

TOYS DESIGNED BY ARCHITECTS TO DEVELOP SPATIAL PERCEPTION

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ABSTRACT: The paper analyses selected examples of children's kits and furniture in relation to the development of cognitive perception according to Jean Piaget's theory and the perception of space. Using the three mid-twentieth century toys Tyng Toy, The Eames Toy and Child Chair as examples, the principles of children's discovery of space leading to the development of thinking and creativity are described. The examples highlight the principles of composition, incompleteness, and change of function that are applicable to the development of new toys, furniture design, interior design, and architecture in the context of capitalism.

KEY WORDS: Architecture, space, education, children, cognitive perception, toys, phenomenology

Introduction

A child growing up in an urbanised environment primarily experiences the indoors. An environment controlled by man, an atmosphere that triumphs over the weather, a definitive space with a determined function. In a certain environment, there is no ideal development of cognitive functions. These develop in children depending on the possibility of exploring space visually, tactilely, acoustically, by movement and by smell. The ideal environment for exploration is nature, in other terms the outdoor environment, which allows nearly endless exploration, change and climate fluidity.

Most of the alternative methods of education, such as forest schools, the Montessori method, Waldorf pedagogy, etc., are based on the principles of recognising phenomena existing freely in nature. Froebel gifts teach children to gradually learn the physical laws of stability and composition, depending on the child's ability at a given developmental stage. Mud kitchen works with materials found wild in nature, through permaculture, and educates children to discover by touching organic materials.

Children learn through the space that surrounds them. The architect and society create this environment. So, there is a connection between the child and the environment in which they grow up. In other words, there is a connection between the person, the environment and the person's childhood experiences.

	Tyng Toy	The Toy	Child Chair
Maturation	<ul style="list-style-type: none"> • The way of use changes over time, the object ages with the child 	<ul style="list-style-type: none"> • The way of use changes over time, the object ages with the child 	<ul style="list-style-type: none"> • The way of use changes over time, the object ages with the child
Experience	<ul style="list-style-type: none"> • Creating a space from a surface • Folding parts and creating whole structures • Make-it-and-Breake-it • Exercising motor skills • Thinking about creating new forms • Developing abstract thinking 	<ul style="list-style-type: none"> • Creating a space from a surface • Folding parts and creating whole structures • Make-it-and-Breake-it • Exercising motor skills • Thinking about creating new forms • Colour recognition • Developing abstract thinking 	<ul style="list-style-type: none"> • Make-it-and-Breake-it • Exercising motor skills • Thinking about creating new forms • Furniture becomes a toy • The toy becomes furniture • Developing abstract thinking
Social transmission	<ul style="list-style-type: none"> • Build together • Use together 	<ul style="list-style-type: none"> • Build together • Use together 	<ul style="list-style-type: none"> • Build together • Use together • Use of the object by adults
Equilibrium	<ul style="list-style-type: none"> • Balancing • Stability of objects • Learning the basic physics principles • Motion of the object 	<ul style="list-style-type: none"> • Perception of the created space • Learning the fragility of construction • Learning the basic physics principles 	<ul style="list-style-type: none"> • Balancing • Learning the basic physics principles

Table 1 - Summarising the child's observations of the analysed object according to the four basic elements of child development (Source: author's archive)

Theory of Cognitive Development by Jean Piaget

Jean Piaget's theory of children's cognitive development has become one of the foundations for the development of educational methodologies, child psychology and science itself. Jean Piaget divides the levels of cognitive development into several stages

according to the age of the child, and also defines four basic elements in development: 1. Maturation, 2. Experience, 3. Social transmission (learning through language, schooling or teaching by parents) and 4. Equilibrium.

Based on this theory and other observations, we can say that children learn by experiencing space, by discovering through movement, by touch, by incremental exploration. This is also why children prefer functionality and variation instead of aesthetics. Adults rather perceive form, function and aesthetics in space.

This paper relates objects designed for children by architects in the mid-twentieth century to children's perception of space according to Jean Piaget's theory of the development of cognitive perception.

