INTRODUCTION OF BASIC GEOMETRY SHAPES FOR CHILDREN AGED 5-6 YEARS THROUGH FASHION READY TO WEAR

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ABSTRACT
Learning for children aged 5-6 years requires concrete media so that learning can be conveyed well and students can understand learning easily. Based on the results of observations found problems in learning math geometry, namely the lack of media that supports learning geometry in the material so that students mastery of the material is still not optimal. Therefore, the focus of this research is to create design innovations by applying printing and knitting techniques as visual and sensory media on ready-to-wear clothing products for children aged 5-6 years to prevent delays in knowledge of geometric shapes before entering further education. This research was conducted using the creation theory method of "three stage design process". The design is also meant to promote children's fashion as part of a trend that is now rare to find. In addition, this design will produce a product that is different from other clothing products, this research produces a design concept and modification of geometric motifs applied to printing and knitting techniques using fabric materials applied to basic products of ready-made children's clothing that has aesthetic and modern values.

Keywords: *Basic Geometry, Children Aged 5-6 Years, Fashion Ready To Wear, Learning Media*

ABSTRAK
Pembelajaran untuk anak usia 5-6 tahun membutuhkan media yang konkret agar pembelajaran dapat tersampaikan dengan baik dan siswa dapat memahami pembelajaran dengan mudah. Berdasarkan hasil observasi ditemukan permasalahan dalam pembelajaran matematika geometri, yaitu kurangnya media yang mendukung pembelajaran geometri pada materi tersebut sehingga penguasaan siswa terhadap materi masih kurang maksimal. Oleh karena itu, fokus penelitian ini adalah menciptakan inovasi desain dengan menerapkan teknik printing dan rajut sebagai media visual dan sensorik pada produk pakaian siap pakai untuk anak usia 5-6 tahun untuk mencegah keterlambatan pengetahuan bentuk geometri sebelum memasuki pendidikan lebih lanjut. Penelitian ini dilakukan dengan menggunakan metode teori kreasi *"three stage design process"*. Perancangan ini juga dimaksudkan untuk mempromosikan *fashion* anak sebagai bagian dari tren yang saat ini sudah jarang ditemukan. Selain itu, perancangan ini akan menghasilkan sebuah produk yang berbeda dengan produk pakaian lainnya, penelitian ini menghasilkan sebuah konsep desain dan modifikasi motif geometris yang diaplikasikan pada teknik printing dan rajut dengan menggunakan bahan kain yang diaplikasikan pada produk dasar pakaian anak siap pakai yang memiliki nilai estetis dan modern.

Kata Kunci: Anak Usia 5-6 Tahun, Busana Siap Pakai, Geometri Dasar, Media Pembelajaran

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INTRODUCTION

The Government of Indonesia declares according to Law Number 20 of 2003 concerning the National Education System, Article 1 number 14 states that Early Childhood Education (ECE) is a coaching effort aimed at children from birth to six years of age and is carried out through providing educational stimuli to help physical and spiritual growth and development so that children are ready to enter further education. One aspect of early childhood development is the cognitive aspect. The ability to think, such as remembering, solving problems, making decisions, and thinking logically, is called cognitive ability (Sulistiyorini, 2016). Cognitive aspects are related to the ability to think "the process of knowing something by thinking is an important function in life that allows children to adapt to their environment" as stated by Jean Piaget (Rudiyanto, 2004).

One way to improve thinking skills is to recognize the basic shapes of flat geometry. Geometry is one of the subjects of mathematics. Mathematics is taught as one of the subjects at every level of education. According to Clements, Wilson, & Sarama (in Seefeldt & Wasik, 2008), understanding flat shapes or geometry is the second most important understanding after understanding numbers. Teaching the concept of flat shapes to children starts with identifying shapes, investigating buildings, and grouping flat shapes according to their shape, such as triangles, quadrilaterals, circles, and rectangles. This is in accordance with the Regulation of the Minister of Education and Culture of the Republic of Indonesia on the 2013 curriculum for Early Childhood Education (ECE). Indicators of developmental achievement levels in the introduction of geometric shapes for children aged 5-6 years include: mentioning geometric shapes, classifying geometric shapes, distinguishing geometric shapes, and distinguishing their characteristics. The purpose of teaching geometry at every level of basic education refers to structuring reasoning and forming attitudes, as well as on the application and skills of geometry. In other words, the purpose of teaching geometry is to develop five basic abilities of students, namely: visual, verbal, drawing, logic and application. In this study, the introduction of geometric shapes is important to be introduced to children from an early age because it is the initial step to understand more complex abilities and skills, and children can explore knowledge optimally and develop ideas and ideas to the maximum.

