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The Use of Open-Ended Toys to Stimulate The Cognitive Development of 1-3 Year-Old Children in The Pandemic Era

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Abstract

Cognitive development is one of the important aspects related to the stages of a child's ability to acquire interpretation and knowledge based on experience and information obtained. One way to stimulate children's cognitive development is through the use of open-ended toys. Open-ended toys are a type of toy that provides space for interpretation and can be used in various ways to trigger children's creativity. The purpose of this research was to analyze the use of open-ended toys in stimulating the cognitive development of children aged 1-3 years old in the pandemic era. The method used in this study was the qualitative method, which involved a descriptive analysis of the function aspect of the three types of open-ended toys. Data were obtained through literature study, observation, interviews, and documentation. This research used Piaget's theory of children's play development stages. Based on the results of the analysis, it can be concluded that open-ended toys in the form of puzzles, building blocks, and animal figurines can stimulate children's cognitive development by increasing children's attention span, language skills, fine motor skills, and gross motor skills in 1-3-year-old children in the era of the covid-19 pandemic.

Keywords: *Early Childhood, open-ended toys, Piaget, cognitive development*

INTRODUCTION

Based on Technische Universiteit Eindhoven 2015 “Designing for Open-ended play” open-ended toys are a type of game that can be used by various ages, from toddlers to school-age children. Children play with these toys in numerous ways (Valk. 2015). This is related to the children's cognitive development stages, starting from the interests, experiences, and information that has been obtained, as well as the imagination they possess. For preschoolers, the cognitive development of children is the most influential phase in the process of growing, the concept in terms of psychology and preschool education is identified as an important theory in children’s potential development (Liao. 2012) Cognitive development in this research can be interpreted as broad knowledge, reasoning power, creativity (inventiveness), language skills, and memory. There are a lot of concepts that pre-schoolers can acquire through play. Pre-school-age children are expected to be able to master various concepts such as color, size, shape, direction, and quantity, as a basis for learning writing, language, mathematics, and other scientific fields. Knowledge of these concepts will be more easily obtained through play activities. Providing stimulation will be more effective if it meets the needs of the children and is carried out during the golden age of children, which happen during the first two years of children's life. Insubstantial development can cause a decrease in children's creativity in adapting to their environment (Anandithaa in Virianingsih, et al. 2021).

According to Ismail in 2009 “Education Game” at the age of 7-11 months, the activities carried out by children are not mere repetition but are accompanied by variations (Piaget in Ismail. 2009). At the age of 18 months, children begin to do active experiments in play activities and are increasingly able to vary their actions in various types of games. Entering the age of 2 years, children begin to develop their imagination and role-play. Children will ask more questions and try to do various activities related to various concepts, ranging from numbers, space, size, quantity, and so on. At the age of 2-3 years, children absorb more things that happen around them, especially paying attention to the use of objects that are used daily and then do it again using other media that are considered to resemble these objects. This happens because children have started to be able to use various objects as symbols or representations of other objects, such as feeding and bathing dolls, using a broom as a piggyback, and so on. In the pandemic era, people are required to be adaptive, and to make adjustments in various aspects of life. Including parents who have children aged 1-3 years. It takes creativity to be able to spend most of the time you have at home. With the various limitations that exist today, parents still have to facilitate their children so that they can grow and develop optimally according to their stage of development.

Open-ended toys are a medium that can be used to help children during the pandemic. According to Piaget, children learn to understand knowledge by interacting with objects around

them (Purnama, et al. 2019). Open-ended toys can be in the form of ready-made play equipment (manufactured toys) or DIY toys (crafts). This research will focus on ready-made play tools, such as Lego, building blocks, and puzzles. Based on the results of the interviews with 10 parents who have children aged 1-3 years, it can be concluded that at least each respondent has one of the three types of games to facilitate children's activities at home during the pandemic era.

This study aims to analyze three types of open-ended toys, which involves lego, building blocks, and puzzles which are used to facilitate 1-3-year-old children's play activities during the pandemic. This research employed the functional aspect of those toys because this is one of the ways to support the creation of diverse open-ended toys in order to accommodate children's needs and maximize the potential or uniqueness that exists within a child through a variety of ways of playing.