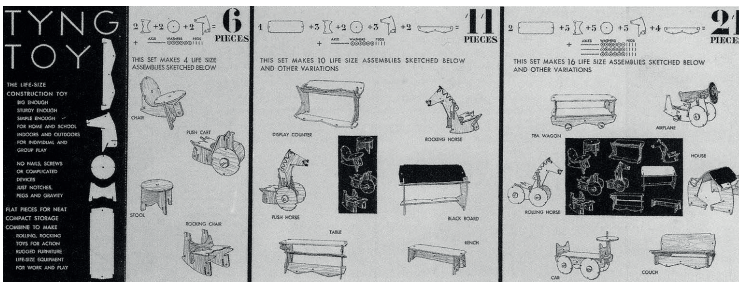


Figure 1 - Tyng Toy variations (Source: Documento promocional del Tyng Toy, 1949. © Anne Griswold Tyng Collection, Architectural Archives University of Pennsylvania, Philadelphia, Juárez Chicote, A. & Moreno Sánchez-Cañete, 2017)



Figure 2 - Tyng Toy - Black board, stool, Push horse (Source: Louis I. Kahn to Anne Tyng: the Rome letters 1953-54. New York: Rizzoli, 2009, p. 39. Juárez Chicote, A. & Moreno Sánchez-Cañete, 2017)

Methods - A selection of children's toys

The subjects of the research are three toys: 1. Tyng toy (Anna Tyng, 1940); 2. The Eames Toy (Charles and Ray Eames, 1951) and 3. Child Chair (Kristian Vedel, 1957). All three examples show how children's experience of space can be improved to support their cognitive development. Objects that work with the child's scale and can transform their function to create a space that the child can use, were deliberately chosen.

1. Tyng Toy – Anne Tyng



Figure 3 - Tyng Toy - Anne Griswold Tyng and elements (Source: Tana Hoban. © Anne Griswold Tyng Collection, Architectural Archives University of Pennsylvania, Philadelphia., Juárez Chicote, A. & Moreno Sánchez-Cañete, 2017)

Architect Anne Tyng, a graduate of Harvard University, researched *Simultaneous Randomness and Order: the Fibonacci Divine Proportion as a Universal Forming Principle* at the University of Pennsylvania. It was this research that provided the basis for the creation of the children's toy kit. It consists of five different abstract shapes carved out of plywood. The pieces snap together and are fixed together by wooden pegs. The system allows for infinite folding and unfolding. The combination of parts allows the creation of various objects. The size is designed so that the resulting, temporary objects are in scale with the child and easy to use. By simply joining parts

together, a bench, chair, swing, horse, car and many other objects can be created, depending on the child's imagination.

LARGE • COLORFUL • EASY TO ASSEMBLE • FOR CREATING A LIGHT, BRIGHT EXPANDABLE WORLD LARGE ENOUGH TO PLAY IN AND AROUND

NO. 50 THE TOY
RETAIL PRICE \$3.50
ONE IN FOUR COLOR DISPLAY BOX
BOX SIZE 30" x 3" DIAMETER
12 TO MASTER CARTON
WEIGHT OF MASTER CARTON — 39 LBS.

THE TOY contains four 30 inch squares and four 30 inch triangles of heavy fire resistant paper, 38 hardwood dowels, one pack of connection wires and instruction sheet.

the **TOY**
PATENT PENDING
LUCILLE CORP. N.Y.

ALL PRODUCTS F. O. B. JACKSON, TENN.

F. O. B. JACKSON, TENN.
THE EAMES TOY
PATENT PENDING
LUCILLE CORP. N.Y.

Figure 4 - The Eames Toy - poster (Source: <https://99percentinvisible.org/article/card-board-cities-the-eames-design-that-turned-packages-into-play-spaces-for-kids/>)

Toy kits engage in the development of cognitive perception in several ways. The child learns about space, literally observes and experiences how space is created by putting the pieces together. The first discovery is made when the parts are put together when the surface becomes an object or when the three-dimensional object can be used, modified or even moved. The make-it-and-break-it system leads to the child's constant thinking and imagination. There is no final, unchangeable form of the piece of furniture. The child always has something to discover.