At the primary school level, children will learn to identify, describe and calculate the properties of different shapes. The shapes of rectangles, triangles, and quadrilaterals form the basis for more advanced geometry topics to be taught in the future. The introduction of geometry in primary school level has a basic purpose to provide an opportunity for students to further analyze the world in which they live, as well as providing early on the foundation in the form of basic concepts and terminology needed for further study. Understanding basic concepts determines

the success of further learning. But the reality in Math Learning Groups (MLGs) states that many elementary school students tend to be negative towards geometry. This is due to students' difficulties in understanding geometry concepts/ principles and understanding of concepts that still contain misconceptions. Misconception is a mismatch between students' prior knowledge of a concept with the concept to be learned. This attitude comes from the limited geometry concepts covered in textbooks. To stimulate a sense of excitement in learning geometry, teachers are required to link the chapters in the textbook with real-life situations. However, due to limited time and resources, it is not always possible for teachers to ensure that every child has understood geometry. In a class, students' understanding of a topic will definitely differ from one student to another. With a class size that has a number of students, many students may be left behind if the teacher progresses too fast.

Teaching the concept of flat shapes requires media that can facilitate students in understanding these shapes. The media provided must be in concrete form so that students easily understand the shapes of flat shapes according to the concept to be taught. This agrees with Wulandari (2017) who says that in instilling the concept of flat shapes in primary school students must use the right learning method that involves students actively which will affect the child's ability to understand the concept of flat shapes. Due to students' inability and limited knowledge in recognizing the concept of flat shapes, before entering primary school there is a possibility for researchers to build geometry vocabulary and provide directed learning experiences for children aged 5-6 years in a fashion-based learning environment. Fashion or clothing is one of the factors that influence the education and formation of children (Soerjadinato, 1971). It is generally recognized that clothing is an absolute human need. Clothing is everything that is worn from above or from head to toe (Joseph, 2013). Clothing that a person wears is not only to protect the body but also used as beauty, along with the development of trends, fashion models develop from children's clothing to adults.

Relationship between children development and clothing it is stated that children experiences the world through clothes, which is one of the best and primary methods for an individual to do so. The child's growth and development may benefit from wearing clothing that give the child a sense of pride, joy, security, and safety can have a positive impact on the growth and development of the child. Children's socio-intellectual skills might be improved or restricted by their clothing. It could affect a child's neurological and perceptive-building development, for example, if he wears clothing that could give him pain or discomfort. Uncomfortable clothing can also benefit your child's sensory ability. Clothing that is irritating to the child's skin might have an impact on the child's sensory responses due to tactile sensitivity. Unusual or heightened sensitivity to touch and textures is known as tactile sensitivity.

Due to the infant's greater tactile sensitivity, the brain has considerably less energy to work with, which can make it harder for the child to process other sensory signals. In addition, clothing is also used as jewelry to beautify the body and it must also be recognized that clothing fashions change to add beauty, adjusted to the situation. Children's fashion and clothing contribute to shaping their social identity and gender, as well as to developing and supporting their interactions with their environment related to their age. However, despite the daily nature of children's interaction with clothing, their relationship with clothes is ignored and methods to support an analysis of it are lacking. Unlike the adult fashion industry, the fashion industry especially for children is usually underestimated and not fully appreciated at all. The fashion industry vigorously follows and remodels adult fashion with a variety of options, in line with changing trends. However, children are never considered as fashionistas who are passionate about fashion or trends. An investigation of children's clothing behaviour is needed to better understand children's and to encourage policymakers to engage more sustainably with children's fashion.

