

## **Research on Harmonized Human-Computer Interaction Design for Preschool Education for Children**

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### **Abstract**

How to effectively construct a preschool education method for children with good emotional interaction and human-computer interaction, and to raise children's cognitive ability, behavior habits, and establish a correct outlook on life through human-computer interaction is a matter of rapid development of information technology. Through the analysis of the harmonious human-computer interaction design in children's preschool education tools, this paper proposes a research on human-computer interaction mode for children's preschool education, which will provide a more effective and harmonious human-computer interaction mode for children's preschool education.

**Key words:** Preschool education; Human interaction; Harmonization.

The human-computer interaction (HCI) has been with us since the emergence of computer in 1964. In recent years, the application of HCI has got great improvement. And HCI-design has been

utilized in various aspects of our daily life including preschool education for children. Based on the software of preschool education in App store, this paper links the harmonized HCI -design with children's concentration training and discusses about the application of HCI in visual sense, auditory sense and tactile sense.

### *A. Research Background*

Preschool education is the significant beginning of life-long education system, therefore, the educational product and instructional resources for preschool education will have great influence on physical and mental development of children. Preschool education system is designed to promote physical and mental development of preschool children. The preschool education and children's development is interrelated and mutually restricted.

The preschool stage of children is a significant stage in our lifetime. Many basic abilities are formed in this stage, such as language expression, thinking mode, social communication ability etc. It is also a critical period for the rapid development of children's nervous system. Preschool education plays an important role in formation of children's intelligence, emotion and logical sense. The enhancement of education quality is of great significance to cultivate good habits and improve moral cultivation for child. On the other hand, proper preschool education

guide children to cultivate good behavior habits and outlook on life.

In the program and interface system, the consistency of concept semantics, patterns, syntax of command language and display format should be required. The consistency of human-computer interaction and harmonic design is mainly reflected in the consistency of input and output styles. The first interface and the second interface have similar layout, similar human-computer interaction and similar information display formats.

The design of human-computer interaction interface should first establish the type of user, that is, predict their different responses to the interaction interface according to the characteristics of different users. This will be analyzed from various aspects of design. For example, the interaction interface for female users is generally designed to be gentle and elegant. The interface for male users is generally designed to be stable and deep.

Let the computer do more work, reduce the user's work as much as possible, and let the user use some shortcut keys instead of some tedious commands.

The communication of information is the basis of human-computer interaction, and the harmonious design of human-computer interaction is to replace complicated information with simple symbols or languages in many information exchanges, reduce the memory burden of users and adopt a design scheme that is conducive to memory.

The interactive interface should be able to respond to the user's operation commands in time to help the user deal with practical problems. In some important operations, there is an interface reminder to give the initiative to the user as much as possible.

The success of interaction design is not only to provide rich media resources to users, but also to deal with various media integration relationships and make human-computer interaction more natural. Human-computer interaction design in front of the goal focuses on people-oriented so that the interaction design conforms to these habits and patterns. To achieve intelligent human-computer interaction.

Nowadays, human-machine operation is mostly realized through command input and icon clicking, including the development of touch screen technology. However, these modes of operation do not eliminate the gap between man and machine. Computers are an extension of human functions, but people are tired of the operation of mice and keyboards and yearn for a more natural mode of operation, just like using a part of their own body. With the development of intelligent technology, p

people have continuously improved the interactive design, and can now implement real-time operation on the 3D virtual reality environment through virtual input devices such as data clothing, 3D mouse, data gloves, eye tracking, voice input, etc. The tedious keyboard input or mouse click operation is omitted, and human beings can operate the machine more easily and naturally.

With the development of Internet market, there are an increasing number of intellectual products for preschool children. Instead of traditional education method such as picture books and Intelligent toy, parents prefer to choose some new ways with the Internet, pad and mobile phone, which bring unprecedented change for preschool education.

### B. The current development of HCI-design for the preschool education field

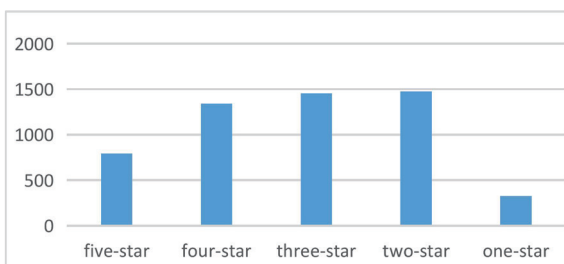
The best results will be obtained if your computer word-processor has several font sizes. Table I recommends all the font sizes for your reference. As an aid to gauging font size, 1 point is about 0.35 mm. Use a proportional, serif font such as Times or Dutch Roman.

