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Design concept analysis of educational toys to stimulate early childhood fine motor development

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ABSTRACT

The early years of a child's life are widely acknowledged as a critical period for growth and development, encompassing significant advancements in their physical, cognitive, and emotional aspects. While development encompasses many different areas, fine motor skills are the cornerstone of a child's capacity to interact with their environment and attain significant achievements. This research discusses educational toys to stimulate fine motor development in early childhood. This research uses the theory of Palgunadi about design aspects, which are functional, aesthetic, and security of the product. This research aims to produce several alternative component designs that can be placed on a busy board to stimulate children's fine motor development. This research uses qualitative methods with data collection techniques through observation, interviews, and literature studies. The design method used in this research is SCAMPER. The results of this research are several alternative components of educational toy design that can be implemented on busy boards in order to optimize early childhood fine motor development. This research presents a comprehensive analysis of the design concept that underlies an educational toy to stimulate fine motor development in early children. The proposed toy provides a distinctive and captivating learning experience that effectively targets multiple aspects of fine motor skill development. This pioneering design contributes to the burgeoning collection of educational toys that are intentionally fashioned to foster skill-building in early children.

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1. Introduction

This Motor physical ability is one of the abilities that needs to be developed in children from an early age. Motor development is one of the most important factors in a child's overall development. Physical development is closely related to the motor development of the child. A child's motor development consists of gross motor and fine motor. Gross motor is a gesture activity that involves large muscles, such as creeping, rolling, crawling, sitting, standing, walking, running, jumping, and various kicking activities, as well as throwing and catching activities. Fine motor is a movement that uses smooth muscles or a certain part of the limb that is influenced by the opportunity to learn as well as practice, such as grasping toys, buttoning clothes, and various other activities that require hand skills showing the child's fine motor skills. Both abilities are very important so that early childhood can develop optimally [1]. Based on this explanation, it can be known that children's fine motor abilities are related to physical skills that involve small muscles with eye and hand coordination. Children who have not yet developed fine motor skills need to be stimulated so as not to have difficulty flexibly coordinating the movements of their hands and fingers [2]. The better fine motor movements will allow the child to be creative, such as cutting paper with various patterns, making simple drawings, coloring, sticking, sewing, weaving paper, and others. The fine motor skills possessed

 ISSN 2655-9153

by each child are different, both in terms of strength and accuracy. It is this difference that is influenced by the characteristics of each child as well as the stimulation obtained at an early age.

Motor skills serve as the foundation of a lifelong active lifestyle [3]. Moreover, mastery of motor skills, motor skills are categorized in the form of gross and fine motor. Not only has it been shown to contribute to physical health and physical development, but it has also substantially contributed to cognitive and social development [3]. Further evidence for a close relationship between motor and cognitive skills comes from similar developmental trajectories and overlapping activated nerve areas (*e.g.,* cerebellum, dorsolateral prefrontal cortex), psychosocial adjustment, and school achievement [4]. In child development, gross motor skills usually precede fine motor skills. For example, children who can walk using their leg muscles first, after they are able to control the movements of their hands and fingers, such as when scissoring or pasting, fine motor skills in general in adjustment require a relatively long time. It is a process for a child to achieve it. The intensity of activity is needed as a condition to improve fine motor skills [5]. Fine motor skills are defined as the ability to control small muscle movements to complete a task using hand-eye coordination, fine motor precision, and integration. When the child's motor development is not stimulated properly, the body will become uncomfortable, causing the child to have difficulty focusing on activities that have an impact on the learning process, experience delays in speaking, and have difficulty in the process of reading and writing [6].

In playing activities, interesting media are needed that can support and stimulate children's development. Educational toys are all forms of play facilities or media that can be used to stimulate and optimize all aspects of early childhood development. As for the motor development of children, it is greatly influenced by the creativity of the adults around them during the learning process. Both teachers and parents are required to be more creative through the exploration of various methods, techniques, strategies, media, and more interesting activities so that they are easy to understand and implement in the learning process. Based on the results of a preliminary study through observation and interviews with teachers at Telkom School Daycare, Bandung, in August 2022, it can be seen that in early childhood, there are some who tend to have difficulty in daily activities. Children tend to be reluctant to play a game that requires focus and energy for a long time, such as drawing or color sorting. Activities like this do not attract children's attention during the learning process in class because children tend to get bored easily, so the development of children's fine motor skills becomes less optimal. This occurs in normal and healthy children. In this regard, the role of teachers and parents is highly expected. Teachers and parents must be more innovative in choosing activities and preparing learning media that make children interested in doing so so that the goals to be achieved can be realized. Looking at the existing problems, the author intends to conduct research on visual concepts or design characteristics that can be implemented in the process of designing or developing a tool or component that will be placed on a busy board to stimulate children's fine motor skills. Evidence for a link between fine motor and cognitive skills comes primarily from studies with kindergarten children which usually develops. For example, cross-sectional and longitudinal studies show that fine motor skills significantly contribute to achievement in early childhood [7].

