



CHILDREN PLAYING EXPERIENCE SYSTEMATIC METHODOLOGY STUDY
THRU THE NORTH-EASTERN THAI TEXTILE MATERIALS,
SURFACE AND TOY DESIGN



A Thesis Submitted in Partial Fulfillment of the Requirements
for Doctor of Philosophy DESIGN ARTS (INTERNATIONAL PROGRAM)

Graduate School, Silpakorn University

Academic Year 2019

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By
MISS Nantiya NA NONGKAI

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By Nantiya NA NONGKAI

Field of Study DESIGN ARTS (INTERNATIONAL PROGRAM)

Advisor JIRAWAT VONGPHANTUSET

Graduate School Silpakorn University in Partial Fulfillment of the Requirements
for the Doctor of Philosophy

.....Dean of graduate school
(Associate Professor Jurairat Nunthanid, Ph.D.)

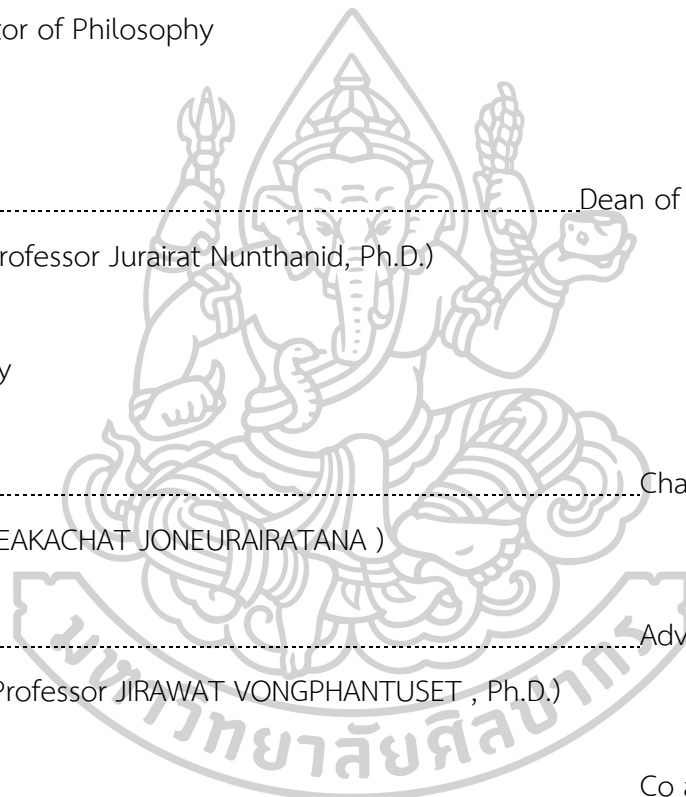
Approved by

.....Chair person
(Professor EAKACHAT JONEURAIRATANA)

.....Advisor
(Assistant Professor JIRAWAT VONGPHANTUSET , Ph.D.)

.....Co advisor
(Associate Professor PAIROJ JAMUNI , Ed.D)

.....External Examiner
(Professor Mustafa Halabi Bin Azahari , Ph.D)



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MISS NANTIYA NA NONGKAI : CHILDREN PLAYING EXPERIENCE SYSTEMATIC METHODOLOGY STUDY THRU THE NORTH-EASTERN THAI TEXTILE MATERIALS, SURFACE AND TOY DESIGN THESIS ADVISOR : ASSISTANT PROFESSOR JIRAWAT VONGPHANTUSET, Ph.D.

This research is qualitative research, divided into two parts i.e. the research base and the practice base. It is the study of insight and practice, concurrently according to the objectives, which are 1. To examine the fundamental characteristics and elements of the Northern-Eastern Thai Textile. 2. To experiment related designs and materials of the Northern-Eastern Thai Textile that can be enhanced for pre-schooler playset. and 3. To develop an appropriate pre-schooler playset based on the design, and materials of the Northern-Eastern Thai Textile. The research base of the study is in accordance with the topics and theories related to the development and learning of preschoolers. Practice base of needlework practice is emphasizing on sensory perception to playing and learning, to help children develop their intellect and creativity. Development of production quality meets the standards of the research conceptual framework. The tools used in the research were participatory observation used in the community area to collect information and practice of the needlework, questionnaire used to collect information from the manufacturers in the production process and sensory surface created by needlework, non-Participant observation used to observe the preschooler play, and unstructured interviews used to query expert opinions on designed toys from the surfaces manufactured by needlework, including other useful suggestions for the research.

The results of the data collected were found that the process of creating the textile sensory surface can be summarized as follows: in term of fluffy texture, knitting crochet method has the maximum fluffiness, followed by sewing and weaving. For terms of production time, weaving takes less time, followed by knitting crochet and sewing which took longer time in production; in term of durability, the most durable content was produced with weaving technique, followed by knitting crochet and sewing, with least durability. From the observation behavior in play, it revealed that preschoolers interested in sensory surfaces in each surface were different. Their attentions were drawn on the surface that have more volume rather than the flat surface; sensory surface that is soft makes the children's feel safer and the toy with sound stimulates children's attention very well. Combined with the experience and methods of play that can be applied to play in different ways, children can learn and play again even with the same toy.

The concept of Apply Surface Design to Touch and Feel Stimulation Toy, consists of 2 main stages. The first one is "Children Development Stage" including with children development by age both physical and cognitive learning merged with beneficial purpose of play that children will get and how the toy can promote their touch and feel perception. Second is "Making Process and Material Stage" this stage is also important, it concerns on techniques and materials that designer choose. It must be suitable for the first stage as above. Techniques and Materials should not be complicated in term of industrial process. It refers to time and cost that would be spent in the production line. And all of these must should be aware of the safety and remind the principle of art and design should be in every steps of designing.