With more hands-on learning opportunities provided to children, it will ensure that children have the opportunity to explore and practice the geometry skills needed to master the basics. This will also prepare children to be ready for further education at the next level. The opportunity to embed geometry vocabulary and provide purposeful and unrestricted learning experiences within the environment, by embedding clothing-based geometry learning. Because the geometry shapes approach can help children develop important higher-order thinking skills, such as problem-solving ability, deductive and analytical reasoning, and logical thinking. With clothing-based geometry learning, providing various geometry resources and some learning prompts will help children naturally incorporate more geometry learning into their environment.

Referring to what has been described above, it makes an interesting thing for the author to apply geometry motifs to clothing, so that children can know the basic shapes of flat shapes that are not only obtained from classroom lessons. The author can focus this research problem into design. Recognizing the basic shapes of flat shapes on clothing, which pays attention to fashion trends into ready to wear clothing to support policy makers to be more sustainably involved with children's fashion.

METHOD

To support the introduction of basic geometry shapes for children aged 5-6 years through ready to wear clothing, requires a method as a reference to produce designs. The design stage uses a "three stage design process" method by exploring sources of reference and information to find a theme which is then designed into a fashion embodiment. Method by LaBat and Sokolowski,

(1999) in the Clothing and Textiles Research Journal of the United States, SAGE Publications. The three main stages of the design process include problem definition and research, creative exploration, and implementation.

Stages of Design Process

1. Problem Definition and Research

The exploration stage which includes extracting sources of reference and information, controlling theoretical foundations, sources, and visual references to find themes or various issues, then used as material for analysis. In the exploration process of introduction and deeper understanding of geometric shapes for children aged 5-6 years that allow as a theoretical foundation, the exploration process also includes the relationship of geometry with ready to wear clothes that will be used as a medium of introduction in the creation of the work. In the end, the introductory media used in clothing are visual media and sensorial media. The media was chosen because media in the sensorial area can construct a child's developing mind by drawing out the tendencies experienced in the child's environment through their senses and movements (Lauren, 2017). Visual media is media that only relies on the sense of sight, such as photos or images. According to Arsyad (2004) visual-based media (images or parables) play a very important role in the learning process. Visual media can facilitate understanding and strengthen memory. Visuals can also foster student interest and can provide a connection between the content of the subject matter and the real world.

2. Creative Exploration

The design stage is pouring ideas or ideas carried out into the limits of 2D designs, sketches, and technical drawings. This stage is designed based on the results of the exploration that has been formulated into the realization of the work. The process of realizing geometry ideas in clothing was carried out with various considerations of aspects concerning the complexity of craft values, including aspects of material, technique, process, method, construction. The selected sketch design or technical drawing was prepared into a prototype model. Because the prototype model is a presentation that is carried out based on the prevailing process of art formation.

3. Implementation

The realization stage is the formation process, and is followed by an assessment and evaluation of the work that has been made. For the process of realizing geometry in visual media and sensorial media on clothing, done in accordance with technical drawings or designs that already exist. The realization stage is based on the prototype model that has been considered perfect, including the final completion or finishing. The results of the embodiment that has been completed, evaluated to criticize the achievement of the quality of the work, concerning physical and non-physical.

Theory of Basic Shapes Geometry

Many factors are used as a cause of low student mastery of geometry facts and concepts. One of the factors according to Soejono (2010) is the intellectual

ability of students. Furthermore, based on Piaget's theory, according to Orthon (1993) said that children are not ready to accept mathematics if they have not reached the stage of intellectual development that is in accordance with the demands of the material to be learned. Intellectual development is based on two functions, namely organization and adaptation. Adaptation is a way of gaining knowledge by adjusting to the environment. Adaptation is done through the process of assimilation and accommodation. In the assimilation process, a person uses existing structures in responding to environmental challenges, while the accommodation process is a process of modifying (re-structuring) mentally as a result of new information and experiences. So, learning is not only receiving new information and experiences, but also re-structuring old information and experiences to accommodate new information and experiences.

The human thought process is a gradual development from concrete to abstract intellectual thinking. According to Piaget in the pre-operational period (2-7 years), children are qualitatively more advanced when compared to the previous period (motor sensory period (0-2 years)). A clear difference with the previous period is the ability to use symbols. Nevertheless, children in this period cannot yet focus on two distinct dimensions in real time, but their thought processes are based on decisions that can be seen immediately.