Fine motor skills serve as the foundation of a lifelong active lifestyle. Contributes to physical health and physical development, but also substantially contributes to writing ability. The golden period is a time when the ability of the child's brain to absorb all forms of information is very high. This period is also a window of opportunity for children, allowing children to hone all aspects of motor development. To train children's motor skills must be done intensively so that children can develop optimally. Most of the previous research has discussed a lot about the analysis of the effect of fine motor development stimulation on early childhood, but there is still little discussion about the concept of educational toy design or the development of variants of educational toys that can stimulate early childhood fine motor development. Therefore, this research is important to be carried out in order to produce product variants that are in accordance with the characteristics of early childhood and are able to optimize early childhood growth and development. However, the limitation of this study is that the design concept analysis was carried out only on one component that can be placed on the busy board; in

 ISSN 2655-9153

addition, observations and interviews were only carried out on one of the schools in Bandung Regency, West Java.

2. Method

In this research, qualitative methods were used. Qualitative research is a non-mathematical data analysis that provides insight using data collected through various methods such as interviews, observations, documents or archives, and tests [8]. Qualitative research is a type of research that explores and provides deeper insights into real-world problems. Instead of collecting numerical data points or intervening or introducing treatments just like in quantitative research, qualitative research helps generate hypotheses as well as further investigate and understand quantitative data [9]. By paying attention to some limitations of qualitative research, it can be seen that, in essence, qualitative research is a case study or research that is limited to its environment. That is, all case study designs in qualitative research are always contextual, that is, research that bases its study on a specific nature without an attempt to generalize the research results.

2.1. Design Method

The SCAMPER method is an idea brainstorming technique that can be used to develop and improve products or services by answering seven types of questions. This method was developed by an educational administrator and author named Bob Eberle [10]. The following are seven types of questions that need to be answered and elaborated; (1) Product development strategy with substitutes; finding ideas by replacing supporting components, materials, or people in a design process; (2) Combine; develop ideas by combining or combining ideas or products in the design process; (3) Adapt; change and customize designed products; (4) Modify strategy for product development; find the part of the product that needs to be modified; (5) Put to another use; how to use objects or things for other purposes or functions; (6) Eliminate; remove or simplify some of the elements of the product; (7) Reverse as the final stage of product development strategy; at the last stage of the SCAMPER method, it is necessary to reset the product, for example component placement or product workflow adjustment.

2.2. Data Collection Technique

2.2.1. Semi-Structured Interviews

A semi-structured interview is an interview where the interviewer has prepared questions to ask the interviewee, but the flow of questions is not sequential because it is determined by the direction of the conversation [10]. In this research, semi-structured interviews were conducted with resource persons from teachers and parents of early childhood to identify habits, problems faced, and media currently used to optimize early childhood fine motor development. Interviews were conducted directly with the interviewees. Interview activities at Telkom School Daycare were carried out to collect important data or information for designing educational toys according to the needs of early childhood. The author explores information by conducting question-and-answer sessions with resource persons regularly. In addition, another data obtained based on interviews with principals and teachers is the selection of safe materials in the process of designing educational toys for use in early childhood by paying attention to the characteristics and activities of the child.

2.2.2. Natural Observation

Natural observations are observations made in the subject's natural environment, without attempts to change or manipulate the subject's behavior [11]. In this research, observations were made to observe the activities carried out by children and identify various difficulties or obstacles experienced by children in the process of playing and learning). Through observations made in preliminary studies at Telkom School Daycare for five days, several activities prepared by teachers can be identified as an effort to stimulate the fine motor development of early childhood, see Fig 1; the majority of activities carried out are sticking and coloring, besides, several things can be identified, namely as follows; (1) The lack of variety of educational toy and their use in daily activities makes children easily bored and very easily distracted; (2) Children find it difficult to learn when taught verbally, they are easier to teach by example by adults; (3) Children tend to be more interested when they have access to a wide array of educational toy

 ISSN 2655-9153

that appeals to their curiosity and offer something new and unfamiliar; (4) Children want a toy that are more challenging but still within their ability to complete; (5) Children tend to like educational toys with visuals that are easily identifiable and close to their daily lives, such as animals, fruits, and plants.

Fig 1. Early Childhood Fine Motor Stimulation Activities

2.2.3. Literature Study

Literature studies can be in the form of literature studies, which are carried out in order to reveal various theories relevant to the problem being studied as reference information material in discussing the results of a study in writing. A credible search for literacy can also be found by *internet searching servers that* are able to access the accessibility and *flexibility* of searching for complete data that reaches the whole world as research-supporting information. In this research, a literature study was conducted to collect data on early childhood development, activities, and media that can be used to optimize early childhood fine motor development, as well as other similar research that has been done before. Based on the results of literature studies, it can be known the characteristics of ideal child development at the age of 4 years, where children's fine motor skills have begun to mature slightly, children can already arrange blocks, crochet, draw, paint, and write exercises. By the age of 5, the child's fine motor coordination continues to improve.