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My sincere thanks also goes to my family, friends and students who devote the time and power to push this research until the final stage with their encourage and faculty of Fine Arts and Industrial Design, Rajamangala University of Technology Isan, professors and specialist who giving the value suggestion Asst. Prof Dr. Ravitep Musikaparn, Dr. Koraklod Kamsook, Dr. Patcharaporn Puthikul, Asst. Prof Chuleeporn Lertprasert, Assistant Professor Dr Pratuengthip Pambameung, Dr. Chantida Sanitnarakorn, Miss Chantaravimol Jaiaeerop, Miss Natcha Rojviroj and Mr. Navee Pathomanant.

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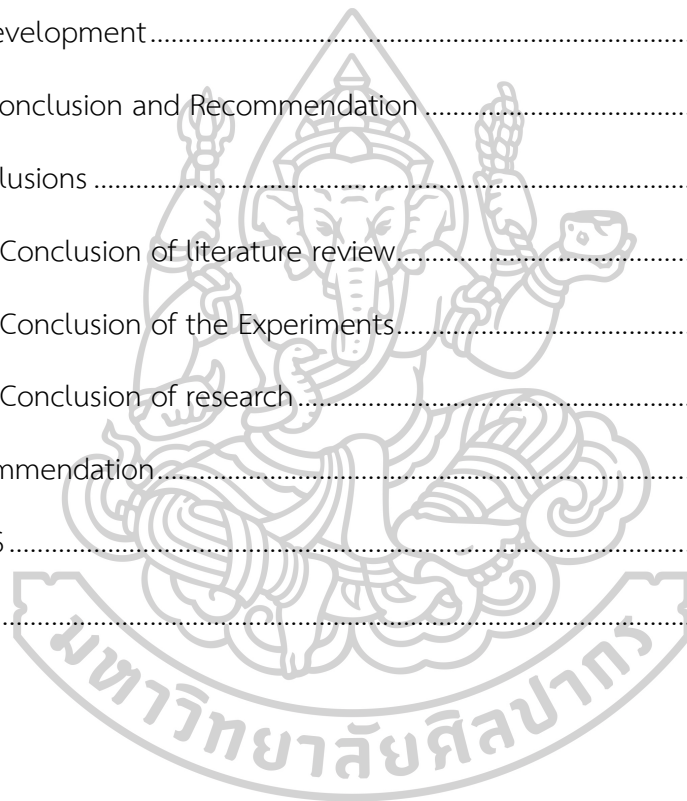
Last, I would like to express my deepest gratitude to my son Who is the inspiration for creating designs at every step and is an important encouragement in difficult times to overcome obstacles.

Nantiya NA NONGKAI

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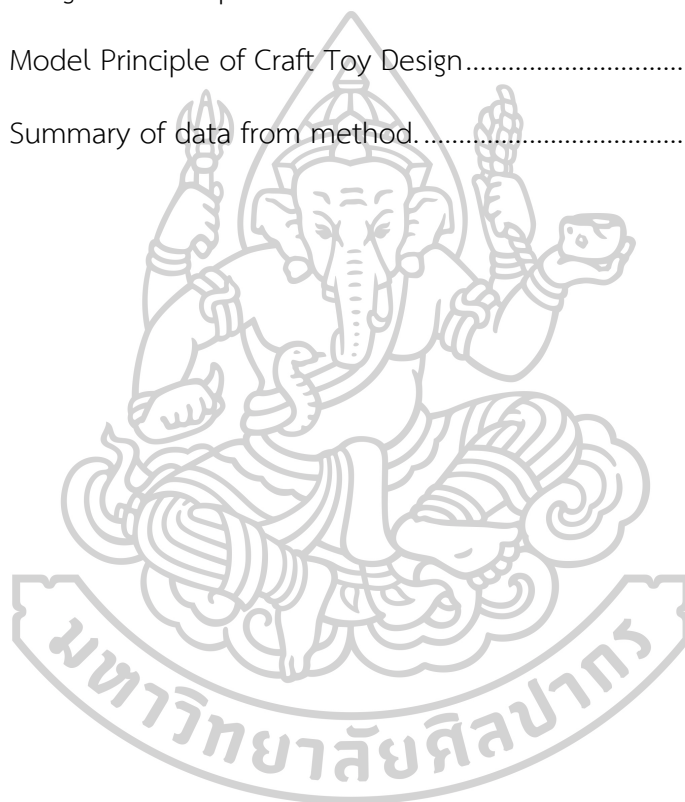
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Chapter 1

Introduction

Statement of the problem

Textile industry in Thailand is the one of important business for shifting Thailand economy. Textiles in each region of Thailand were unique with their own style and techniques that were inherited from ancestors by generations to generations. From this importance, there were many researchers to discuss the achievement of the quality and aesthetics of textile. Many textiles were analyzed from various points of view and created with various techniques and various textures with the curious question that which one could make more interesting and attractive. The different textures could be also useful for stimulating human's sensory perception especially young children. Sensory stimulation is important and useful because it would send some signals to children's brains that improve their nervous system for all types of learning. The young learners improve their age development through their sense of touching which would be the basis of learning other skills such as identifying objects by touch and using fine-motor muscles (Gainsley, 2011)

A notable feature of the fabric is soft that make safe feeling when touching. After it combines with processes of handicraft production, it will be suitable for making children's products such as a soft toy. The seeing and touching sensory provides a perception of quality, light, color, depth of an object by awakening our nerves because the body is ready to perceive (Nimkulrat, Kane, & Walton, 2016). This feature is important for toy designer including 3D toy products which are produced in limited amounts and most of those products were made of vinyl, resin, or wood that was sewn with soft material. It could serve for only niche players (Phoenix, 2006: 11).

