TOOLS FOR ENCOURAGING YOUNG CHILDREN'S IMAGINATION AND CREATIVE THINKING

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ABSTRACT

Imagination and creativity are not talents but rather fundamental abstract ideas inherent in all human beings that we can apply our imagination and creativity to the real world in many ways and create. new results Which will spark the dream of what we will do, as well as many inspirations to live until adulthood, with many responsibilities, face a more realistic world with various important factors in life resulting in imagination. and our creativity gradually fades away That's why people assume that imagination and creativity are less important in our daily life and far from us can only be found in art or design but in reality, it is close to us and has There are many benefits, such as helping to solve problems in different ways and creativity, making us see things around us in different angles, resulting in a more cheerful and positive personality. According to various researches, it is found that the right age to foster imagination and creativity in children will have a positive effect on both the body and mind.

In this research, creative research aimed to study factors that motivate and collect data to analyze the concept of designing a tool that encouraging promotes imagination and creativity for children aged 7 years and over in the form of play through design and development process until prototyping was get results that was tested for real use, including simulating the use of 3D programs, found that the results were novel and various ways of playing. as well as being able to actually use.

Keywords: Creativity Thinking, Imagination, Promoting creativity

1. Introduction

From the past to the present, human beings have used creativity to play a role in many lives, whether it is culture, lifestyle and facilities, with many things arising from the imagination of people in the past will continue to inspire and push people today to extend their imagination to creative ideas.

The definition of imagination is the ability to produce images in the brain that may not be perceived through sight, hearing, or other senses. That can be considered as an important aid in piloting knowledge into practical applications. In terms of creativity, it is different. Creativity is that human beings have the ability to piece together the meaning of things through sensory perception and experience in a way that relates various information within the

brain are analyzed to produce new and different results, which by human creativity and good imagination will bring many benefits for example help us to develop the potential of the brain, make us more intelligent, witty, sharper because the brain has more flexible work and also helps to more open and neutral learning mindset, It helps to be ready to cope with changes and find new aspects and ways of living with new ways to solve problems, Increases positive emotions, reduces stress and invigorates life.

In this research, the context that helps people's creativity in modern times is studied to obtain interesting datasets that can be further developed and applied in design work. In this work process, it is necessary to study the process that stimulates imagination and creativity, as well as to study the concepts of human beings in each age group whether they are different or not and what factors affect changes and collect data.

According to the results of a study to test creativity (Land & Beth, 1992) as in Figure 1 below, in a longitudinal test of creative, NASA study found that of 1,600 children's 5 years old got 98 percent scored at "Creative Genius Level". Five year later in the same group of children got 30 percent and five years later again have only 12 percent and when the same test with 280,000 adults (31 year). This shown that creativity can tend to decline while we have to learn and face more of the real world and what if creativity persists with us and can adapt this applicable to life in the future.

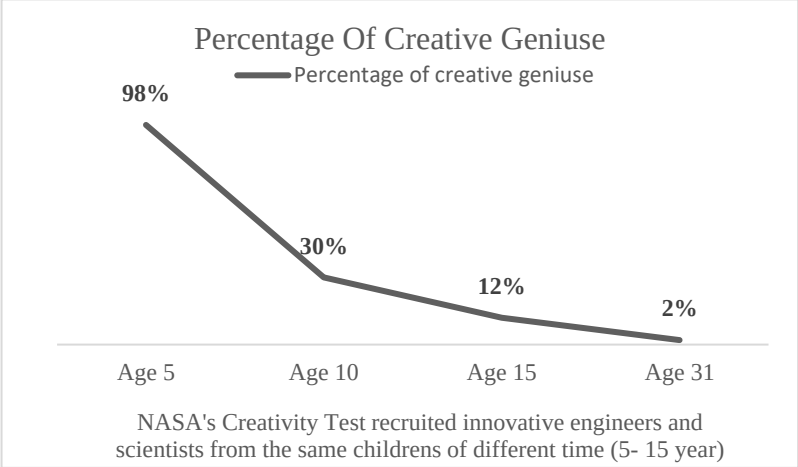

Figure 1 Test results from NASA's Creativity test recruited innovative engineers and scientists form the same children at different time (5,10 and 15 year) compared to adults (31 year), (Land & Beth, 1992)

2. Objectives of the study

1. To study the factor to stimulate imagination and creativity
2. To study the design process of tools that promote the development of the imagination and creativity

