

A Study of Children's Educational Toy Products with Multi-Sensory Experiences

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Received: 10 April 2023; **Accepted:** 24 April 2023; **Published:** 16 May 2023

Abstract:

This article explores the design of children's educational toys in the context of multisensory experience, and provides a reference for the development and design of educational toys for preschool children. The article explores the multi-sensory experience of children, analyses the current situation of educational toys in the market, analyses the sensory needs of children based on the "multi-sensory experience" in design research, and provides examples of related products. The design elements of children's educational products are summarised, namely interactivity, functionality and storytelling.

Keywords:

Educational Toys, Multi-Sensory, Children, Fun

1. Introduction

Parents are becoming more and more concerned about the education of their children. Children's physiological and psychological development is immature, and at the same time, the post-90s have become the main group of parents who have higher requirements for their children's knowledge base. However, educational toys are the most receptive way for preschoolers to receive knowledge. They are designed to train hand-brain coordination and stimulate organ development, but children lack interest in the abstract mathematical and logical knowledge conveyed by most educational toys and are more interested in natural knowledge and figurative and cute things. Good educational toys therefore require a good combination of form and function.

The children's education market is booming, with changes in educational methods and innovations in interaction capabilities, giving the children's consumer industry an unprecedented industrial scale and market outlook. At the same time toys are both teachers and friends to children, they pass on knowledge to children in the form of a special carrier, while educational toys are functionally a definition of toys that help develop age-appropriate children for. Children feel the joy of playing with toys in their interactive experience with them. Interest is what drives children's perception of the world. Educational toys, in particular, have the function of developing intelligence as well as stimulating children's senses of sight, hearing and touch. This is why the

article focuses on how to make educational toys more pedagogically meaningful and interesting, and well integrated into children's sensory experiences.

2. Overview of Children's Educational Toys

2.1. Definition and Types

Children's educational toys are a category of toys designed to help children develop their cognitive, intellectual, creative and coordination skills. These toys are often challenging and require children to use their thinking skills and imagination to complete tasks or solve problems. They can also help children develop skills in observation, memory, spatial awareness and hand-eye coordination. Some typical educational toys include Melissa & Doug puzzles, LEGO blocks, Rubik's Cube cubes and Little Passports science discovery sets. The increasing variety of forms and types of children's educational toys also represents a diversification of educational approaches and training purposes, and a better combination of subjective educational approaches and objective environments.

As smart technology continues to evolve, new types of educational toys have emerged, such as the Oculus Quest 2 VR head-mounted display, the Leap Motion gesture recogniser, the Dash and Dot robot and other new interactive educational toys that enhance children's fun in using them in a more active and novel way, thus improving learning.

2.2. The development of Chinese Buddhism in the Song Dynasty

According to statistics, the global children's educational toys market size reached US\$26.76 billion in 2020 and is expected to reach US\$32.76 billion by 2025, growing at a CAGR of 4.1%. The children's educational toys market can be segmented on the basis of different types of toys, such as blocks, puzzles, mind games, logic games and others. Of these, blocks and puzzles are the two segments with the largest market share, followed by mind games and logic games. With the continuous development of technology, new types of educational toys such as electronic toys, virtual reality toys and robotic toys are gradually entering the market. At the same time, children's educational toys are also incorporating educational elements such as STEM education, creative thinking and social emotion, and these trends will continue to influence the direction of the market. By analysing the current market for children's educational toys, we find that most products are poorly experienced, simple and do not incorporate children's sensory performance well. Educational toys should combine children's sensory performance in the experience as a basis for expression, explore the need for multi-sensory experience of children's educational toys, and in this way summarise the key points of the design of children's educational toys, avoiding monotonous forms of interaction, boring storytelling, and enhancing children's active participation.

3. Multisensory Analysis of Children

Children's multisensory experience refers to the way children acquire information and experience a rich and colourful world through multiple senses such as sight, hearing, touch, smell and taste as they play, learn and grow. Liu Chun et al. analyse the analogy between single-sensory experience and multi-sensory combined children's toys to explore the future multi-sensory development trend of children's toys. Wei Yuanyuan et al. analyse the design elements of children's toys

from the perspective of children's education and summarise the elements of multi-sensory experience for children's toys. Hu Kang et al. analyse the experience elements of children's educational toys from the perspectives of users, products and contexts, and summarise the emerging technologies under multisensory experience to help children's cognitive education.

3.1. Visual Analysis

Children are far more receptive to visual images than other senses at this stage of development, and multimodal visuals are also more appealing. This is why people prefer video to text and audio; the impact of visuals has an intuitive perceptual effect, and many experts in the study of the human brain have also shown that image memory is one of the fastest ways for the human brain to process information; it can quickly recognise and process visual stimuli, such as recognising visual features like colour, shape and size, and this processing speed may be faster than other types of memory, such as language, numbers facts, etc., somewhat more quickly. In the visual representation of toys, LEGO gives children guidance in different shades of colour to aid assembly. The logical representation of morphological structures in different themes is the unique highlight of LEGO toys that have taken the world by storm.

3.2. Auditory analysis

The auditory response is one of the most important ways in which people receive information, and preschool children are much more sensitive to sound than adults. Listening, reading and writing are the most basic methods of learning, and the use of audio is used to great effect in education. Many teaching aids also combine the different senses by presenting fables and traditional moral concepts in an audio-visual format, which is more educational than simply using comic books or audio stories.