Cognitive or mental flexibility: It is an ability to quickly shift our attention and switch mental gears when faced with new information, circumstances, perspective, or priorities. Cognitive flexibility also allows out-of-the-box thinking- allowing us to apply different rules to different circumstance. (Jana, 2017) children also increasingly

adept by using symbols, as evidenced by the more playing and pretending. (Cherry, 2018) Since most students could learn in multiple ways, it will be good to present information in multiple ways. (Vorderman, 2016)

Objective of research

The purpose of the research are:

1. To examine the fundamental characteristics and elements of the Northern-Eastern Thai Textile.
2. To experiment related designs and materials of the Northern-Eastern Thai Textile that can be enhanced for pre-schooler playset.
3. To develop an appropriate pre-schooler playset based on the design, and materials of the Northern-Eastern Thai Textile.

Scope of the study

1. Focus on local material in North Eastern area including with
 - 1.1 Cotton
 - 1.2 Hemp
 - 1.3 Silk
2. Local Handicraft technique which used in the local community
 - 2.1 Sewing
 - 2.2 Crocheting
 - 2.3 Weaving
3. The learning behavior of preschoolers.
 - 3.1 The intellectual ability to recognize, understand of the preschoolers.
 - 3.2 Sensory perception process in preschoolers.
 - 3.3 The potential of Physical ability and ergonomics of the preschoolers.
4. The product must be produced in the local community by local people with quality standardized, non-hazardous material testing for children.

Research Question

1. What is main materials in study area and their structure details?
2. How making process of creating a surface on textiles by handicraft methods which be produced in the locality?
3. Why surface design affects to the perception of Touch and Feel sensory?
4. How playset with a new surface can stimulate the perception of preschoolers with appropriate by the physical and brain in touch and feel sensory?
5. How to produce the product with the acceptable quality and follow standard which is not harmful to children?

Benefit

1. Knowing structure of North – Eastern Thai textile by using innovation and the standard of the colour dying.
2. To apply a local textile surface in a different way.
3. Got a systematic job creation guide to be useful for product development in local communities.
4. Products for the first step in classification for preschoolers in development.
5. To provide the local producer with full potential beside what they have done.
6. Got the how to process to design craft toy model for others who interested.
7. Creative toy with craft techniques to enhance children imagination.
8. Unique production process for soft toy products.

Research Methodology

Research Methodology to carry out the research process. Researchers have studied the tools used to collect data. The following issues. To collect information, research tool consisted of the research process is divided into 3 phases according to the research objectives. Can be divided as follows.

1. Participant observation to collect data study and analyze the local hand weaving material and handicraft technique in the North Eastern area.
 - 1.1 To collect and analyze the local hand weaving material
 - 1.2 To collect handicraft technique in the North Eastern area.

2. The questionnaire is used to collect information from the manufacturers in the production process.

3. Non-participant behavior observation used to observe the preschooler reaction and play behavior with the playset.

4. Unstructured interviews used to query expert opinions on the design of the playset.

Phase 1 Survey and Data Collection in Local production process and materials:

Researchers have entered the storage area. The tools used in this step are participatory surveys and questionnaires.

1.1 Participant observation used to collect data in the textile surface at this stage, the researcher used the participatory observation method to collaborate with the local community to explore and collect the data of making surface process. There are various methods available in the local community in the research area. Make a note and practice to create the surface from the local manufacturer in the community.

1.2 Questionnaire is used to collect information from the manufacturers in the production process. The questionnaire was used. To ask the producers in the community for their opinions on each process. And the results of the production process. To be used as a piece of design information.

Phase 2 non-participant observation on play Behavior and the development of preschool children:

By starting to design basic toys. Then bring the set of toy to the children to play. Observe the playing behavior and unstructured interviews used to discuss with the experts and specialist about the playing behavior. The result of playing the toy and more for further improvement in the design process. For important information in the design process is the reaction of the preschooler. The researcher, therefore, designed the initial toy set.

Phase 3 To develop the textile surface to stimulate the sensory perception of preschoolers and design a product for preschoolers from a new textile surface:

Summarize and collect all the results from the research tools used above. The results are synthesized to process for creating the right design for preschoolers by way of crafting in this research is the needle works. From concept to acquisition then put to test and experiment on the standard level to get a set of toys with quality crafts.

Research outcome

1. The research can be shown that the structure of the local textile in North Eastern area including with hemp, cotton, and silk.
2. The local textile and hand craft techniques can be produce in soft toy industry.
3. The expected result of the experiment was the suitable process and support child's development.

Definition

1. **North-Eastern Thai Textile**, local material in North Eastern area including with hemp, cotton, and silk.
2. **Materials**, including with hemp, cotton, and silk.
3. **Techniques**, needle works techniques, including with sewing, crocheting and weaving.
4. **Surface Design**, how to create surface by needle works techniques.
5. **Preschool**, children age 2-4 years.
6. **The play set**, a set of craft toy made by new textile surface such as set of blocks and dolls with dinosaurs theme.
7. **Local history**, history about dinosaurs which found in the area of scope study.

Chapter 2

Literature reviews and related Studies

This research is a qualitative research, divided into two parts, the research base and the practice base, which is the study of insight and practice, concurrently according to the objectives, which is

Thai textile

Local textile industry

Fiber to fabric

Children Development

The Piagetian Concept of Stages (Periods) in Cognitive

Montessori method

Steiner Waldorf

John Dewey

Touch and Feel Sensory

Design for kids

Creating inspiring places for play

Create a Clear Visual Ranking

Education and play

The Reality of Children's Play Throughout the Ages

Styles and Types of Play

Benefits of Play to Holistic Development

Children's play in natural environments

Previous works and Global Research.