With the development and innovation of information technology, HCI-design is constantly updated. The purpose of HCI-design is to enable the users to operate in a relaxed atmosphere. In recent years, HCI is an anthropomorphic design of computer system, which is represented by multi-channel and multimedia intelligent technology. The invitation of pad makes HCI product miniaturized as well as portable and makes operation easier. When the one-dimensional information space transfers into multi-dimensional mode, HCI realizes the human-centered interactive mode, which makes the computer recognize and analyze the information with language, picture, text, gesture and facial expressions. With the improvement of HCI application, HCI-design has been utilized in various aspects of our daily life including preschool education for children.

Simple games are often found in preschool education software. In the past decade, the upgrade of preschool education software can't keep up with the development of science and technology. Targeted training enables to promote rapid change of cerebral cortex and children's concentration, therefore, it is necessary to perfect preschool education software especially those designed for improving children's cognitive ability.

In App store, the number of Apps for children education increases to more than 5000 by March, 2018, including 793 five-star Apps, 1342 four-star, 1455 three-star, 1475 two-star and 326 one-star, as in (TABLE I).

TABLE I  
 THE NUMBER OF APPS FOR CHILDREN EDUCATION INCREASES



From the data, we can find that the number of the highest-ranked software is smaller than those in lower ranks. This data

analysis shows deficiency of popular Apps for children education. In App store, more than 80% best selling educational Apps are designed for children. This paper classifies children education software into language category, intelligence category, game category, music&dance category, etc. In App store, the most two popular categories are language and game.

### C. How to Apply Concentration and Visual- Auditory Design to HCI

Concentration refers to the ability of one's mental activity to focus attention on something. The ability of concentration controlling is the fundamental part of cognitive activities, and children's concentration formation is an important part of preschool education.

Concentration is characterized by two elements, directionality and centrality. Directionality refers to giving focused attention to specific, chosen detail in our surroundings. Centrality refers to the emotional tension and intension when concentrated on something. The emergence and duration of concentration depends on the external stimulus and subjective factors. As the research result of neuroplasticity shows, our cognition such as the ability to control concentration and working memory capacity is expected to be trained and strengthened by new technology, audio-visual interaction, haptic interaction and transcranial, electromagnetic stimulation and brain-computer interface.

Concentration is the mental activity directing to and focusing on the specific object, and concentration is an influencing factor for some other psychological process, such as perception, imagine and memory. The development of one's concentration has impact on the intellectual development. With perception, children have a elementary understanding of the world and know more new things, therefore, we can make full use of children's curiosity to cultivate their concentration.

It exemplifies that those objects attracting children's attention tend to be constantly changing and interesting, for instance, the singing birthday cake, the jumping frog and the walking doll. These objects arouse children's curiosity and draw their attention to observe. Therefore, it is necessary to apply sense of vision and auditory sense to the interfacial design of child education software.

The research of man-computer engineering finds out that 80% of the information receiving from the outside world depends on sense of vision and the others are auditory and tactile sense. The visual and auditory sense plays an important role when learning. Compared with traditional learning methods like books and pictures, the interactivity of software for children education is irreplaceable. The interactivity of software enables the emergence of customized learning service with animation, sound, picture, which can not be realized by printed books.

Interaction design makes human-computer interaction appear blood, flesh and character, and also makes the interaction interface and user have emotional interaction. The performance made by grasping the emotional scene of the target user matches the user's mood very well, and enables the user to take the initiative to stand on the user's side through computer interaction, thus resolving the uncomfortable feelings that the user may have.

Excellent human-computer interaction design should have a simple operation, beautification and accurate interface, and

pay more attention to the safety and reliability of interaction. When people operate the machine, they often make irreparable mistakes due to lack of experience, inattention, misjudgment, etc. For example, if the function is deleted improperly, information will be lost. The development of intelligent technology has minimized such mistakes and created a safer, more reliable and more efficient man-machine interaction.

In recent years, the HCI is an anthropomorphic design of a computer system, which is represented by multi-channel and multimedia intelligent technology. The invention of pad makes HCI product miniaturized and portable. Simple operation procedure, beautified user interface and security guarantees are indispensable for an excellent HCI-design.

In recent years, emotional design is one of the methods having been considered in the design industry to enable to better handle the relationship between people and objects. Emotional Design emphasizes emotional experience more than usability and accessibility. Donald Arthur Norman known as an American cognitive scientist and psychologist classifies emotional design by three levels, visceral level, behavioral level and reflective level.