2. The Eames Toy - Charles and Ray Eames – The Eames office

A puzzle called The Eames Toy from the family-owned Charles and Ray Eames design practice complements their design series of children's toys. Supplied in Octagon Tubes, the pack contains solid stick wooden elements, coloured fabric triangles and squares in a 30-inch (76.20 cm) module, and joints made of soft coated wires. The sticks are threaded through tunnels at the edges of the fabric geometric figures. By connecting the solid elements in various combinations, similar to the Tyng Toy, the space is created. With its lightness and variability, the system allows for the formation of spatial structures to grow, to be reassembled, to be changed. It is self-supporting, but can also be hung. A child can build a canopy, a tower, a gate, a tunnel, an aeroplane or even a house.

Changing the function of furniture

Furniture and its changing function or usage for play used to be a frequent subject of interest for designers. Alma Siedhoff-Buscher of the Weimar Bauhaus is one of the pioneers of the 20th century. She designed, for example, cabinets that contain detachable or extendable parts that transform the original functionality and a table that can be separated from a large cabinet and reintegrated, as well as boxes of various sizes or with castors fitted. Pieces with modular proportions transform a stool into a child-scale shelter or transfer into a rolling cart.

James Hennessey and Victor Papanek's *The Cube* from the *Self-Made Nomadic Furniture* collection provides unforgettable examples of adapting the scale of space to children. The elementary cube-shaped structure with wooden beams visually defines the space and allows further subdivision, the hanging of various items, curtains, swings, ropes, panels, lights, etc. The Utility children's room becomes a multi-functional structure for exploring, playing and occupying the child. The cube is not primarily intended for kids, but has been designed as a multifunctional built-in-entertainment cube.

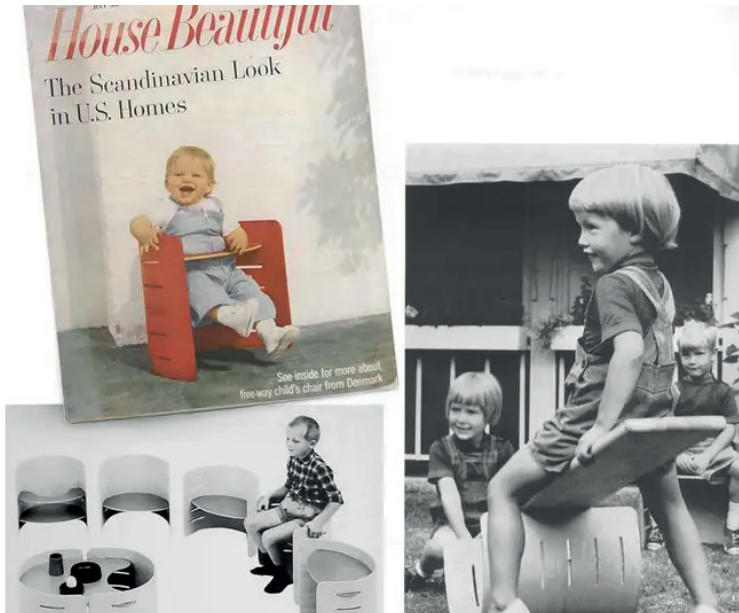


Figure 6 - Child's Chair by Architect Kristian Vedel (Source: https://www.1stdibs.com/furniture/more-furniture-collectibles/childrens-furniture/childs-chair-architect-kristian-vedel-denmark-1956/id-f_35360792/)



Figure 7 - Alma Siedhoff-Buscher. (Source: Bauhaus-Archiv Berlin)

Results and discussion

The study of the environment of the children's department of a hospital proves the importance of exploring the outdoor environment, and how spatial structures in an environment not controlled by humans influence the development of cognitive functions. When visiting the hospital garden, the children began to recover better than when they were inside the hospital.

