The difficulty of operation and understanding of task setting should meet the cognitive psychology of preschool children.

4.2   Multi-sensory Channel Feedback

The interactive types of children's picture books studied in this thesis mainly indicate multichannel interaction, meaning the interactive method of using two or more channels to communicate with computers in the input and output process. The multichannel perceptual system mainly involves the three sensory channels of vision, auditory sense and touch. The existing interactive picture books in the market can be roughly classified into the following three types according to the form of the interactive interface, namely electronic picture set, audition animation set and experience feedback set [5]. Among them, experience feedback sets can attract children's more interests by combining multi-channel senses such as sight, hearing and touch. Research shows that the use of picture books in different materials will also have an impact on the understanding of preschool children's stories. The ingenious combination of images, texts, sounds, animations, etc. will transform the traditional static images into more dynamic and lively dynamic videos, providing children with multi-sensory experiences that can be seen, heard and felt [6].

Children can click anywhere on the interface. On the one hand, it must be designed to prevent misuse. On the other hand, this operating habit can be used to make the interface more interesting. The type and intensity of feedback is the most important difference between electronic and non-electronic [7]. Speaking of the reason why Tetris, is such a simple but charming game, reasonable feedback should be given first place. The three types of feedback that can be obtained when stacking Tetris: visual feedback – colorful cubes that are continuously generated and eliminated, quantitative feedback – rising scores, qualitative feedback – the challenge of continuing to rise.

The multi-channel and timely feedback is a supplement to the overall process after setting up the picture content and framework. Multi-channel feedback through key points and other important steps through graphics and sounds. This is Yu-kai's octagonal behavioral analysis framework hidden in the driving force - the feeling, brings a sense of pleasure, including touch, hearing, vision, etc. Visualization mainly consists of changes in the color, shape, and quantity of pattern elements in a single-page picture book and the display of picture book reading progress. Auditory can supplement timely

audio feedback. Most of the tactile feedback is now based on vibration. It is divided into short vibration, long vibration and interval vibration. The supplement of feedback can better maintain children's interest, strengthen progress and sense of accomplishment in the process, thus forming a good circular reading framework.

5   Conclusion

Digital picture books would, no matter in the form of reflection or reading model, bring more interactive and entertaining experiences to children, with the development of intelligent terminal equipment and the wave of mobile internet, children's digital picture books are worthy of deeper discussions and researches.

Through the research of the current interactive picture book in the market and the analysis of preschool children's cognitive psychology, the key points of preschool children's picture book interactive design are proposed from the perspectives of usability and fun, hoping to provide the value of reference for interactive design of children's electronic picture books in the future.

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