Basic Shapes Geometry for Children

In Indonesian Geometry is translated as the science of measurement. Geometry can be defined as a branch of mathematics that studies points, lines, planes and space objects as well as their properties, sizes and relationships with each other. Space is a set of points that can form geometric shapes, a line is a set of parts of space which is a set of points that have special properties. Field is a set of points that lie on a flat plane (Usiskin, 1982). In accordance with the teaching of mathematics, the purpose of teaching geometry at each level of basic education refers to the structuring of reasoning and attitude formation, as well as the application and skills of geometry. In other words, the purpose of teaching geometry is to develop five basic abilities of students, namely: visual, verbal, drawing, logic and application (Mursalin, 2016). Geometry materials in low grades, especially grade 1, are needed so that children are able to recognize geometric shapes (circles, triangles, quadrilaterals), classify shapes, distinguish sizes, train rational thinking and can know simple concepts of geometry in everyday life. Recognizing geometric shapes is the ability to recognize, point, and mention surrounding objects based on geometric shapes. Geometry needs to be taught because geometry is a field of mathematics that can be related to the physical form of the real world. Understanding geometry can be optimized if students have good visual spatial abilities, this ability is related to the ability to recognize the shape of geometric objects both flat and space. Learning geometry at an early age allows it to be taught although it must be more creative and realistic. Therefore, for low-grade children, especially grade 1 needs to involve the cognitive process of visualization and reasoning, visualization helps learners to recognize and create new shapes or

objects and reveal the relationship between them.

Children Fashion Ready-to-wear

Children's fashion is one of the main clothes worn by children, based on their age level, the model chosen is usually a simple model, comfortable and does not interfere with movement. Design means to have a mental plan, make a preliminary sketch, or delineate an idea or concept in advance of realisation. In the fashion design process this description exactly matches the fashion design activity. The fashion designer conceives the idea, experiments with several alternatives of this idea in sketch form, makes a choice from these, has a pattern cut from this sketch and then has a prototype made up from which a cloth sample can go into manufacture (Waddel, 2004). The levels of the fashion industry this complex process also operates on different levels: levels of excellence, quality and snobbery. Within the fashion world these levels have acquired names, couture, ready-to-wear and mass production. Ready to wear fashion is a type of clothing that can be worn directly. This type of fashion is usually mass-produced, therefore usually the clothes produced already have universal sizes. It comes with a variety of styles, from casual to formal. Clothes in ready to wear fashion include shirts, t-shirts, skirts, pants, jackets, sweaters, dresses, jumpsuits, and others.

RESULT AND DISCUSSION

Concept Design

The design concept of this collection was inspired by the basic shape of flat geometry, the author imagined the use of geometric designs adapted with the right silhouette, cutting, and color block selection to utilize a pleasant aesthetic as ready to wear clothing. This aesthetic value can be seen from the color, exploration, and style applied in designs and artworks. Aesthetics is a science that studies everything related to beauty, studying all aspects called beauty (Sachari, 2002). The design of this collection wanted to display beauty, especially from printing and knit techniques. The geometry pattern is the hallmark, so it is designed in such a way as to form a product of children's ready-to-wear clothing collection. However, there are several aspects that must be considered in designing collections such as aspects of comfort, especially children's clothing, must feel comfortable when used and can be adjusted to the selection of materials, motifs and sewing techniques used, so that the product can be used in various activities both indoors and outdoors. Therefore, as a creative author must further analyze considering the selection of quality materials, colors that are attractive to children's eyes, models or forms of ready-to-wear designs with a modern style, and printing and knit techniques used. The design and model used must have an attractive value because this clothing is intended for children, so the design and model of clothing should not be excessive but must be simple, clean, not too many ornaments, comfortable, and modern, in accordance with the activities of active wearers.

This mood board is called Mind Mission which means a mission to think, thinking can help

children be more independent, increase creativity, and encourage curiosity, and to improve child's thinking skills from an early age with a variety of activities that are easy to do and fun. Just like the process of drawing fabric motifs with printing and knitting techniques that require creativity to improve thinking so that the results obtained are optimal and have aesthetic value.