Scope of the study

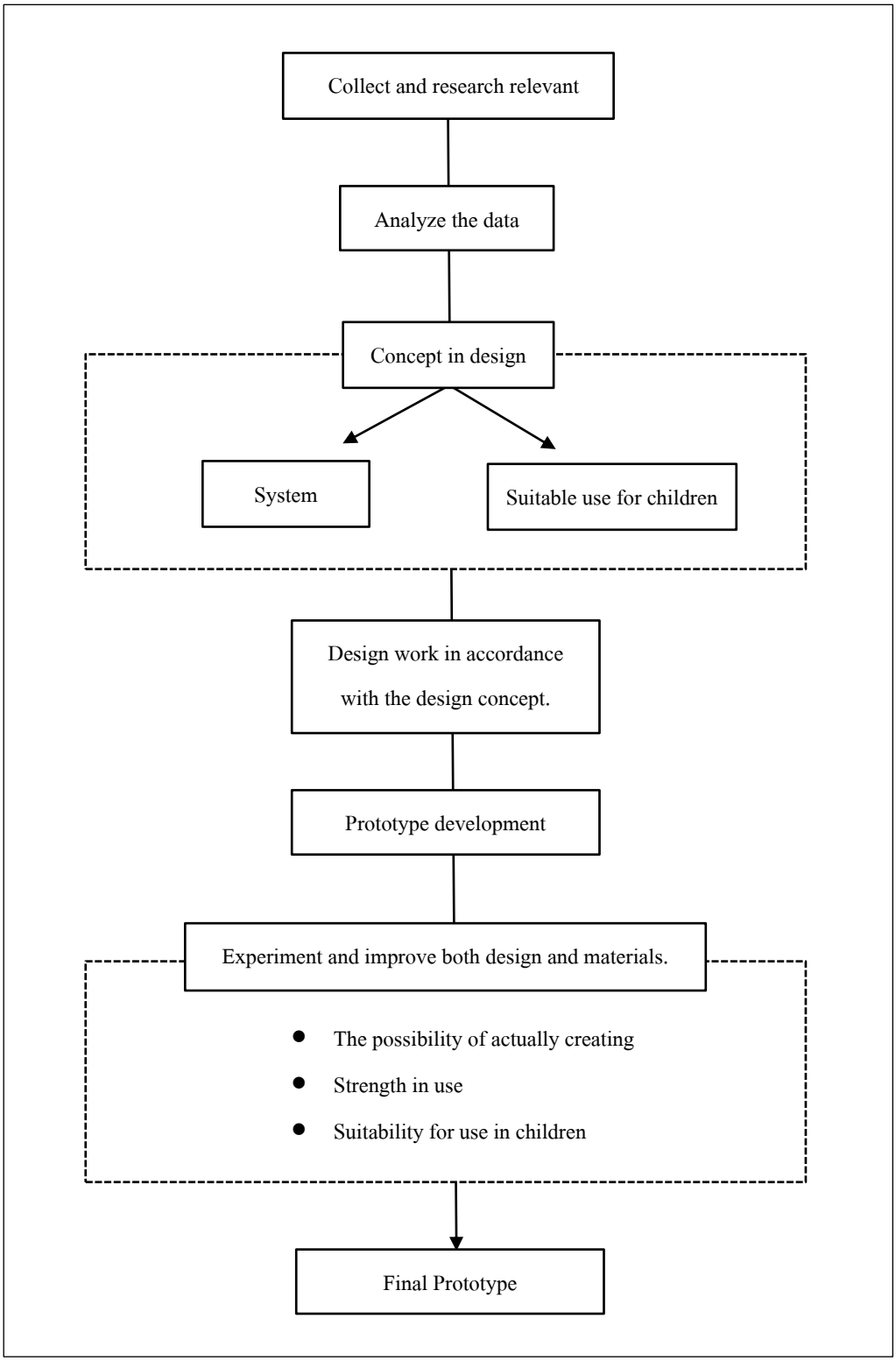

Figure 2 Scope of the study

3. Materials and methods

The method of conducting the research is as follows.

3.1 Researching and collecting information related to promoting the development of children's imagination and creativity.

3.2 Data analysis

3.3 Thinking process in design and development

3.4 Materials used to create designs

3.5 Observe, record images, experiment for actual use in order to study and analyze the relationship to encourage creativity and imagination with the design work.