3.3. Olfactory analysis

Of the five senses of perception, vision (37%), smell (23%), hearing (20%), taste (15%) and touch (5%) each performs a different perceptual function. The sense of smell is the second sense of sensory stimulation. Studies have shown that the scent of lavender reduces error rates by a fifth when typing on a keyboard, while the presence of jasmine reduces error rates by a third. Scent improves mood and productivity because it evokes fond memories, bringing back scenes and connecting them to the emotions of the moment, thus releasing positive emotions and improving mood.

3.4. Tactile analysis

Children can perceive the softness and hardness of toys, surface texture and other characteristics through observation and touch, and thus generate tactile experiences. Different materials bring different tactile experiences to children, for example, marble and porcelain bring a sense of coldness and nobility; cloth gives children a sense of friendliness and simplicity. Different materials have different textures, which are divided into visual and tactile textures. Visual textures influence children's tactile experience by evoking memories and associations with existing tactile textures. Tactile textures are experienced by the user through touching the product, including the denseness, bumpiness, hot and cold of the material. In the

design of stress-relieving toys, this can be achieved through different treatments of material colour and tactility.

3.5. Associative response

An associative response is a sensory stimulus that causes the simultaneous appearance of sensations from different senses, i.e. a stimulus from one sense can cause a response from another sense or senses at the same time. For example, seeing a colour gives rise to sensations such as the sense of sound, taste and touch at the same time, or hearing a sound gives rise to sensations such as colour, taste and touch at the same time. These senses do not seem to be directly linked to each other, but they are linked together in the associative response. The associative response is also used extensively in product design. Designers can enhance the experience and value of a product by exploiting the interconnectedness of the different senses. For example, some smartphones have a touchscreen that makes a 'click' sound when the user taps it, which can enhance the user's experience by making it feel more realistic. Another example is the steering wheel and accelerator pedal of a car, which are often designed with different materials and textures. The steering wheel is made of a soft material while the gas pedal is made of a hard material, which makes it easier for the driver to distinguish the difference between the different controls while driving, thus improving driving safety and convenience. In short, synaesthetic response is a very effective product design tool to make products more responsive to human senses, thus enhancing the user experience and value of use.

4. Design elements for Children's Educational Toys

4.1. Storytelling

Storytelling in puzzle toys refers to the combination of puzzles and challenges in a puzzle game with an interesting storyline through certain plotting and character design, thus capturing the interest of players and enhancing the fun and challenge of the game. A good puzzle toy needs a good story, which can be a fun adventure, a mystery, a suspenseful case, or an imaginative fantasy world, etc. Through this storyline, players are able to better understand the background and rules of the game, become better engaged in the game, and experience a full story experience while solving the game's puzzles.

4.2. Skillful

Skillfulness in puzzles means that the game requires players to master certain skills and strategies in order to complete tasks or solve puzzles. This skill is often closely related to the difficulty, challenge and depth of the game, and can lead to a richer and more meaningful play experience for the player. In the design of educational toys, skill is usually achieved through the rules and difficulty of the game. A good puzzle toy should be able to stimulate the player's mind and creativity while at the same time requiring constant experimentation and practice before the player can master the skills and strategies to complete tasks and solve puzzles.

4.3. CMF

Colour is a very important CMF element and in educational toys, colour can influence the player's emotional connection and perception of the game. Typically, bright, vibrant colours can increase the fun and appeal of the game, while dull, low-

saturation colours can increase the focus and cognitive depth of the game. Material refers to the physical material of the product, which can influence aspects such as the appearance, texture and feel of the product. In the design of educational toys, materials are often considered in terms of safety, durability and texture. For example, the use of environmentally friendly materials can ensure the safety and health of the product, while the use of high quality materials can improve the durability and texture of the product. Finish refers to the surface treatment of a product, which can affect aspects such as its lustre, texture and tactile feel. In the design of educational toys, finishes often need to be considered for their compatibility and consistency with the function and theme of the product. For example, a wooden puzzle may require a fine finish, such as hand carving or baking, to enhance the ornamentation and texture of the product.

4.4. Interactivity

For school-age children, the way in which toys interact with each other determines the child's cognitive performance and learning ability when using them. Excellent interaction allows children to become more immersed in the game, making it more interesting and engaging. Through clever interaction design, children's interest can be stimulated and their participation in the game promoted. It also facilitates greater cognitive depth and learning. Sphero Mini, for example, is a small and cute spherical robot toy that can be used for a variety of games and interactive experiences. Sphero Mini can be controlled from a smartphone or tablet and enables a variety of actions and interactions such as chasing games, races and maze challenges through the built-in sensors and motors. It also has programming features that allow children to write codes to control the robot's actions, promoting their STEM education and computational thinking skills. In addition, Sphero Mini can display different emotions and expressions through a variety of colour and light changes, bringing children closer to the robot and stimulating their creativity and imagination. Such interactive toys for children are not only fun to play with, but also promote development and learning.

5. Conclusions

Through the analysis and examples of children's multi-sensory experience under the characteristics of vision, hearing, touch and smell, this paper extracts the cognitive needs of children in different scenarios, and combines some actual cases in the demand for verification, summarising a series of children's educational toys design points, with certain exploration significance, and provides certain research ideas and directions for the future development and design principles of children's educational toys. With the rapid development of interactive technology and intelligent AI resulting in various high-tech products, which are currently more oriented towards the general public, the role of educational and educational toys is yet to be developed. In addition, children's cognitive levels and performance vary in different situations, and basic needs such as dual-quotient education, moral education and general knowledge are all pain points. Therefore, the development of educational children's toys should start from the sensory needs of children in these scenarios, fully consider what children really need in a certain scenario, and accurately grasp the cognitive and receptive abilities of children to help them live a better life. I hope this article can help the future of the children's education industry.

Conflicts of Interest

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

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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