The hands, arms, and fingers all moved under the command of the eyes. Children can already play with smaller toys with more components. At the age of 6, the child can hammer, glue, tie shoelaces, and tidy clothes. At this age, the fine motor development of the child continues to increase. Educational toys are one of the media that can be used to stimulate the development of fine motor development in early childhood. What distinguishes educational toys from other learning media is the production planning component that pays attention to children's characteristics and relates them to aspects of child development. Educational toys used to stimulate child development must be appropriate to the child's developmental stage to be effective. Hurlock's theory of children's development also discusses an educational toy that's bound if the design meets the design requirements. Divided into three types of requirements, namely educational requirements, technical requirements, and aesthetic requirements, as follows based on Tinker [12].

- Educational Requirements: (1) An educational toy is made to pay attention to educational activity programs in accordance with the age of child development; (2) an Educational toy created to stimulate the success of play and learning activities encourages children's activities and creativity according to children's needs, as well as children's abilities.
- Technical Requirements: (1) Educational toy designed according to the needs, objectives, and functions of the means; (2) Educational toy is designed multipurpose, multipurpose concept with a specific purpose that allows it to be used for other developmental stimulation purposes for the child; (3) Educational toy is designed to make it easy for users to reach; (4) Educational toy is designed using materials that are safe for children; (5) Educational toy designed with strong and durable use; (6) Educational toy that is designed to be easy to use and easy for children to understand; (7) Designed educational toy can be used individually or in groups.
- Aesthetic Requirements: (1) Easy-to-exploit educational toy for the child (light and not sharp); (2) Educational toy that is not very large in size and not very small; (3)

 ISSN 2655-9153

Educational toy that has a harmony of color combinations and shapes that are attractive to children.

2.3. Stages of Research

There are several stages carried out in this research which can be seen in Fig. 2. In Fig. 2. It can be seen that in this study, primary and secondary data were collected through interviews and observations at Telkom School Daycare to identify the considerations and interests of teachers and parents in choosing educational game tools to stimulate child development. This aims to find out the variety of toys that already exist today, the need for fine motor growth and development stimulus, and phenomena or problems that occur in the field. Another supporting data collection stage is the collection of secondary data, namely literature from journals, magazines, articles from the official website, and related previous studies to support the validity of primary data carried out previously. After that, proceed with the preparation of the general concept of design at the ideate stage to then analyze the design concept and be implemented in the design process so as to produce alternative designs of educational game tools that will be placed on the busy board to stimulate the fine motor development of early childhood.

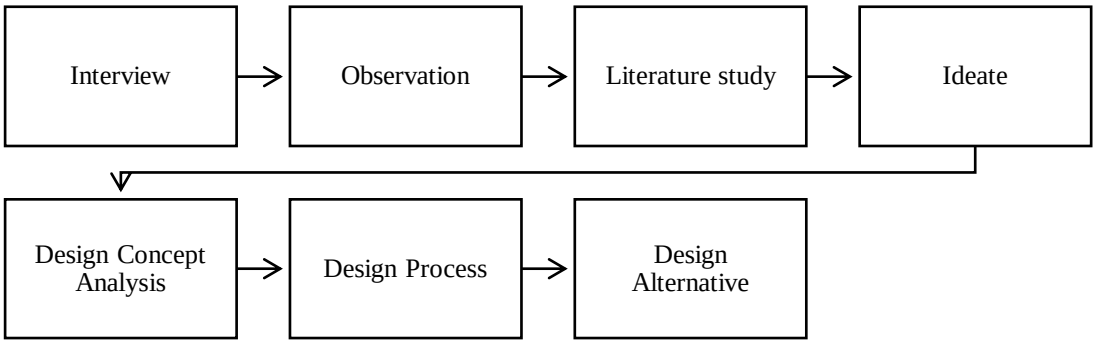

Fig 2. Stages of Research

3. Results and Discussion

Fine motor development in early childhood is very important because with fine motor as the basis of a child's ability will be able to develop his physical movement ability. Educators need to use their ideas to develop the fine motor skills of older children, correctly provide examples of fine motor activities, and stimulate the child's fine motor development by solving problems through his fine motor skills [13]. Children learning fine motor skills need to use various strategies, for example, with educational toys. In addition, the implementation of various methods can also be explored in accordance with the stages of child development so as to improve the fine motor development of early childhood. In the process of early childhood learning activities, teachers must use various media that are interesting to children, one of which is a sensory board; with these media, children will feel happy so that they enjoy the activities provided by the teacher or parents. This will increase the child's motivation to play while learning so that, in the end, they can master the concept of the game using the sensory board. Stimulation of children's fine motor development is also based on several principles that must be considered, namely, oriented to the needs of the child, learning while playing, creative and innovative, using integrated activities, and activities oriented to the principles of child development [14].