METHOD

According to Palgunadi in 2008 regarding "Disain Produk 3, Aspek-aspek Desain" the method used in this study was the qualitative method with a descriptive analysis using several aspects of the design based on Palgunadi's theory (Palgunadi. 2008). This method was chosen because of the compatibility between the problems studied, the research objectives, and the procedures to be carried out to obtain the final results of the research in the form of design characteristics of open-ended toys. Data collection was carried out through literature studies, observations, interviews, and documentation.

Observations were made during the playing process indirectly, with the help of each child's parents when using one of the three types of open-ended toys which were the focus of this study. The aspects that were observed during the observation included the technique or how the children play, the children's interest in the media used, the children's attitude during the playing process, and the average time spent using one type of toy. A literature study was conducted to obtain information and data regarding the stages of children's cognitive development, open-ended toys or open-ended play, as well as relevant previous research. Interviews were conducted with 10 parents who had children aged 1-3 years and used one of the toys, Legos, building blocks, and puzzles to help their children play during the pandemic.

RESULTS AND DISCUSSION

Results

The first stage carried out in this study was a preliminary study to identify phenomena in society. At this stage, it can be seen that parents who have children aged 1-3 years have an interest in open-ended toys and use several types of products to stimulate children's development in the pandemic era. In this case, the field of design is expected to find a solution to the existing problems.

The design is a product design, which involves educational games or open-ended toys. Product design is a scientific field that is integrated with all aspects of human life over time. Product design bridges aesthetics and technology, each of which has a dynamic character and a certain pattern in its development. Valk stated “designing for open-ended toy brings together some disciplines. Theories of play are interwoven with literature on child development and design research on human-object interaction and user experience” (Valk. 2015). Based on this description, it can be concluded that the design of open-ended play or open-ended toys involves various scientific fields and takes into account the stages of children's play development, human interaction with objects, and user experience so that the resulting product can stimulate cognitive development and is following the stages of children play development. According to the Directorate General of Early Childhood Education, Non-formal and Informal, Ministry of Education and Culture, several provisions must be taken into account in the design of educational toys:

1. Based on the stages of child development

   Every child has different stages of play development. It all depends on the age. Therefore, in making educational toys, this must still be considered. The developed educational toys should be adapted to the age of the children so that the product can be used according to its function and is beneficial for children's development.
2. Support active activities.

   Active educational toys are types of toys that require children to involve in creation by themselves, not just monotonous or passive. In this context, educational toys should be designed to actively involve children in playing.
3. Open

   This is one of the requirements for the development of educational toys that are closely related to open-ended toys, where the educational toy produced is easily modified by children so that numerous ways of games are obtained.
4. Give multiple purposes.

   Educational toys should have multiple goals for children's development. With many goals, it will be able to encourage children's imagination and creativity so that children can develop their various potentials.

5. Safe and durable

   The safety and durability of educational toys are very important, especially for children under five years old. At that age, children are less controlled in playing, for example hitting, kicking, and throwing the toys. Thus, it is necessary to consider producing educational toys from materials that are not easily cracked and broken. In addition, educational toys should be blunt because sharp toys might endanger children while playing (Purnama, et al. 2019).

6. Genderless and free of racism

   This means that educational toys for early childhood are toys and materials that can be used by any child, there is no specialization for boys or girls. In addition, there should not be a tendency towards a particular ethnicity or race.

The following are the stages of development of children aged 1-3 years according to Piaget.

1. Sensory motor play

   This stage occurs in children aged 0-2 years. At this stage, children will rely more on their senses and body movements (Purnama, et al. 2019). The right type of play equipment to use at this age can stimulate the five senses, for example, toys that are brightly colored, have many shapes and textures, and are not easily swallowed by children. Besides, at this stage, children can enjoy movements and coordinate fine motor skills and gross motor skills. In playing, children begin to practice and control their movements and explore experiences with sight, sound, and touch (Hasan in Purnama, et al. 2019).