#### *D. Discussion on optimizing HCI design for preschool education software*

Preschool children in the preschool stage depends on the figurative thinking, because their ability of abstract thinking is not well-developed. The cognition level and preference of users should be taken into consideration for the software design, with which, the software designers can create sound learning environment and situation to arouse children's interest in learning.

From the perspective of education, early education is aimed at preschool children aged from 0 to 6 years old, so as to better develop their intelligence by satisfying all kinds of stimuli required during their brain development. The content of formal early education is designed according to the law of human cognitive development, which is a kind of training rather than knowledge learning.

From the perspective of cognitive ability (that is, the more focused learning ability in early education), the classic piaget cognitive development stage in developmental psychology is summarized as follows:

Sensory motor stage from 0 to 2 years old. Includes: repetition action, schema, mental representation, symbolic thinking

This period of baby in coordinating the senses, more like the bright color, moving objects, and music. They constantly repeat are interested in and love, to establish contact with the outside world gradually, the resulting target behavior and expected (for example, will pass pull on the rope toys), and have the mental representation or symbolic thinking ability. In this period, the most important thing for children is to contact, imitate and explore more, instead of putting pressure on education too early.

The pre-operational stage is 2-6 years old. Including: symbol representation system

Children in this period began to have the concepts of "symbol" and "representation", with simple thoughts, concepts and reasoning, and liked symbolic games (such as playing house). But their minds remain single-dimensional, self-centered and incapable of understanding complex abstractions. In this period, learning mathematics and other things, such as role-playin

g games to exercise children's symbolic ability.

After the age of 7, they liked slow things, they couldn't tell fantasy from reality, and they began to recognize simple characters. The child begins to understand quantity relation and logical relation reasoning, gradually learns concrete image generalization, image abstract generalization, preliminary essence abstract generalization (using xyz symbol), and finally forms algebraic proposition generalization. That is to say, only after 7 years old can children acquire the operation concept and develop logical thinking ability. Therefore, education software for children should design interactive interface and course direction according to the age of children.

It is common to add some instructive elements in situation design, and the elements help children to solve problems by themselves and take the control of learning process. Meanwhile, with imagine and experiment, we can recall the knowledge mastered before and reconnect old and new knowledge. Lifelike design, pop-up window and arrow button constantly accelerate the formation and development of learner's abstract thinking, strengthen their memory and mastery of knowledge. It is natural instincts of children to love playing. So edutainment is important, which means allowing children to learn new knowledge and skills with playfulness.

In digital times, learners show interesting in the course content demonstrated with both pictures and texts by education software. Faced with massive amounts of information, learners spend much time to filter critical information, and the massive information increase learners' cognitive load. So children's cognitive level and age characteristic should be taken into account for children education software designing. The software is expected to be innovative and comprise new ideas, emotional design factors and comfortable user experience. The designer or developer emphasize learners' cognitive level when setting the course content.

Good mood makes high learning efficiency. With proper evaluation, children will be in good mood and their confidence in re-cognition will be enhanced. This system of evaluation needs to be set up for learning process as well as learning outcomes. The evaluation system aim to arouse children's interest in learning new things.

Self-centeredness is an important characteristic of children, therefore, with evaluative feedback during their learning process, learners can check whether their opinion is correct and then correct mistakes in time. Constructivism holds that the value of learning comes from one's experience. In other words, the education software designing needs to be linked with life experience, from which a thorough understanding of knowledge comes from. Education software linking with life experience and catering to children's cognitive level will motivate them to learn. Learning in relaxed atmosphere can enhance efficiency and arouse interest in learning, so the education software are supposed to possess life-like learning environment and good learning resource.

#### References

- [1] G. Eason, et al., *Phil. Trans. Roy. Soc. London*, A247, pp. 529-551, April 1955.
- [2] J. Clerk Maxwell, *A Treaties on Electricity and Magnetism*, 3rd ed., Vol. 2, Oxford: Clarendon Press, 1892, pp. 68-73.

- [3] I. S. Jacobs and C. P. Bean, *Magnetism*, 3, G. T. Rado and H. Suhl, Eds., New York: Academic Press, 1963, pp. 271-350.
- [4] M. Smith, "Title of paper optional here," unpublished.
- [5] K. Rose, "Title of paper with only first word capitalized," in press.
- [6] Y. Yorozu, et al., *IEEE Trans. J. Magn. Japan*, 2, pp. 740-741, August 1987 [*Digests 9th Annual conf. Magn. Japan*, p. 3012, 1982]