The analysis provided essential categorization of developmental stages, based on age, that highlight the advancement of fine motor skills. The categorization of these landmarks based on age groups provides a significant classification of developmental stages, highlighting the progression of fine motor skills. This data provides essential contextualization for understanding the age group in question and aligning the toys' activities with appropriate developmental objectives. Fine motor is a movement that uses smooth muscles, such as writing, folding, and cutting. The child's fine motor skills are the organization of the use of a group of

 ISSN 2655-9153

small muscles, such as fingers and hands, that often require carefulness and coordination with the hands, skills that include the use of tools to work on an object [15].

In the theory of child development, motor skills coordinate with the brain. So, it greatly affects cognitive ability (thinking) [16]. For example, if they are skilled at drawing, cutting, or sticking, then these subtle movements will later help the child learn to write more easily. There are three things that are important in developing skills: opportunities to practice, stimuli to learn, good examples to imitate, and good guidance to convince that the imitation is correct. The design of an educational game tool to stimulate children to develop optimally is one of the fulfillment of children's rights. The provision of educational toys in accordance with the period of the child's growth phase is able to support the recognition of the five senses, control, and motor reactions to the child's gestures response.

3.1. General Concept

Busy board is one of the learning media that can be used to stimulate fine motor skills in early childhood. This is because there are various types of activities that children can do on a board. In this case, the busy board acts as an educational toy. Learning media is useful for complementing, maintaining, and even improving the quality and ongoing learning process; the use of media in learning will improve learning outcomes, increase children's activities, and increase children's learning motivation [17]. A sensory or activity board, commonly referred to as a busy board, is a prevalent educational toy intended to stimulate children's fine motor skills, hand-eye coordination, and sensory exploration. Typically, a busy board is made up of a wooden board or panel containing an assortment of objects, knobs, switches, and textures that children can manipulate and interact with.

Busy boards are frequently utilized both in early childhood education settings and homes to engage children in playful learning activities. Busy board is an educational toy that is, on average, quite large and contains a variety of educational toy that combines with real objects used by children every day that can stimulate various early childhood development, one of which is fine motor stimulation. The dimensions of the busy board are on average 40 cm x 60 cm, and there is a special area in the form of a maze that can be raised and lowered to stimulate fine motor and improve the child's focus. Maze components with certain patterns or paths or blocks that can stimulate children's fine motor skills are usually placed at an angle so that they are easy to operate or use with a size of about 10 cm x 15 cm or 15 cm x 20 cm. The component is marked red and can be seen on one example of a busy board can be seen in Fig. 3.

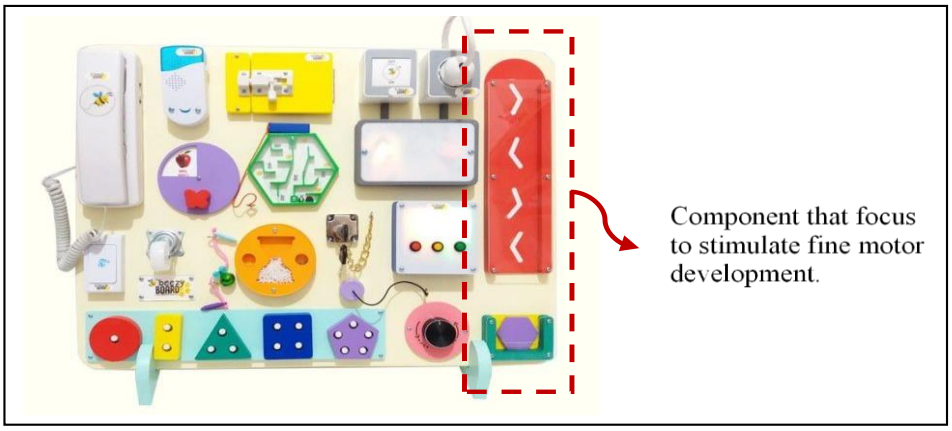

Fig 3. Component to Stimulate Fine Motor Development on Busy Board

Based on Fig. 3, it can be identified that there is a zoning division laying various components on the busy board. In general, it is divided into two, namely the placement of real object components used by children every day is the educational toy component that has different functions or purposes. Based on this, a comparative analysis of several busy boards was carried out to identify several busy boards to be able to identify zoning or placement of real objects and educational toys as well as the types of educational toys on the busy board. A comparative analysis of similar products can be seen in Table 1.