2. Pre-operational (symbolic play)

   This stage occurs at the age of 2-7 years, at this stage, the child's imagination is more developed, and can involve in pretend play (make-believe play). At the preoperational stage, children already use symbols, and play to learn a language, and learn to make things (Purnama, et al. 2019). Children aged 2-3 years are starting to be able to say simple sentences about something they see in pictures as well as involve in question-and-answer activities, so parents are needed to be active and willing to tell children about everything they see, hear, and destroy. At this stage, the children have also begun to be able to practice some new skills, such as naming, matching, guessing, or comparing. Children also like physical activities that involve movements to develop their fine motor and gross motor skills, therefore, with the limited space available in this pandemic era, parents are required to be more creative in offering various activities that children can do every day so that children can continue to develop optimally according to the stage of development.

DISCUSSIONS

The scope of this research was open-ended toys played by children aged 1-3 years together with their parents at home during the pandemic era and focused on three types of open-ended toys that are following the stages of sensorimotor and pre-operational development as well as the design requirements or conditions of educational toys for early childhood, involving Lego, building blocks, and puzzles.

1. *Lego*

   Lego can be introduced to children aged 1-3 years. However, the materials of Lego should also be considered. At first, from an adult's point of view, children just build vertical and horizontal stacks, or just throw the Lego away. However, it is a moment when the child's learning process occurs. One of the Legos owned by the respondents in this study is presented in Figure 1.

Figure. 1. *Soft Lego Blocks.* (Author's data, 2021)

2. *Building Blocks*

   Building blocks are toys made of wood, plastic, or thick sponge which are shaped in such a way as to have a certain size. Generally, they are in the form of cubes, rectangular cubes, right triangle cubes, semicircular cubes, and so on (Ismail. 2009). Building blocks can be arranged into building shapes or other forms according to the stages of children's development.

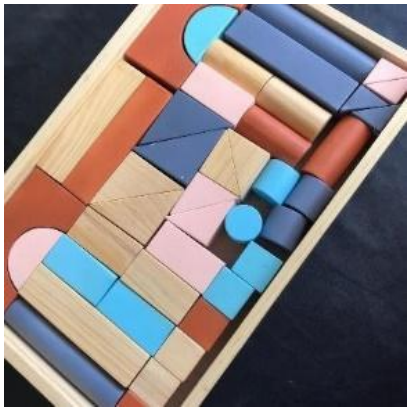

Figure. 2. *Building blocks* or *wooden blocks*. (Author's Data, 2021)

3. *Puzzle*

A puzzle is a game that compiles an image or object that has been broken down into several parts. Puzzle has great benefits in training children's cognitive skills because through this game children are motivated by their thinking skills to be able to return the position of the picture to the appropriate place (Ismail. 2009). Puzzle games involve eye and hand coordination, so they are suitable for young children.

Figure. 3. *My first puzzle 10 in a box.* (Author's Data, 2021)

Aral et al stated, "Puzzles are effective instructional materials through supporting children's developmental areas (cognitive, language, psychomotor, social and emotional development), their creativity, interests, needs, and providing learning while entertaining them" (Aral, et al. 2011). A puzzle is essentially a form of puzzle game that is generally used by children. Puzzle games facilitate the children to explore things or objects based on their abilities

and interests. In general, puzzles are usually formed from an image that is cut according to certain parts. Puzzles can be made of plastic, sponge, paper, or thick wood.

Based on the results of the interviews and observations, it can be seen that in every play activity using open-ended toys, children always show enthusiasm and happiness. Children can learn many things through the use of each type of game, such as exploring colors, shapes, and sizes, and how to arrange certain shapes. In general, there are three stages of children using open-ended toys.

1. Observing

   One of the documentation from the observation at the stage of using open-ended toys can be seen in Figure 4.

Figure. 4. The stage of observation when using building blocks. (Author's Data, 2021)

At this stage, the children will observe, then hold and carry the shape of the toys, and start to be interested in learning about this type of game. After that, the children will begin to learn what can be explored with this type of game.