Researching and collecting information

Cognitive development

Jean Piaget's Theory of Cognitive Development proposes that children go through four distinct learning stages. The theory understands how children acquire knowledge at different ages.

phase is the first phase Sensorimotor range from birth to 2 years, are able to perceive through movement and senses by learning through basic physical actions such as grasping, looking, and listening, the next stage is the Pre operational stage, from 2 to 7 years old their able to use pictures to represent objects concrete operational stage Ages 7 to 11, The key features and developmental changes in this stage are: Beginning to think logically about concrete events Beginning to understand concepts of conservation There will be more logical and organized thinking but it's still very concrete. In Formal operational stage, age 12 and older, begins to think abstractly and reason about hypothetical problems, thinking more about moral, philosophical, ethical, social, and political issues. (Cherry, 2022)

This section should provide enough detail to allow full replication of the study by suitably skilled investigators. Protocols for new methods should be included, but well-established protocols may simply be referenced.

Creativity

Torrance said, “Creativity is defined as a process in which a person is sensitive to problems, flaws, gaps in knowledge, missing or inconsistent, and sensitive to discernment and finding solutions. problem solving sensitive to guesses or assumptions about defects Test and retest the hypothesis until finally the results can be shown to others.”

Gilford said, “Creativity is the brain's ability to think in multiple directions. which can start fluency in thinking flexibility in thinking and the ability to compose and give new explanations that follow the logic to find just one correct answer. But the most essential element of creativity is originality. Creativity is not a talent that a person has but it is a quality that exists in a person, which is not equal and individuals manifest themselves at various levels.”

In addition, there are five fundamental elements of creativity as follows (Guilford, 1967)

1. Fluency in thinking means producing many ideas in a brief time. Then choose the best ideas to solve problems, including the ability to change the direction of thinking as well.

2. Flexibility in thinking means finding multiple approaches to solve a problem instead of using only one approach by analyzing the problem from multiple perspectives.

3. Initiative means finding innovative approaches or different methods, including different ideas, may be caused by adapting prior experience and knowledge.

4. Elaboration means analyzing concepts until examining details more clearly.

Creative Process

The traditional Four Stages of the creative process by the theory of Wallas, 1962 (Skillicorn, 2021)

1. Preparation It is a collection or identification of problems that arise.

2. Incubation The process of cleaning up the information obtained.

3. Illumination The process of arranging and connecting ideas until they become clear images.

4. Verification Testing and proving opinions.

Basic types of creativity

Creative insights can be the result of two processing modes, deliberate and spontaneous, each of which can guide neural computation in structures that contribute emotional content and in structures that supply cognitive analysis. Crossing the two processing modes with the type of information yields the four basic types of creativity shown as in Figure 3 below. (Dietrich, 2004)

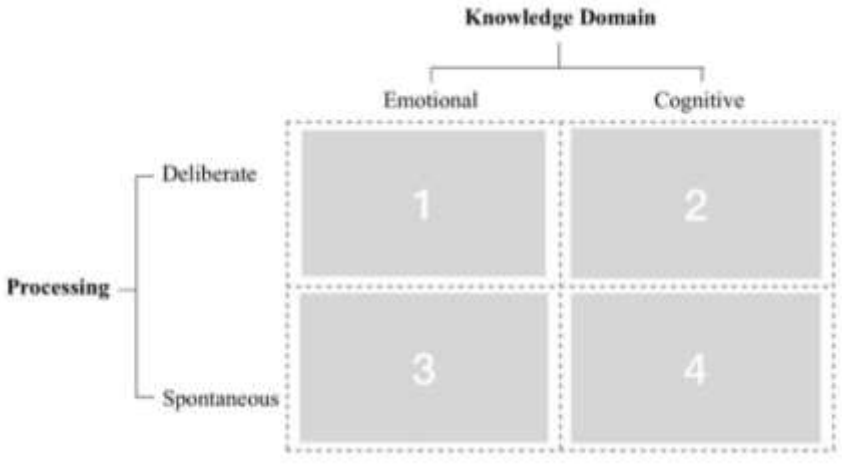

Figure 3 Type of Creativity (Deliberate mode–cognitive structures, Deliberate mode–emotional structures, Spontaneous mode–cognitive structures, Spontaneous mode–emotional structure), (Dietrich, 2004)

Variables effect to children's creativity

Based on the results of the Friedman's assessment of the factors of creative effectiveness of children using the test, the effect of each factor on children's creativity differs, shown in Table 1 Shows the top 5 variables with the highest score: motivation to play, Innovation, environmental survey, relaxing the mind and imagination of the child. In section the lowest scores 5 variables were familiarity with the original conditions, competition, pressure, number of children in the family and the gender of the child (Azeri, Reza Parvizi, & Hosseini, 2015)

From the above research, it is interesting to reveal that the most influencing factor affecting creativity in children is the motivation for playing. Therefore, the researcher is interested in focusing on the playing system that sends creativity.