Tokyo Toy Museum

Singapore Art Museum

Sensory Playground

Global Research

1. Thai textile

1.1 Local textile industry

Thailand is ramping up its competitiveness by focusing on innovation. The government is providing additional incentives along with infrastructure development to

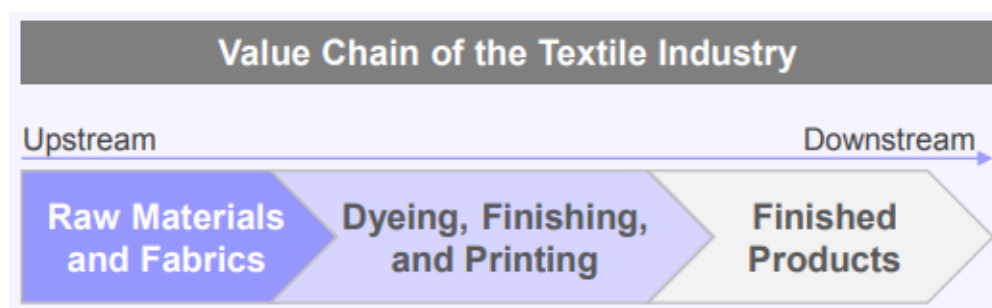


Figure 1 Value Chain of the Textile Industry (Thailand Board of Investment, 2016)

Further support growth in the country's textile industry. In addition to extensive textile and clothing manufacturing, Thailand also hosts one of the largest garment marketplaces. Through decades of heavy investments in R&D, Thailand adopted ground-breaking technologies becoming a leading producer of fabrics in the region. Thailand is one of the few countries in the world that provides the whole value chain of the textile industry, from upstream, midstream, to downstream. With over 4,700 local textile producers. Thailand hosts a full range of activities across the entire textile value chain, ranging from the production of fiber, and fabric, all the way to the design, manufacturing and sales of apparel and functional textiles.

In each locality of Thailand There is a culture that is unique to that. The whole geographical environment History way of life, way of life, beliefs and wisdom that are passed down differently. Therefore, the popularity of using textiles is different. Until the production process in some stages In this research Focus on the textiles of the northeast region of the country by focusing on the study of popular local textiles Widely known Used for the main occupation in many areas Which has processes from upstream to downstream, from the raw material production process to weaving, dyeing and product development. The researchers have surveyed and collected data in the

area, can summarize the 3 most popular types of fibers, silk, cotton and hemp, especially silk, can be considered the queen of Thai fabrics. Is a representative of the Northeast region that has it all whenever thinking of the Northeast region of Thailand, silk is the first representative of the Northeast region.

With research and many researchers Thai silk is the reigning queen among fabrics available to consumers today. Little was known about Thai silk among foreigners in the past because the fabric was not even popular with the majority of local citizens which viewed that silk was a reserved textile only for high ranking and well off individuals. It was only after war world 2 that Thai silk was globally popularized by Jim Thompson an American entrepreneur who brought Thai silk to global attention. Thai silk was also supported by the royal patronage of Her Majesty Queen Sirikit of Thailand who supported the establishment of Royal Folk Arts and Crafts Center to support Thai indigenous knowledge. (Sawatdi, 2013) Most of the silk threads used in production starting to shift back to locally produced threads and is mixed with purchased threads from factories according to client orders. Natural dyes still continue to be used but many producers now prefer synthetic pigments, but the deciding factor depends on the clients orders. The integration of raw materials with synthetics affiliates in lowering the amount of time spent on production sometimes traditional and natural materials are chosen due to the fact that some clients prefer organic and chemical free materials. This is reflected in traditional silk textiles that use traditional methods and natural substances (Holland et al., 2007). Next to silk that has been very popular is cotton that is very popular among foreigners and many foreigners. The most memorable, the cotton color of the people in the northeast will be remembered with colors, especially indigo, representing the cotton from the Isa region. Improved development due to the combination of silk and cotton with good quality and reasonable price from cotton and cotton. The production of costumes and accessories for the market or the most interesting research. Studies and experiments have found that cotton fabrics that are well ventilated help the accumulation of fat quickly and efficiently. The results of the comparison of these 3 fibers will be discussed in the next chapter of the research, Hemp fiber, but cultural exchanges using the wisdom that is not abundant in the stomach area have been studied. And exchange knowledge about

the fiber production process some that are suitable for use in areas with extremely hot weather such as the eastern region. Can also be worn but when in the cold weather But still feel good as well, but the price of hemp fiber in the eastern region and still have a very high price, most still have to order from the northern region at the beginning.

Hemp (*Cannabis sativa* L.) bast fiber has been used for textiles and cordage for more than 4000 years. It is widely cultivated throughout the temperate climate regions from Europe to North America more than in tropical Asia (Lu & Clarke, 1995; Nakamura, 2000; Phengklai, 1981). In Thailand, hemp was used by the hill tribe people called "Hmong," who live in the northern part of the country. The pure hemp fabric was coarse and sold only in local markets in 50-cm wide strips of cloth. The material might have been imported from China, Myanmar, and Laos somewhere across the border of Thailand and some were obtained from the hill tribes. Hemp seeds used in this experiment came from the wild type that Hmong people grow, and were collected by the Queen Sirikit Botanic Garden Organization in Chiang Mai province, Thailand. At the stage of early flowering, the maturity of fiber (as measured by single fiber strength) was more uniform than at the vegetative stage. The characteristics of male and female plants were largely similar. Fiber fineness, strength, length, and lignin content were affected by fiber maturity and growth stage of plants.

1.2 Fiber to fabric

The properties of each fabric are different. From the source to the destination. That the fabric. The production of the fabric begins with fiber. To get each fiber. We need to study and understand the process. The properties of the fabric in order to get the right fabric to use. Especially works that need to involve young children. Special care must be taken in the area of safety. And maintain the properties of the fabric to stay. Durability of use It's very important as well. Therefore, the study of fiber types is a very important initial step. That should not be overlooked.