2. Stacking/ Playing

At this stage, the child begins to stack and place the toy on the floor. The children discover how to arrange and stack the product elements. The children will be more careful because they are starting to realize things that cannot be done with this type of game. For example, if a child stack blocks too high, the blocks will fall and make a sound. From there the child learns many things, such as the causal relationship. Documentation of the stage of compiling or playing can be seen in Figure 5.

Figure. 5. The stage of compiling or playing using a puzzle. (Author Data, 2021)

3. Representing shapes with specific forms

This stage is the transitional stage of early childhood from stacking blocks to associating product shapes with real buildings or objects that have been seen, such as houses, cars, etc. This depends on the interests, experience, and information that has been obtained, as well as their imagination. At this stage, children will usually be more active in trying to make discoveries. This shows the child's intelligence in solving problems so that at the next play time the child will find new and more creative ways. In constructing buildings, some children tend to be at a more mature stage of presenting their mind space, this can be seen when they are able to make three-dimensional buildings and combine several building shapes and give names to the objects they create. Documentation of the children playing with open-ended toys can be seen in Figure 6.

Figure. 6. The stage represents a shape with a certain shape when using Lego. (Author Data, 2021)

The analysis of the functional aspects of the three types of open-ended toys discussed in this study can be seen in **Table 1.**

Table 1. The analysis of the functional aspect of open-ended toys

No.	Product Type	Functional Aspect
1	*Lego*	a. According to Yuliana in 2016 regarding "Pemanfaatan Permainan Lego Untuk Pengembangan Kecerdasan Visual-Spasial" train children's visual-spatial abilities. Visual-spatial intelligence is one aspect of cognitive development. In visual-spatial intelligence, it is necessary to understand the concept of directional perspective (left-right), geometric shapes, and connecting spatial concepts with numbers (Yuliana, et al. 2016). b. Develop children's ability to be creative (Kartini, et al. 2018). c. Train fine motor skills, concentration, and perseverance. (Kartini et al., 2018).
2	*Building blocks*	a. Increase children's visual intelligence by developing creative expression and imagination (Hastuti, et al. 2018). Aspects of visual intelligence are sensitivity to shape, form, size, composition, and color. b. Increase visual intelligence. c. Train fine motor skills (Kartini, et al. 2018).
3	*Puzzle*	a. Increase children's imagination and creativity (Purwanto. 2019). b. Sharpen visualization and memory skills, because it requires imagination in its use (Purwanto. 2019). c. It is a good means of expressing emotions (Purwanto. 2019).

Based on the results of the analysis, it can be concluded that the three types of open-ended toys which are the focus of this study have various functions that stimulate children's cognitive development by increasing visual-spatial abilities, fine motor, gross motor, imagination, etc. Stimulation is one of the basic needs to support the growth and development of children. Every child needs to get regular stimulation as early as possible and continuously at every opportunity during their growth period. Stimulation is an activity that stimulates the basic abilities of children aged 0-6 years that come from the external environment of the individual child and is carried out every day to stimulate all sensory systems; hearing, sight, touch, smell, and taste (Soetjiningsih in Rantina, et al. 2021).

The use of different materials in children shows different reactions, interactions, and imaginations. Apart from being used according to their function, Lego, building blocks, and puzzles which are the focus of discussion in this study can also be further explored for their use according to the stages of development, interests, and imagination of children when playing. The use of these toys is also not limited to exploring children's fine motor skills, but can be developed to support active movements at home, for example by playing a puzzle hunt. Moreover, if the child is in the period of learning to recognize letters and numbers, it can be used as a medium for counting or letter recognition while still facilitating the child's movement needs, for example by attaching game components to various points in the house. In addition, the three toys also are used for children to learn colors.

Spatial visual intelligence in early childhood can be developed in various ways such as by playing with shapes, playing to train memory, appreciating pictures, finish the story game, and singing (Suyadi. 2009). The aspect of visual-spatial intelligence is sensitivity to shape, shape elements, size, composition, and color. A person with high visual-spatial intelligence is very imaginative and can imagine things in detail, likes to create three-dimensional constructions from loose parts or types of games with many components that do not have specific rules for their use. Moreover, to develop fine motor skills and gross motor skills, this can be done by giving children media to scribble, crumple paper, play sand, play *oobleck*, jump along lines, etc.