 ISSN 2655-9153

Tabel 1. Comparison of Busy Board Zoning Component

Analysis	**Comparison of Busy Board's Zoning Component**		
			
User	Early childhood.	Early childhood.	Early childhood.
Function	Introduce objects that are used daily, train fine motor skills, and train hand-eye coordination.	Introduce objects that are used daily, train fine motor skills, and train hand-eye coordination.	Introduce objects that are used daily, train fine motor skills, and train hand-eye coordination.
Operational	Slide according to pattern or path, open or close, squeeze.	Slide according to pattern or path, open or close, squeeze.	Slide according to pattern or path, open or close, squeeze.
Ergonomics and Anthropometry	Product dimensions: 40 cm x 60 cm	Product dimensions: 40 cm x 60 cm	Product dimensions: 40 cm x 60 cm
Visual	It consists of a rectangular base with natural color variations of wood or pastel color with various everyday products and educational toys with contrasting colors on top.	It consists of a rectangular base with natural color variations of wood or pastel color with various everyday products and educational toys with contrasting colors on top.	It consists of a rectangular base with natural color variations of wood or pastel color with various everyday products and educational toys with contrasting colors on top.
Material	Real object material and educational toy materials that mostly made from MDF (*medium-density fiber board*) or crimped wood fiber, mindi / pine wood, and non-toxic paint.	Real object materials and educational toy materials that mostly made from MDF (*medium-density fiberboard*) or crimped wood fiber, mindi / pine wood, and non-toxic paint.	Real object materials and educational toy materials that mostly made from MDF (*medium-density fiberboard*) or crimped wood fiber, mindi / pine wood, and non-toxic paint.
Component	The real objects component consists of a TV remote, switch, doorknob lock, and lights, while the educational toy consists of a maze and wheel to stimulate fine motor and eye and hand coordination.	The real objects component consists of a calculator and bell, while the educational toy consists of a maze and wheel to stimulate fine motor and eye and hand coordination.	The real objects component consists of a TV remote, switch, doorknob lock, lamp, and drinking water faucet, while the educational toy consists of a maze and wheel to stimulate fine motor and eye and hand coordination.
Zoning	The placement of real objects is in the left and right corners, and in the middle is placed educational toy. The maze component to stimulate the child's fine motor is at the top with one curved path and duck-shaped pawns.	The placement of real objects is in the upper center; the rest is dominated by educational toys placed in other parts. The maze component to stimulate the child's fine motor is at the left bottom with a labyrinth path and star-shaped pawns.	The placement of real objects is in the left and right corners, and in the middle is placed educational toy. The maze component to stimulate the child's fine motor is at the bottom with a zig-zag path and duck-shaped pawns.

Based on Table 1, it can be identified that the placement of real objects and educational toy components can vary greatly, but maze-shaped educational toys to stimulate children's fine motor skills should be placed on the edges or ends to facilitate the product's operational process. Broadly speaking, the zoning alternatives for the placement of real objects and educational toys can be seen in the illustration in Fig. 4.