In the urban environment, there are only limited opportunities to play in the natural environment, something which used to be typical and stimulated, among other things, the establishment of social ties. Nowadays, children explore nature, or the form of the external environment, they receive in the virtual environment in the form of computer games, which also contributes to the development of cognitive functions, develops imagination and improves memory, etc., but at the same time creates great difficulties in establishing social ties. With the help of the virtual world, its users can experience a space, which is mediated primarily on the basis of visual perception, supplemented by audio effects and through imagination.

An unforgettable example of a game in which a person creates a space is the Lego kit. This legendary line of construction toys is used in therapies for autism spectrum

disorders, and it develops critical thinking, trains motor skills, imagination supports social interactions during play, etc. The user can create an almost infinite number of re-decomposable structures through it. They perceive the reduced scale with the help of abstract thinking, or by empathising with the role of the figure.

But during the development of Lego, he transformed this almost perfect teaching aid. We can follow the development of society and capitalism through it. Individual parts become concrete, instructions for use leading to a feeling of finality, immutability. The need or children's desire for Lego shrinks to the desire to own the latest models in their collection. Does this pasting of trends onto a functioning phenomenon only represent a functioning marketing strategy, or can the issue be viewed as a means to a means of increasing its reach? In any case, this approach does not teach children about sustainability, but quite the opposite, and is the opposite of aids that use alternative methods of education.

CHILDREN'S CUBE:

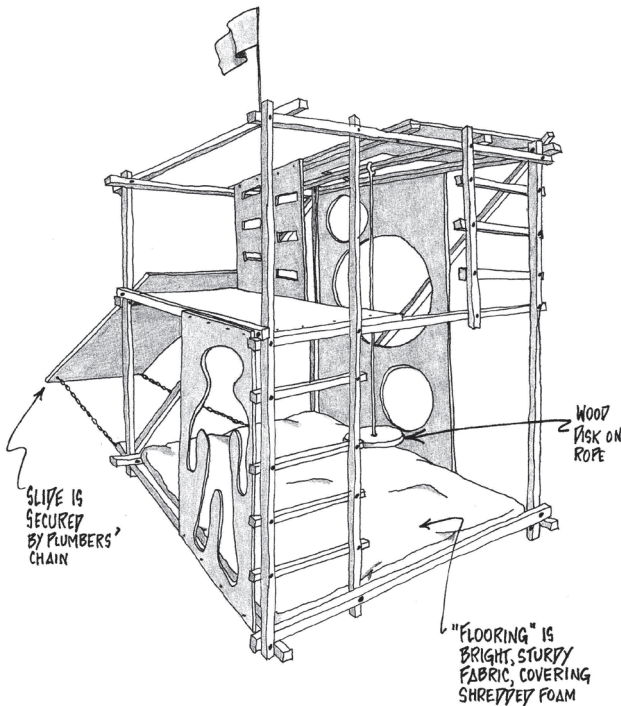


Figure 8 - The Cube - James Hennessey and Victor Papanek (Source: Nomadic Furniture_ Pantheon Books_1973)

We can also notice a similar phenomenon with individual interior elements for children. Furniture for children is not only distinguished by its scale or playful colour, but is often supplemented with a trendy motif of a popular superhero. In common mass-market products, the emphasis is on visual appeal rather than quality or design flexibility leading to sustainable multi-functional use.

Conclusions

Nowadays, children are under strong pressure from consumerism and capitalism, which produces toys and objects with predetermined uses. This does not develop the imagination, but it precisely determines the right way of playing.

An inseparable part of the game with objects is also the participation of another person, usually a parent, who helps the child to build the object.

There are many ways to develop children's cognitive perception in architecture and design. Examples of building blocks, games, and modular furniture from history show that the principles are very simple to apply. Objects can age with the individual and become a part of their lives in adulthood. Which leads to learning to live sustainably.

The most important is the moment of transformation and incompleteness, which develops imagination and stimulates creativity and thinking.

The research analysed examples of mid-20th-century design for children engaging with composition, abstraction, imagination and compositional possibilities at the scale of the child. The research created the basis for the development of the tools in the project Understandable Architecture. Mapping the possibilities of learning from space formed part of my dissertation.

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