Start with the fabric study in the community. This research. The purpose is to bring the best local materials to use. The study area of materials in the community. In this research area. The study area is in the South-East of Thailand. The textile industry in all educational areas. Most visible Weaving silk and cotton,

respectively. By planting mulberry silk. It can be considered as the main industry of many families. And the silk of the province in the south is also popular. And a large textile industry. One of Thailand's Both silk and cotton. Sorted in the same out of fiber. Natural fibers are separated from plants and animals. The silk is derived from the fiber of the silk wrapped in the nest and the cotton from the cotton to spin the cotton is also important in the hemp fiber is equally popular. Each type. The features vary greatly.

Table 1 Natural staple fiber and Fiber characteristics (Baugh, 2011)

Natural staple fiber	Fiber characteristics	
	Positive	Negative
Plant (cellulose) fiber Seed fiber Cotton	Absorbent Strong when wet Conducts heat well Good abrasion resistance No static buildup Dyes well Matte appearance	Not colorfast in dark tones Shrinks Heavy fiber when wet Not fast – drying Poor resilience Can be attacked by mildew/pets Flammable No elasticity Fair resistance to sun
Silk (All silk fiber begins as filament, But may become staple fiber as fiber waste)	Lustrous Soft hand / drape Very good absorbency Moderate resilience Easily dyed	Expensive Fair colorfastness Fair elasticity

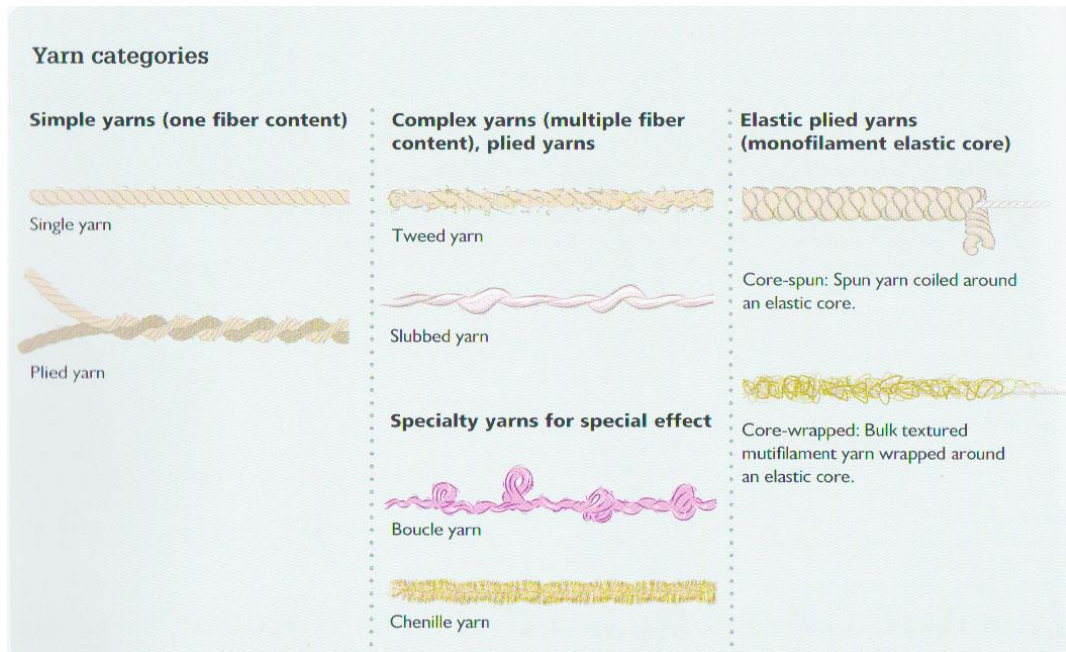


Figure 2 Yarn categories (Baugh, 2011)

2. Children Development

2.1 The Piagetian Concept of Stages (Periods) in Cognitive Development

Piaget actually called his major stages *periods* of development. Within these periods he sometimes delineated what he called

stages of growth as well. According to Piagetian theory these periods (and stages within periods) are characterized by the following properties (Kohlberg, 1968)

Invariant sequence. Stages are invariant in sequence: just as one must learn to crawl before learning to walk, a child must complete earlier stages before later ones can be achieved.

Generality. Each period can be described by very general properties. Thus, for example, the concrete operational period is not merely the period in which a child can solve water level problems, but more generally, the child has come to understand the concept of conservation, including reversibility, as well as the loss of centration.

Cognitive restructuring. Each period represents a cognitive restructuring in the sense that later periods represent qualitatively different ways of thinking; yet at the same time there is –

Hierarchical integration. Each period represents a hierarchical integration of lower stages into higher ones. Earlier thinking patterns are not lost; rather, they are incorporated into the higher levels.

Universality. Periods and stages are universal: all children in all cultures progress through the same periods and stages.

Sensorimotor Period

The first period, from birth to about two years, is called the **sensorimotor period**. During this period most schemes are organizations of physical action patterns. (Piaget, 1936/1974) account refers frequently to observations of his infant 4- 13 son, Laurent, and daughters, Lucienne and Jacqueline.

(18 months – 2 years). It is in this final stage of the sensorimotor period in which **symbolic thought** begins. Piaget did not believe that thinking requires language; in fact, the child's earliest thought consists of the non-linguistic use of symbols.

Table 2 The General Periods of Development (Crain, 2014)

Period I.	Sensorimotor Intelligence (birth to 2 years). Babies organize their physical action schemes, such as sucking, grasping, and hitting, for dealing with the immediate world.
Period II.	Preoperational Thought (2 to 7 years). Children learn to think—to use symbols and internal images—but their thinking is unsystematic and illogical. It is very different from that of adults.
Period III.	Concrete Operations (7 to 11 years). Children develop the capacity to think systematically, but only when they can refer to concrete objects and activities.
Period IV	Formal Operations (11 to adulthood). Young people develop the capacity to think systematically on a purely abstract and hypothetical plane.