The position of open-ended toys is still obscure, it is between structured play (game with rules) and free play, however, the use of open-ended toys is quite effective to be used through various ways in early childhood, especially in this Pandemic era. Based on the results of observations it can be concluded that the focus range of each child depends on the stages of development, interests, experiences, and information that has been obtained, as well as their imagination, but the average play time of the open-ended toys is around 530 minutes. Apart from the internal factors that exist in the child, the duration spent by a child using one type of toy can also be influenced by external factors, such as the selection of appropriate media by parents, a conducive environment and minimal distraction, and the presence of the adults when the child is playing at home. The younger the children, the more they need visualization/concrete (toys) that can be touched, seen, felt, and heard (Rahmawati in Haryani & Qalbi. 2021). Open-ended toys as a source of learning mean that this toy is designed, produced, and used to provide convenience to children in their play activities (learning). Educational toys are believed to help develop children's cognitive skills, and maintain children's creativity and imagination, especially for preschool children (Wang in Pahlevy &

Mardiana. 2021). Innovation needs to be carried out to maintain the existence of open-ended toys as a medium for children to play and learn. In this case, the role of product designers is needed in the process of developing open-ended toys that are included in the category of educational games to obtain new types of innovative and interactive games, especially to entertain early childhood in this Pandemic era. This needs to be done by paying attention to some of the objectives of developing educational games, including adding value, increasing quantity, repairing educational toys, increasing creativity, and preserving educational toys. In developing open-ended toys, it is necessary to consider the implementation of the principles of developing educational toys in order to function optimally. The principles are as follows (Purnama, et al. 2019).

1. Material Principle

Materials used to produce educational toys should not contain harmful substances. In addition, the material should be easy to obtain and inexpensive, but still, pay attention to quality as the top priority.

2. Shape Principle

The shape of educational toys should be simple, attractive, and easy to use. The attractiveness of educational toys can be developed through color composition. For the aspect of safety in playing, the shape of educational toys should be considered, such as not being too pointed, sharp, and easily corroded.

3. Color Principle

In choosing colors for educational toys, bright colors should be chosen, such as red, yellow, orange, green, blue, and purple. Besides, dark colors should be avoided. In coloring, do not use dyes or paints that fade or peel off easily, and give an unpleasant odor, as this can endanger children's health.

4. Benefit Principle

The developed educational toys must have benefits for children, especially in stimulating their intelligence. Every educational toy produced should be able to develop children's abilities, in terms of physical-motor, cognitive, language, and social-emotional abilities.

5. Necessity Principle

The purpose of this principle is that the development of educational toys should be adjusted to the age, interests, and needs of children. A developed educational toy would be better if it includes the age of the child who can use the toys. It aims to provide a sense of security and

comfort for its users. In addition, the developed educational toys should be used anytime and anywhere, and easily modified and explored by children in various ways.

These three types of toys can be utilized to maximize the potential of 1-3-year-old children because these toys follow the stages of children's development, can attract children's attention, and can be adjusted to the children's interests and needs. These aspects are some of the uniqueness of open-ended toys. The use of open-ended toys, including Lego, building blocks, and puzzles can develop imagination and attention span, train children's logical thinking skills, support children in controlling and coordinating body movements, develop language skills, train children's patience and perseverance, and foster children's independence. This condition will foster children's self-confidence and can stimulate the cognitive development of children aged 1-3 years and will have a positive impact on the development of the next stage.

In order to increase the knowledge of product designers about open-ended toys and how to design or develop them, it is essential to carry out further analysis and develop a clearer design approach to be implemented in similar research. Through this design approach, relevant design knowledge will be generated and used as a reference or guideline in the design process. Two general things can describe a design process, the first is that the design process consists of several stages, and the second, the level of detail of the design results increases as the design process progresses from one stage to another.

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