 ISSN 2655-9153

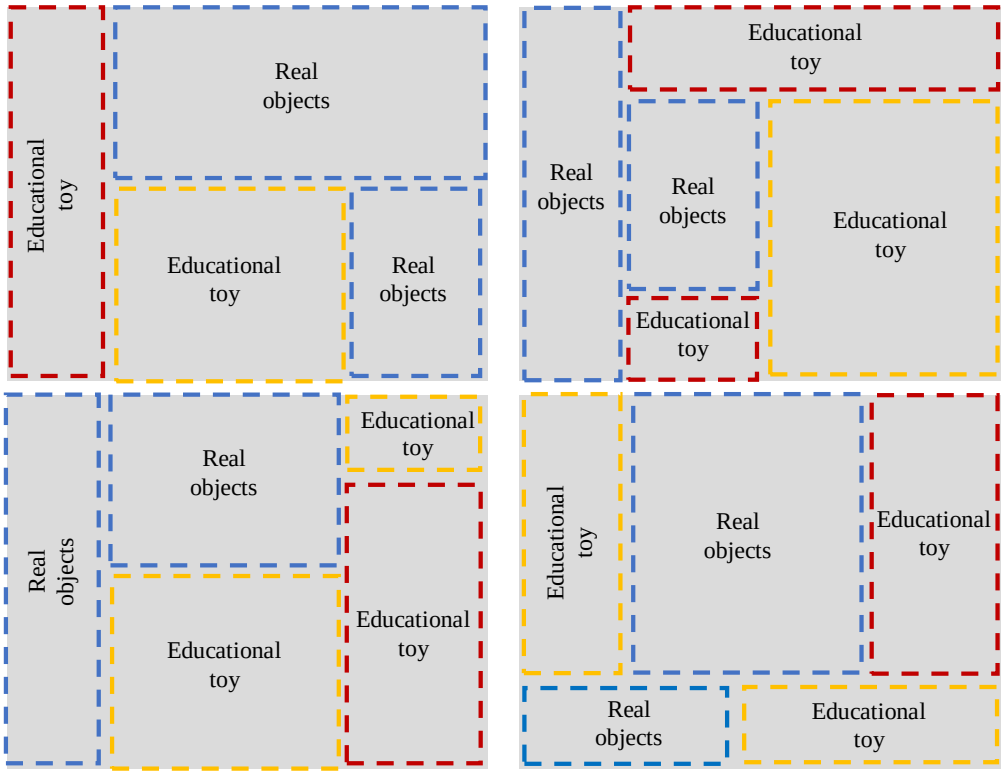

Fig 4. Busy Board Component Design Zoning Alternatives

Fig.4 shows four alternative zoning or component compositions on a busy board which are divided into two categories, namely real objects and educational toys. The blue line in the picture shows the placement of real objects, the red color is an educational toy to stimulate children's fine motor skills, and the yellow color indicates the placement of an educational toy to stimulate eye-hand coordination in early childhood. Based on the results of the discussion and data analysis, the general concept of design was obtained in this study. The general concept of this design is to produce a variety of educational toy design components that can stimulate the fine motor development of early childhood optimally. Furthermore, the design components will be implemented or combined on the busy board. Analysis of the general concept of design based on design aspects according to Marpaung [18] can be seen in Table 2.

Tabel 2. General Concept

Design Aspects	General Concept
User	Early childhood
Function	Stimulates fine motor skills of children
Activities	Moving children's hands to follow the pattern provided
Product operations	Easy to operate by children with adult guidance
Anthropometry and ergonomics	Designed according to the anthropometry of children to facilitate the process of fine motor stimulation. In this case, the dimensions of the components to stimulate the child's fine motor should not be less than 10 cm x 15 cm so that the size of the pions is not too small
Shape	The shape should be square or rectangular to optimize the busy board area, which is mostly rectangular, and the color of the product corresponds to the majority of similar products intended for the same age range of users. Also, use animal forms that are familiar to children.
Materials	Choosing materials that are safe for use by children, considering the ease of formation and obtainment.

However, these components or parts, especially to stimulate fine motor development, are still less varied, so an analysis of design concepts that can be implemented is needed so that they can be more attractive for use in early childhood. Based on these considerations, an analysis of the concept of designing educational toys to stimulate early childhood fine motor using the SCAMPER method was carried out. SCAMPER is a creativity technique used to generate

 ISSN 2655-9153

innovative ideas and improve existing concepts. It stands for Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, and Rearrange. Applying SCAMPER to the design concept analysis of an educational toy to stimulate early childhood fine motor development can lead to new and creative ideas for enhancing the toy's effectiveness and appeal. SCAMPER analysis on this research can be seen in Table 3.

Tabel 3. SCAMPER Analysis

SCAMPER	Analysis
Substitute	Consider substituting materials or components in the toy to add variety and novelty. For example, using different textures, colors, or shapes for the toy's elements could provide a more engaging sensory experience for children (*e.g.,* using soft fabrics, bumpy surfaces, or textured materials).
Combine	Explore the possibility of combining multiple activities or skill-building elements into a single interactive feature. For instance, integrating shape sorting and color recognition activities within the same component can promote multi-dimensional learning and cognitive development.
Adapt	Look for ways to adapt the toy to accommodate children with diverse abilities and learning styles. This could involve adding adjustable elements, larger grips, or providing alternative modes of interaction to cater to individual needs.
Modify	Make modifications to existing components to increase the challenge level gradually. For example, incorporating adjustable difficulty levels for specific activities can ensure that the toy remains engaging and beneficial as children progress in their fine motor development.
Put to another use	Explore how the toy's components can be repurposed to support learning in other domains, such as language development or problem-solving. For instance, incorporating letters and numbers into the toy's design could facilitate early literacy and numeracy skills.
Eliminate	Identify any elements that may be redundant or less effective in supporting fine motor development. Streamlining the design can ensure a more focused and efficient learning experience.
Rearrange	Consider reorganizing the layout of the toy's components to create new play patterns and interactions. Rearranging the elements can offer fresh challenges and keep children engaged over extended periods.

The stages used in the SCAMPER method in this study are adapted and modified with details of each stage that can be seen in Table 4. In this research, two stages of SCAMPER analysis were used because the design process only includes educational toy components that will be placed on the busy board to stimulate early childhood fine motor development; therefore, the dimensions and shapes will be adjusted to the base in the form of rectangular wooden boards. In addition, to maximize the development of children's abilities, the educational toy design must also be adjusted to the stages of early childhood development.

Tabel 4. Implementation of SCAMPER Analysis

SCAMPER	Analysis
Adapt	Adapting the concept of the maze to be applied to the product design process is because both types of toys are widely found on the market and are often used to stimulate early childhood fine motor development.
Modify	Modify the shape of the pawn on the maze with an animal or transportation icon and its path that is close to the child's daily life.