Piaget's four stages of cognitive development

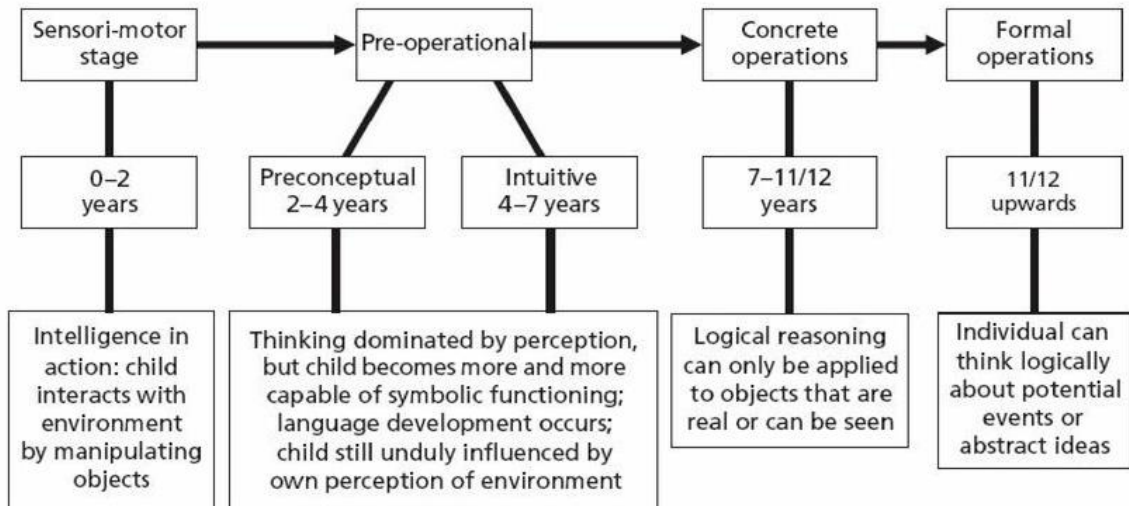


Diagram 1 Piaget's four stage of cognitive development (Curtis Donoghue davies, 2019)

2.2 Montessori method

According to Montessori, from ages 2-6 children experience a "sensitive period" in which vital skills such as language acquisition, socialization and, kinesiology need to be identified and strategically applied and advanced. Any deficiency in intellect, ethics or socialization later in life can be attributed to a lack of cognitive development during the "sensitive period" (Ruenzel, 1997: 31).

One underlying premise of the Montessori Method is that each child possesses an inner power that motivates them to seek out specific activities and interactions (Crain, 2004). The purpose of the classroom was to create a "prepared environment" where the student was free to discover and advance his or her unique power while disciplined enough to stay focused on a specific series of tasks. With this progressive approach, learning becomes "a complex process of making sense of new information through.

Reflection and interaction" (Weissglass, 1999: 46). Rather than sitting through a traditional collective lesson, students achieve what Montessori referred to as "auto-education" by working independently under the direction of a "pedagogic

apparatus” of their choice (Brehony, 2000). Common manipulators, or manipulative materials, used by Montessori included wooden letters and numbers, cylinders, blocks, beads, rods, puzzles, gymnastic equipment, metal objects, and household items by using a sensory learning method, the child gains knowledge by playing the inquisitive role of the naïve scientist.

Classroom Environment Children are always free to move around the room and are not given deadlines for the various learning tasks. Desks are arranged into open networks that encourage meaningful group discourse, as well as independent learning. Students work together with the teachers to organize time strategically in order to complete the necessary learning tasks of the day. The amount of teachers in the classroom varies based on class size, but usually two teachers are used for sections with thirty or more students.

According to Montessori, from birth to age 3 the child learns primarily through the “unconscious absorbent mind.” During education in the first three years, Montessori believed that it was necessary for the parents to develop in the role of an obtrusive educator; there to protect and guide without infringing on the child’s right to self-discovery (Crain, 2004). This early developmental model enabled children to learn their own skills at their own pace. During the ages of 3 to 6 the child begins to utilize the “conscious absorbent mind” which prompts students to participate in creative problem-solving consisting of wooden and metal objects of various sizes and shapes, personally designed by Montessori. If a problem becomes too difficult for the student, the teacher delays the project for a future day. Children also engage in practical work consisting of household tasks and personal maintenance. In both developmental mindsets, “the child seeks sensory input, regulation of movement, order, and freedom to choose activities and explore them deeply without interruption in a carefully prepared environment that helps the child choose well” (Edwards, 2002: 6).

2.3 Steiner Waldorf

In Waldorf nursery-kindergartens, home care programs, childcare centers, parent-child programs and other settings, foundations are laid for later learning and healthy development, including life-long physical, emotional, social, intellectual, and spiritual growth. Activities in Waldorf early childhood education take into

consideration the age-specific developmental needs of young children, from a focus on will-oriented physical activity in the first three years, then on imaginative play in the middle years of early childhood, and later a more cognitive approach to learning after the child enters school.