Image 1. Moodboard Inspiration
Source: Research Document

This concept reflects the built aspect of geometry, as children learn geometric shapes from simple objects in their environment, such as cabinets, tables, doors, toys, kites, household containers, and so on. According to Kahfi (1996), it shows that children are familiar with geometry because it is present in almost all visual objects. The main visuals that appear on this moodboard are colors that give a beautiful impression such as light blue, pink, and orange and a combination of bold colors such as dark blue, red, and yellow. Expressive bright colors combined with subtle neutral colors and soft pastels in dynamic clothing are used as a selection of children's clothing. The bright color palette with a collision of striking prints and patterns is suitable for stylish clothing and ready to wear concepts. The motifs applied to this collection are renewed geometric motifs composed with high-octane colors and unusual positioning. Bright color blocking was chosen to bring out a sense of youth, and give a fresh look to the artwork and enhance the mood. Applying large patterns to make the visuals clearly visible to the target and give a solid and modern impression.

Printing Design of Basic Geometry

The initial process carried out is to do a visual design that can describe the basic wake. In the trial of the creation of craft design is to create a depiction of the basic building as a fashion motif. This visual design will be formed into a pattern that will be present in each garment. The pattern design comes in 2 different variations of methods, visual for printing and sensory for knitting. This method variation was chosen because of the target style during the research.

This visual pattern illustrates the abstract shape of the basic building pieces and is given bright colors such as blue, red, pink, green, yellow and purple to give a happy impression as children's clothing. After that, it is combined with neutral colors such as beige so that the geometry shapes in the visual look clear and contrasting. The abstract shapes in pink, red and purple are an update of the modified flat shapes. In accordance with the wgsn trend direction, updating the shapes on the pattern can show innovation, optimism and a great desire to revive imagination. So various types of basic shapes are combined by

modifying the pattern so as to produce a new motif. The following is the result of the depiction of basic geometry and the combination of modified patterns as a ready to wear children's visual clothing aged 5-6 years that applies the basic shapes of triangles, trapezoids and rectangles as fashion motifs in the printing technique.

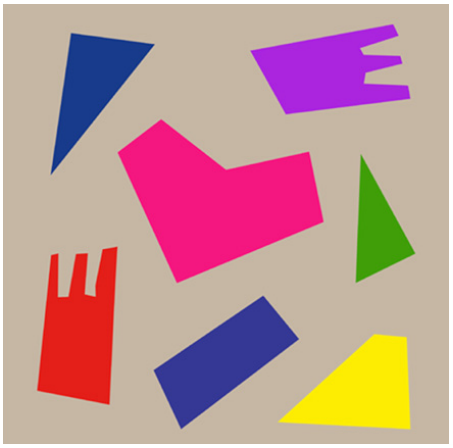
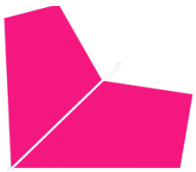


Image 2. Printing Pattern Design
Source: Research Document

Table 1. Modified Geometry for Printing

Modified Geometry	Image
Combination of two trapezoids	
Combination of square and three rectangles	

Source: Research Document Alfarist, 2024

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From the depiction of basic geometry, it is developed into a repetition of motifs. Arrange the laying of flat shapes in accordance with the design before printing on a special textile digital printing machine. Flat shapes are drawn on the fabric with a length of one meter. The motif on the largest flat shape is 10 cm x 10 cm, to ensure that the geometry motif produced is clearly visible, and precise by the child.

Image 3. Pattern Result on Printing Machine
Source: Research Document

Knitting Design of Basic Geometry

The second pattern depicts more diverse flat shapes, including square, rectangle, triangle, trapezoid and quarter circle. The collection in the knitting technique is dominated by green and dark blue, which are the basic colors in the clothes, then combined with one color selection applied to the flat shapes, namely gray. The reason for using only one color on the flat shapes is so that children can focus on the shape and structure that can be felt on the clothes. Visual patterns will be applied to each garment. The placement of this visual pattern in each garment is not the same. This aims to make this clothing collection richer in design and look more unique. Here are the results of the visual pattern 2 flat plane shapes applied to knitwear.