Table 1 Ranking the effective factors in children's creativity (questions of the questionnaire) by Friedman's test,

Rank	Effective factors in children's	Mean ranks
1	Motivation to playing	41.74
2	Innovation	40.89
3	Exploration in the environment	39.91
4	Mental relaxation of the child	37.60
5	Imagination	37.46
46	Getting used to the condition	11.71
47	Competition	11.68
48	Pressure	9.83
49	No. of children in the family (home)	9.27
50	Child's gender (boy or girl)	5.70

Source: Azeri, Reza Parvizi, & Hosseini, 2015)

Case Study

In this additional 4 of case study that collecting and exploring both children's toys, household appliances, tools, and everyday objects to study the functions and various working systems that may affect to encourages imagination and creativity shown in below Figure (4, 5, 6, 7).

1. Chewp

The practical cooking set that able to real cooking, allow children get real experiences and real material. Being able to experience real situations helps children to know how to be learning and dealing with problems better including integrating cooking skills with toys to inspire children in future careers and activities. (Turner, 2013)

Figure 4 Chewp, Toy cooking set, design by Bat Chen

Image source (https://www.yankodesign.com/2013/07/15/for-future-foodies/)

2. Animate

The creative DIY robot kit for children, the creative kit for children between the age of four to eight who want to bring their imagination to life through technological construction. Each electronic element was size and color to make the construction process more approachable against other children's toy. Additionally, the robot's components and modules can be switched out for one another to enhance and diversify interactions between the creator and finished cardboard-mechanical toy. (Kowal, 2020)

Figure 5 Animate, Design by Studio Fantasio x OPPO

Image source (https://www.yankodesign.com/2020/11/11/cardboard-pieces-come-to-life-with-this-diy-robotic-kit-for-kids-in-collaboration-with-oppo)

3. Deku

The modular furniture building system composed of wooden planks that fasten together at the planks' 45-degree, pyramid-shaped edges. This triangular building system is essentially what allows for so many different configurations and shape then use colorful masking tape to fasten each module together It encourages creativity by conveying ideas quickly and resulting in more novel results. (Kowal, 2022)

Figure 6 Deku, Design by Takuto Ohata

Image source (https://www.yankodesign.com/2022/01/25/this-modular-furniture-building-system-takes-an-artistic-approach-to-construct-functional-and-playful-pieces/)

4.

This Toy for ages 6 plus, purchased from a general toy store, there are 48 triangle-shaped pieces that can be rotated, colorful, attractive to children as well. The results of the experiment found that it was quite difficult and took a long time to be able to come out with different appearances.

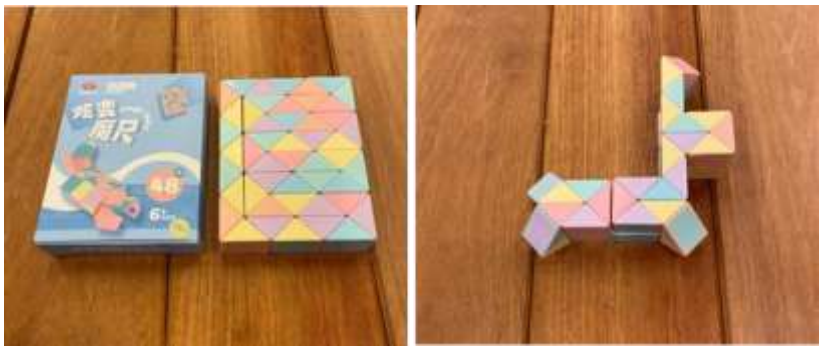

Figure 7 Toy that promote creativity that can be purchased at general toy stores.

The Design Concept

From the study of the mentioned case studies shown in Table 2 below, it was found that the mechanisms and systems of both toys and utensils are interesting, free to play, encourage creativity, can actually be used, help enhance the skill of assembling things and systematic thinking skills, there is a good use of colors and appearances that attract children's attention.