Educational Principles

Waldorf based programs may differ according to geography, culture, group size, age-range, and individual teaching approach. Granting these differences, Waldorf programs share certain fundamental characteristics:

- Loving interest in and acceptance of each child
 - Opportunities for self-initiated play with simple play materials as the essential activity for young children. This is the young child's work and makes it possible for them to digest and understand their experiences.
 - Awareness that young children learn through imitation, through the experience of diverse sensory impressions, and through movement. Their natural inclination is to actively explore their physical and social environment. The surroundings offer limits, structure and protection, as well as the possibility to take risks and meet challenges.
 - A focus on real rather than virtual experiences to support the child in forming a healthy relationship to the world.
 - Artistic activities such as storytelling, music, drawing and painting, rhythmic games, and modeling that foster the healthy development of imagination and creativity.
 - Meaningful practical work such as cooking, baking, gardening, handwork and domestic activity that provide opportunities to develop unfolding human capacities. Here the emphasis is on the processes of life rather than on learning outcomes.
 - Predictable rhythms through the day, week and year that provide security and a sense of the interrelationships and wholeness of life. Seasonal and other festivals are celebrated according to the cultural and geographical surroundings.
- (IASWECE, 2014)

The physiognomy of the New Education

For a decade, Steiner's ideas on education remained no more than abstract rhetoric. It was not until the year of the German Revolution in 1919, at the height of the international movement in favor of a New Education, that the self-taught specialist in pedagogics came to prominence as the founder of a new school. Steiner's educational anthropology now absorbed-sometimes contrary to his own ideological concepts-many contemporary ideas based on the reality of education that could not be arrived at merely through an abstract formula.

- In the historical and systematic perspective, the practical work of the Rudolf Steiner schools (and kindergartens) shows particularly close links with other trends of the New Education. This holds well in the first place for its structure and organization which have remained practically unchanged to the present day:

- They are establishments that maintain their own financial and curricular autonomy and are characterized by a child-centered educational tendency. Parents and children work together in the interest of developing the child.

- The Rudolf Steiner kindergarten has the atmosphere of a living room with a maternal educator. The guiding aims are to develop the senses by imitation and the experience of community life with a rhythmic progression. Factors that contribute to this are the two-hour period set aside each day for free play with natural materials and the particular emphasis placed on artistic creation and a natural religious outlook.

- The Rudolf Steiner schools are continuous establishments in which the pupils learn together in stable year groups from the first to the twelfth year of schooling, without any interruptions or repeat years. Instead of official reports containing marks, the teachers write annual character portraits or learning reports in their own free wording. The syllabus and method of teaching are supposed to be guided in the first instance by the genetic and organic development of the child.

- The all-round personality of the pupil is supposed to be shaped through placing the equal weight on cognitive, artistic-affective and technical-practical activities in both tuition and school life. Practical training-through agricultural activities in the school garden, handicrafts and industry-are intended to develop a practical outlook on life.

- school life, the continuation of the classrooms by gardens, workshops and practical courses, attention to the physical and spiritual well-being of the pupils, an emphasis on musical education, and a rhythm of school life marked by festivals and ceremonies. Parents are closely involved in school life. The teachers see themselves primarily as persons who accompany the development of the child.

2.4 John Dewey

Theoretical Perspective Dewey (1938) described progressive education as “a product of discontent with traditional education” which imposes adult standards, subject matter, and methodologies (no page number). He believed that traditional education as just described, was beyond the scope of young learners. Progressive education as described by Dewey should include socially engaging learning experiences that are developmentally appropriate for young children (Dewey, 1938). Dewey thought that effective education came primarily through social interactions and that the school setting should be considered a social institution (Flinders & Thornton, 2013). He considered education to be a “process of living and not a preparation for future living” (Flinders & Thornton, 2013: 35; Gutek, 2014). This set of beliefs set Dewey apart from philosophers that supported traditional classroom settings. In contrast to traditional classrooms, Dewey thought that schools and classrooms should be representative of real life situations, allowing children to participate in learning activities interchangeably and flexibly in a variety of social settings (Dewey, 1938; Gutek, 2014). He was of the idea that abruptly introducing too much academic content, out of context with children’s social lives, bordered on unethical teaching behavior (Flinders & Thornton, 2013). This notion would be a point of conflict in education today, as it is vastly different from what is happening in classrooms with the strong emphasis on implementing the Common Core standards. The strong focus on increasing academic achievement through the use of Common Core standards in today’s classrooms makes finding evidence of John Dewey’s philosophies in classrooms less common than it used to be (Theobald, 2009). Learner-centered educators believe that Dewey’s work is supportive of many of their beliefs about how students learn (Schiro, 2013). In learner-centered classrooms, one can see much of John Dewey’s social learning theory and educational beliefs in action. He viewed the

classroom as a social entity for children to learn and problem-solve together as a community. In these classrooms children are viewed as unique individuals; students can be found busy at work constructing their own knowledge through personal meaning, rather than teacher-imposed knowledge and teacher-directed activities (Schiro, 2013). Children will be seen learning-by doing in these classrooms and they will be solving problems through hands-on approaches. When teachers plan for instruction, student interests will be taken into consideration and curricular subjects will be integrated with an emphasis on project learning. The educational experience encompasses the intellectual, social, emotional, physical, and spiritual growth of the whole child, not just academic growth (Schiro, 2013).

3. Touch and Feel Sensory

"Neuroscience for Kids" is maintained by Eric H. Chudler, Ph.D. and was supported by a Science Education Partnership Award (R25 RR12312) from the National Center for Research Resources (NCRR). There are different types of "receptors" that are activated by different stimuli. When a receptor is activated, it triggers a series of nerve impulses. For a person to "feel" the stimulus, the nerve impulses must make their way up to brain. Try different parts of the body: the arm, leg, fingers, back, neck, head, hand, toes. Compare the distances required for a "I feel 2 points" response on different body regions. What part of the body is most sensitive?

- smooth (an apple)
- rough (sand paper; rock)
- cold (ice)
- warm (a sun-warmed piece of metal)
- sandpaper
- various grades
- Wood Blocks (optional)

The receptors in our skin are NOT distributed in a uniform way around our bodies. Some places, such as our fingers and lips, have more touch receptors than other parts of our body, such as our backs. That's one reason why we are more sensitive to touch on our fingers and face than on our backs.