3.2. Visual Concept

Based on the results of the consideration, several design considerations or terms of reference are obtained that can be implemented in the design process, which can be seen in Table 4. Based on the visual concept in Table 5, the products to be designed are game boards and pawns with sizes that are adapted to early childhood ergonomics; the materials used are also safe for children so that they will optimize the stimulation of early childhood fine motor skills.

 ISSN 2655-9153

Tabel 5. Visual Concept Design

Visual Concept Design	Analysis
Shape	According to ISO, educational toys must be free of sharp edges that can cause the skin to puncture, and the surface and edges of the wood used must be free of sharp fibers. Therefore the body of the product consists of a rectangular or varied by being circular base built with rounded corners. The maze path can be varied, so it does not only consist of one shape and varies the level of difficulty.
Material	The main material used for the board is pine wood. Pine wood is often chosen as the main material of APE because of its unique texture, ease of obtaining, and ease of process [19]. The finishing used in educational toys is water-based because water-based binders are more environmentally friendly, do not cause pungent odors, and are safe to use, especially for children [20].
Dimension	Product dimensions follow early childhood anthropometry and adapt from existing busy board dimensions, which are 40 cm x 60 cm. The dimensions of the maze components are 10 cm x 15 cm or 10 cm x 10 cm. If this educational toy will be used separately from the busy board, then the dimensions of the product are in the range of 30 cm x 40 cm.
Color	The color that will be used in this study is the natural color of the material made from pine wood and combined with the primary or secondary color on the pawn that will be moved according to the path.

3.3. Design Concept

Based on data obtained from literature studies, observations, and interviews, there are several aspects that can be used as a reference or characteristic in the process of designing components that can be implemented on the sensory board. This is related to the purpose of designing this component, which is to stimulate fine motor development in early childhood [21]. The aspects are as follows; (1) Functional Aspects; The functional aspect needed to support motor development in the *pre-writing* period is the practice of making various types of lines such as curved lines, zigzags, and so on; (2) Aesthetic Aspects; the form of educational game tools should be made simple, attractive, and easy to use. The attractiveness of educational toys can be developed through color composition. The choice of neutral and bright colors can be an option; this has to do with the visual abilities of early childhood, where they are only able to capture a low range of color spectrum. The component design should be intended so that it can be used by boys and girls. In addition to aesthetic aspects, component design can also adjust to the interests or preferences of the child that are close to their daily life, for example, animals, transportation, and plants; (3) Security Aspects; As for safety in playing, the form of the educational toy must also be considered, such as it should not be too pointed, sharp, and easy to rust. Based on the design criteria that have been described, an alternative component is designed to be implemented on the sensory board in order to stimulate the fine motor development of early childhood. The shape of this component consists of variations of three types of lines with animal or vehicle shapes that are close to children's daily lives. The alternative design of these components can be seen in Fig. 5, Fig. 6, Fig. 7, and Fig. 8.

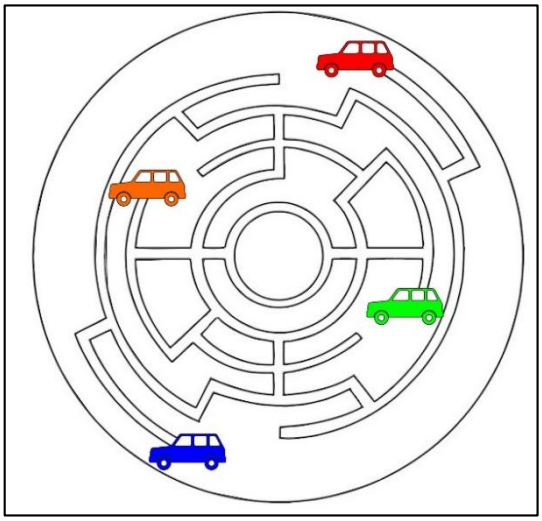

Fig 5. Alternative Sketch 1

 ISSN 2655-9153

The first sketch is designed with a circular pedestal board and with an illustration of a pawn icon which is a distillation of a car that is often encountered by children in daily activities. The concept of the first alternative sketch is that children will park their car in their respective lanes or parking lots.

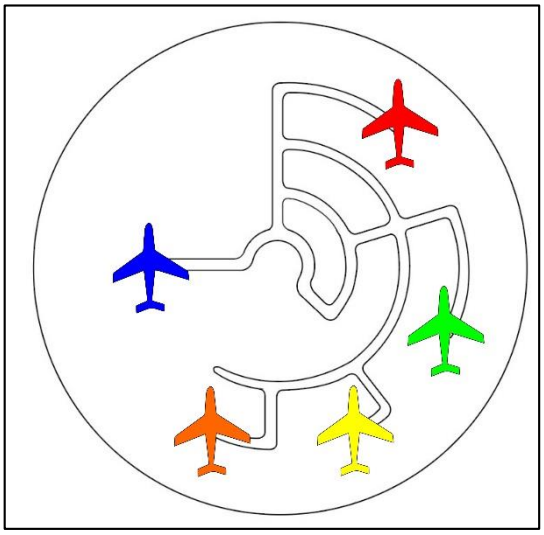

Fig 6. Alternative Sketch 2

The second sketch still uses a circular product base with an aircraft silhouette that will be placed on each track which consists of various colors.