Table 2 Summarize case studies.

No.	Name	Category	Appearance	Interesting key points
1	Chewp	Toy cooking set	- Wooden cooking utensil, there is a curve that looks safe for children.	- Let children get real experiences and real content so that children can learn to better solve problems in life.
2	Animate	Toy	- Colorful - It is a piece made of cardboard that can be assembled into an electronic device.	- The pieces of electronic equipment are of color and size that are easy to identify and use, let children be able to disassemble or assemble the robot creatively and freely.
3	Deku	Furniture	- Several geometric pieces can be put together.	- The shape of the parts is relatively simple - Can be quickly assembled into different shapes.
4	Toy for ages 6 plus, purchased from a general toy store	Toy	- Colorful - 48 triangle pieces that can rotate freely.	- There are colors that look bright. - The shape is simple and can be rotated freely into different shapes.

The researcher has an idea to create a tool to help stimulate the imagination and creativity in children, so the design principles must be considered into 2 issues as follows.

1. System that enhances imagination and creativity.
   1.1 Functionality of various applications It has wider benefits.
   1.2 The use of colors, shapes, attractive to use for fosters imagination and creativity.
   1.3 Simple shape not too complicated Enables children to express their ideas quickly
   1.4 Hands-on with real materials to get acquainted with and experience physical and mental realism.
2. Suitable use for children
   2.1 The size and weight are appropriate that children can hold it by themselves.
   2.2 Usage that is not too complicated.

Thinking process in design and development

The first sketch idea

from the above concept the researcher outlined the first concept of finding ways to connect to achieve various outcomes and methods that are not too complicated.

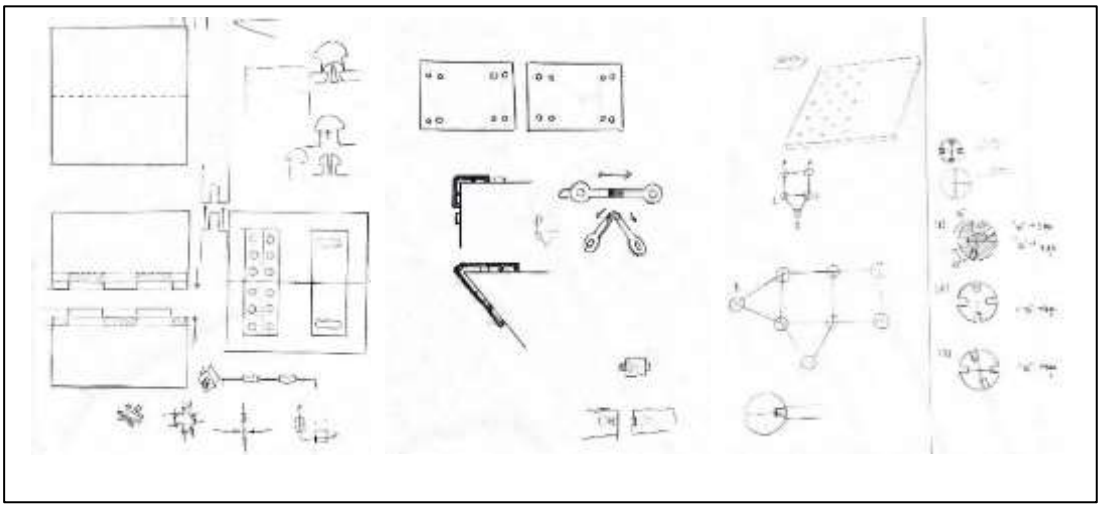

Figure 8 The first sketch idea

In this regard, the researcher has a total of 3 stages of research development as follows:

1. Stage 1st development

This sketch is another idea that the developer tries to connect the shapes together using a modular system because they want to strengthen them, but there are limitations in many ways, whether it is a form of connection that is not Too independent and complicated as shown in Figure 9.

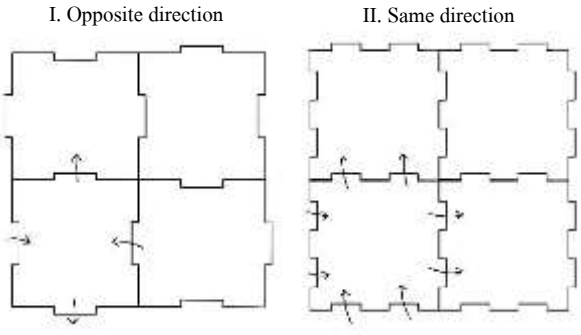

Figure 9

Figure 10

Later, the shape was simplified, and holes were drilled between the panels for more usability. The connector body is made of silicone material for flexibility and strength by being further strengthened with pins to lock everything together according to Figure 10 above.