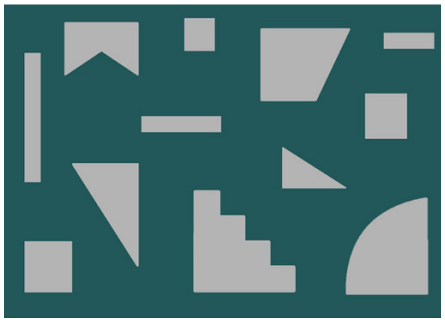

Image 4. Knitting Pattern Design
Source: Research Document

Table 2. Modified Geometry for Knitting

Modified Geometry	Image
Combination of rectangle	
Combination of trapezoid	
Quarter of a circle	

Source: Research Document Alfarist, 2024

This sweater has a shape tailored for children aged 5-6 years. The details on this sweater are on the front and both sleeves, where there is a second visual pattern. The layout of the flat building motif is set in the part that is considered to be interesting when seen so that the motif becomes interesting and does not interfere when used. The patterns of flat shapes are depicted with a large size so that the visuals are clearly visible and give a solid impression in the eyes of the child.

Image 5. Pattern Placement
Source: Research Document

Technical Drawing

Image 6. Design Collection
Source: Research Document

This collection produced 6 looks and consisted of 16 pieces of clothing. The garments include; 4 sweaters, 4 vests, 2 trousers, 2 jogger, culottes, overalls and 2 shirts. Only 11 pieces were realized, namely, 3 sweaters, 3 vests, 2 jogger, shirt, culottes and trousers. However, this discussion only focuses on clothing that is applied to flat visuals such as shirts, 2 sweaters and jogger with printing and knitting techniques to facilitate the understanding of children's senses of sight and touch, so that the concept of ready to wear clothing gives a different effect between the materials and sewing techniques used.

Image 7. Design of Printing
Source: Research Document

Image 8. Design of Knitting
Source: Research Document

Final Product

Image 9. Result of Printing Product
Source: Research Document

In the visual design, the fabric selection is ima cotton. With the characteristics of a smooth material, ima cotton fabric is able to provide its own comfort as a child's clothing material. Ima cotton is one of the recommended fabrics for children's clothing because of its medium thickness, suitable for use in environments that produce a lot of sweat. The natural cotton fibers used as the main ingredient of ima cotton can absorb sweat very well. The smooth surface of ima cotton feels cooler when it comes into contact with the skin. Whereas this sensory sweater design is knitted with 80% cotton and 20% milk fiber knitting yarn material, 4.5-5mm thickness, knitting technique using hands.

Image 10. Result of Knitting Product 1
Source: Research Document

Image 11. Result of Knitting Product 2
Source: Research Document

The results of this design can be used for boys and girls, as evidenced in some of the photos below that the results of the design were used as wardrobe in the implementation of photoshoot kids modeling agency and this design was used at the fashion show at NeoSoho runway stage, West Jakarta. Here is a comparative picture of the design used on boys and girls.

Image 12. Printing Product on Model
Source: Research Document

Image 13. Knitting Product 1 on Model
Source: Research Document

Image 14. Knitting Product 2 on Model
Source: Research Document

Image 14. Printing and Knitting Product on Model
Source: Research Document

CONCLUSION

Geometry is part of the material that studies the concept of shape and space. Some reasons why geometry needs to be taught first are first, geometry is the only area of mathematics that can connect mathematics with the physical form of the real world. Second, geometry is the only area of mathematics that can allow mathematical ideas to be visualized, and third, geometry can provide examples of mathematical systems that are not singular. From this research, it can be concluded that the potential of basic geometry shapes can be applied and utilized in children's ready-to-wear fashion products. The application of printing and knitting techniques in children's

ready-to-wear fashion products can be designed in such a way as to give a new style or look to the clothes, so that the clothes can still be used for daily activities with a ready-to-wear concept. Fashion design consists of a moodboard Mind Mission where there are aesthetic elements in it, so that it can provide balance and unity as a point of interest in the concept and work. The choice of color blocking is taken from vibrant to neutral colors that can attract children's attention. So by paying attention to these various aspects, it is believed that the design of children's clothing after 5-6 years with the application of printing and knitting techniques using new motifs based on the results of this trial is expected to be an alternative new choice and an equally important point is to be able to bring back the basic form of geometry using the techniques applied to clothing as well as to support and involve in the continuous progress of children's fashion followed by popular trends today.

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