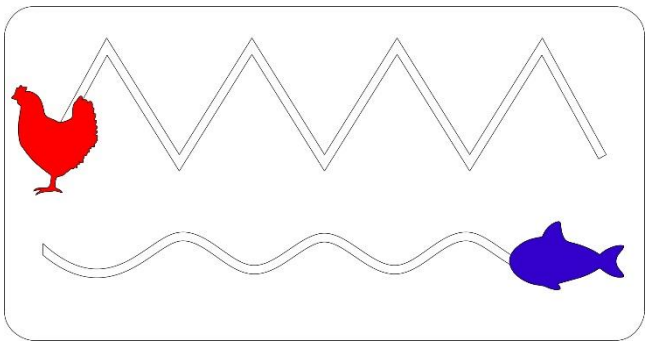

Fig 7. Alternative Sketch 3

The third sketch consists of variations in the shape of zigzag and curved lines with illustrations of pawns taken from the silhouettes of chickens and fish.

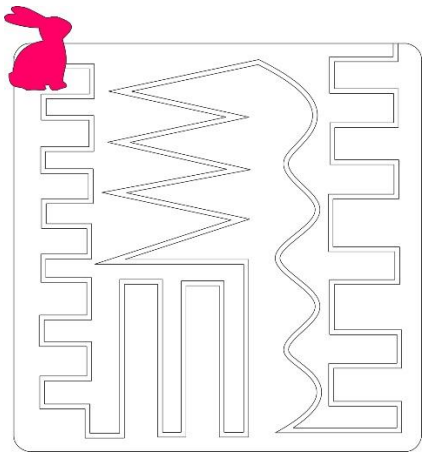

Fig 8. Alternative Sketch 4

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The fourth alternative sketch is designed with a square base body shape and various maze path shapes, while the pawns are inspired by the shape of rabbit animals. One of the sketches is made into 3D modeling, which can be seen in Fig. 9.

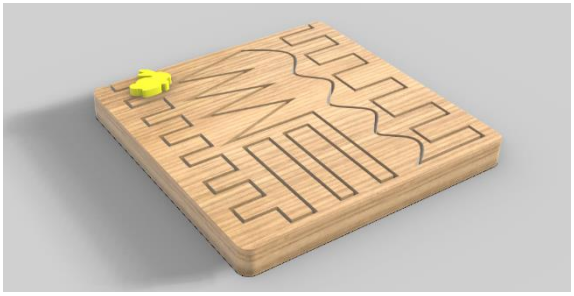

Fig 9. 3D-Modelling

Some of the above design alternatives can be implemented or placed on a busy board to stimulate early childhood fine motor development. The shape of the line as a maze path is varied, and the pawns that will be moved on the pedestal board are in the form of vehicles and animals that are familiar to children. Not only placed on a busy board but the design of this educational game tool can also be used separately to optimize the fine motor development of early childhood.

4. Conclusion

Based on the phenomenon in the field, namely Telkom School Daycare, a variety of educational game tools are needed that can be used to stimulate the fine motor development of early childhood, therefore in this study, several alternative designs were produced that can be produced with dimensions of about 10 cm x 15 cm or 10 cm x 10 cm if they will be placed on a busy board, and dimensions of about 30 cm x 40 cm if it will be used separately. The resulting design alternative consists of a combination of geometric pedestals with pine wood material, namely square and circle, as well as vehicles and animals with contrasting colors. The design of this educational game tool is expected to be produced and used to optimize early childhood development. In the future, this research can be continued by implementing other types of educational toys in order to increase the variety of products that can be used in stimulating the ability and development of early childhood. The analysis of the design utilized in this research has shown great potential as an innovative educational toy. However, to establish its impact on fine motor development, empirical research is required. Future studies can explore the effectiveness of the toy in achieving developmental objectives. The design concept's pedagogical implications highlight the significance of play-based learning and active engagement in early childhood education. The inclusion of purposeful activities in "FingerFun Land" not only promotes fine motor skill development but also encourages curiosity, problem-solving abilities, and creativity. The analysis of the design concept for an educational toy that stimulates fine motor development in early childhood contributes to the continual efforts to improve learning experiences for young children. The combination of research-supported principles and innovative toy design has the potential to positively influence children's fine motor development, facilitating their overall growth and preparing them for future academic pursuits.

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Declarations

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