2. Stage 2nd development

In the second stage of development, it is considered that the size and material of the connector are still not suitable for the load. Therefore, the appearance of the connector has been improved to be larger and the material is made of plastic to increase strength. There are 4 appearances and functions that different are 1. vertical and horizontal connectors, 2. A gap that closes the gap between the panels, 3. Scene and 4. Hinge according to Figure 11.

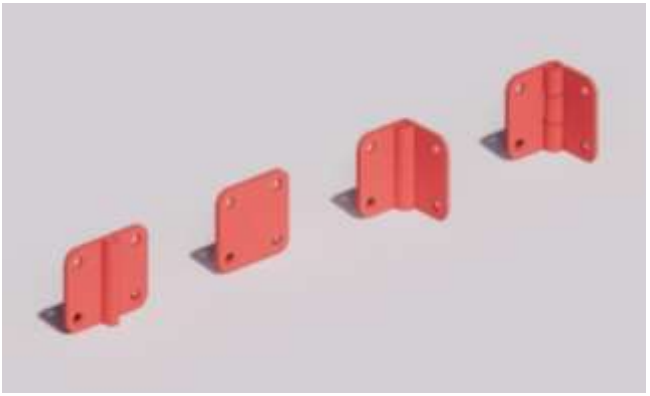

Figure 11 The connector in different appearances and functions.

3. Stage 3rd development

Later, the 3rd development design, modified the position and hole pattern of the new plate to allow for multi-directional assembly and more freedom. Later, the appearance of the control panel was redesigned and change the pins to screws, which makes it easy to assemble and design of the rotation cycle not too much to suit the strength of the child in Figure 12 below.

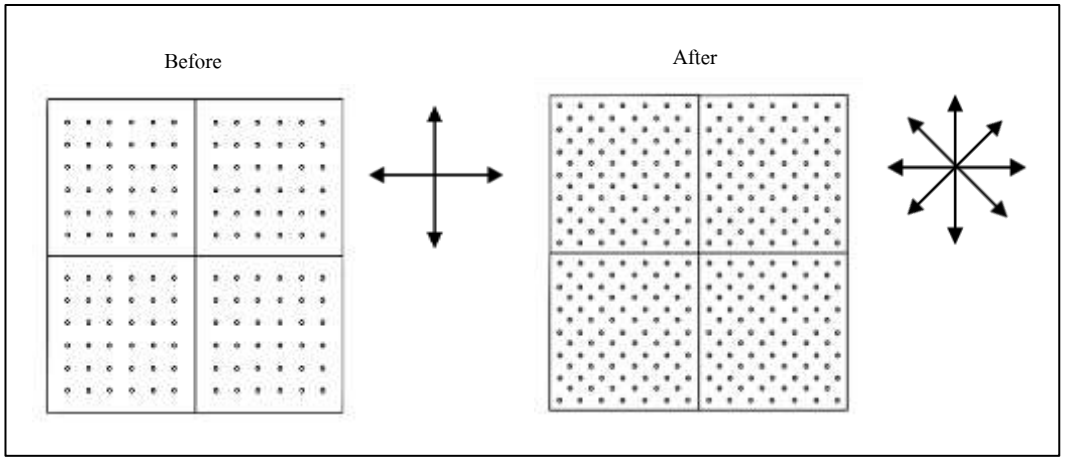

Figure 12 Comparison of hole position patterns before and after design development in relation to directional freedom.

In this prototype, there are 3 main parts: wood panel, screw and connector.

1. Panels

Panels are made of lightweight pine wood material will have a thickness of 10 mm. which is quite safe for children to assemble in different sizes and shapes as shown in Figure 14 below.

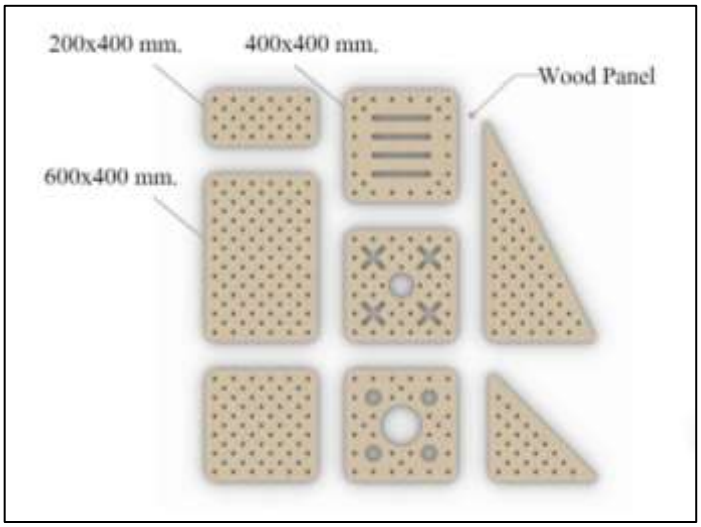

Figure 13 Various parts in the work have wooden panels.

2. Screws

In the screw part, plastic materials from 3D printing are designed to be easy to pick up by adding texture, so there are 7 types of shapes, each with different functions, so that children can expand their imagination as shown in Figure 15 below.

Figure 14 Screws from 3D printed plastic material

3. Connectors

There are a total of 3 types of connectors with different functions. In the design, there are color inserts that help children to identify the types of connectors more easily as in Figure 15.

a. Flat: Vertical and horizontal connectors between two panels.

b. Brace: The Brace allows the connection to look more dimensional and improved the pattern to stronger also can certify the actual use.

c. Hinge: The hinge makes the panel open and close, which makes it more useful when playing.

a. b. c.

Figure 15 Connector prototype 3D model printing (Flat, Brace and Hinge)

By producing this prototype (connectors), plastic materials from 3D printing are chosen because it is easy to modify the design. Which materials may change or appropriate production methods in to future.

Figure 16 Connectors from 3D printed plastic material

4. Results and Discussion

The ways of possible results from using this tool can be divided into 3 ways:

1. Children can unleash their imagination and creativity through this tool set by being able to create ways to use and design a child's own way of playing.

2. The fact that children who have assembled this set of tools to a large size increases the benefits of playing even more.

3. Children can take this set of tools to expand their practical use and benefit more widely, an example of assembly work is shown in Figure 17 below.

In this research, the researcher summarized the research results and discussion according to the objectives in the following order.

1. To study the factor to stimulate imagination and creativity.

As Guilford (1967) claims, the elements of creativity that are 1. Fluency, 2. Flexibility in thinking, 3. Initiative and 4. Elaboration including the research on 50 factors of effective factors in children's creativity (Azeri, Reza Parvizi, & Hosseini, 2015) suggests that the most contributing factor to children's creativity is Motivation to play Therefore, the researcher agrees that this research should be presented in the form of a tool that helps to influence the creation of objects to produce new and diverse results.

2. To study the design process of tools that promote the development of the imagination and creativity.

From the review of the literature, the researcher has come up with two main design concepts: There is a wide range of duties that can be used widely, and the system of the play must be too simple, which will allow the child to quickly shoot creativity by using attractive colors. Children develop imagination Including hands-on experience with real materials for children to understand and cope with real situations by using this tool to satisfy their creativity and imagination in a variety of ways.

Figure 17 Final Prototype 01

Figure 18 Final Prototype 02

Figure 29 Simulate an assembly example that is possible using a 3D program.

5. Conclusion

In this research, factors that promote imagination and creativity were studied to study how to promote imagination and creativity in children. By the way, the researcher has designed a set of tools for children aged 6 years or more to be able to disassemble this tool freely, with a method that is easy to understand, not too complicated so that children can quickly express their creativity and imagination.

There are 3 parts in this set of tools:

1. Wooden panel.

2. 3 Types of connectors

3. 7 Different shape screws.

The researcher has made suggestions divided into 2 parts as follows.

1. Suggestions for use

1.1 As for the panel made of pine wood material, which has properties that are lightweight, safe for children, but not resistant to dropping or scratching, still need to be further developed in terms of material durability.

1.2 As for the hinge type connector, if it is used for a long time, there is a chance of breaking, so the hinge still needs to be developed in terms of stiffness and flexibility.

1.3 Should study more about materials that are safe for children.

2. Suggestions for further research

2.1 There should be more education on more diverse and independent connection systems that will result in children expressing their imagination and creativity in a greater variety.

2.2 There should be additional experiments on actual use in children of each age group to study the suitability of use in children in each age group.

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