Sand Paper Rankings



2-Point Discrimination

Figure 3 Stimulating the senses (Chudler, 2010)

Stimulating the senses sends signals to children's brains that help to strengthen neural pathways important for all types of learning. They develop their sense of touch, which lays the foundation for learning other skills, such as identifying objects by touch, and using fine-motor muscles. Discovering and differentiating these characteristics is a first step in classification an important part of preschoolers' science learning and discovery.

Touch is our oldest, most primitive and pervasive sense – it is the first sense to develop and respond stimulation in uterus (during 8 to 14 weeks of gestation)

- Touch is important in several domains of life across the life span, particularly in early life – touch helps us learn about the world around us – plays an integral role in biological, cognitive, and social development

3.1 Vision vs. touch simplified.

- vision more capable of providing geometric information & general picture
- touch more effective at providing material information & fine surface details

3.2 Different strategies for touching

- active touch (focus on the object properties)
- passive touch (focus on the sensation experienced) Mechanoreceptors have different spatial resolutions
- spatial resolution depends on location of the skin (i.e., what and how many receptors are found in the locus)

– the size of the receptive field depends on how deep in the skin the particular receptor type lies (i.e., the deeper receptor lies the larger is the receptive field) type I receptors have large receptive field (low spatial resolution); type II receptors have small receptive field (good resolution)

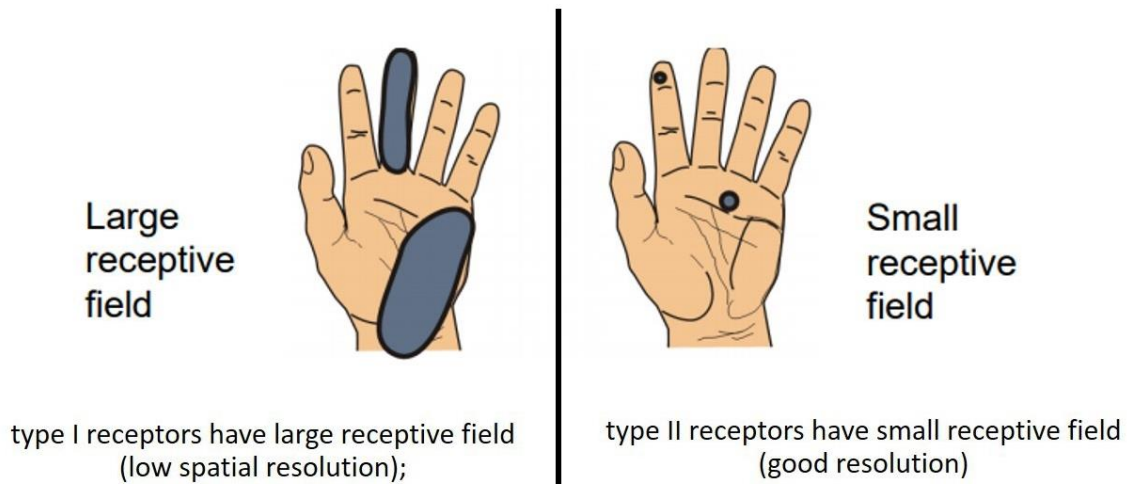


Figure 4 Type of receptor (Raisamo, 2009)

4. Design for kids

4.1 Creating inspiring places for play

The 10 principles underlying this design-led approach depend on all those involved being able to imagine a play space that children will seek out, enjoy and return to remembering their time there for years to come.

1. Play space designed to enhance its setting successful play spaces are designed to fit their surroundings and enhance the local environment, complementing attractive spaces and enhancing poorer environments. Early in the process, designers need to visit and survey the site to identify features that can be built into the design. Knowledge of the local area and its history will provide inspiration.

2. The best possible place are located carefully and away from dangerous roads, noise and pollution. No matter how well designed a play space is, in the wrong location it will be neither used nor usable. While children often enjoy feeling

as if they are away from adult oversight, there is a fine balance between a space that is pleasantly secluded and one that is remote and hidden away

3. Close to nature grassy mounds, planting, logs, and boulders can all help to make a more attractive and playable setting for equipment, and planting can also help attract birds and other wildlife to literally bring the play space alive. In densely populated urban areas with little or no natural or green space, this more natural approach can help soften the hard urban landscape, and it is also beneficial in rural areas where children can often have very limited access to natural features and materials.

4. Where children can play in different ways can be used in different ways by children and young people of different ages and interests; they can also be important social spaces for parents and careers, as well as for children. Fundamental to this concept is the idea of non-prescriptive play equipment and features, which put play in the control of children and encourage imagination and creativity.

5. Where disabled and non-disabled children play together offer enjoyable play experiences to disabled children and young people, and to those who are non-disabled, whilst accepting that not all elements of the play space can be accessible to everyone. Children with different abilities can play together in well designed play spaces, and parents and careers who are themselves disabled should be able to gain access to play spaces if they are to accompany their children. Though many play providers focus on equipment that is wheelchair-accessible, it is important to recognize that there are many different types of disability or special need. Non prescriptive equipment, which can be used flexibly—such as a ‘nest’ swing—might be interesting to large numbers of children with different needs and abilities.

6. Loved by the community the process of creating successful play spaces, that meet the needs of children and the communities they live in, will almost always need prospective users (and neighbors of the scheme) to articulate their concerns as well as their needs and aspirations. A successful community engagement process will help create a site that the community likes and which meets its needs.

7. Where children of all ages play together good play spaces avoid segregating children on the basis of age or ability, and are laid out so that equipment and features can be used by a wide range of children, even allowing different patterns of usage throughout the day or week.

8. Where children can stretch and challenge themselves in every way Children and young people need opportunities to experience challenge and excitement in their play.

9. Maintained for play value and environmental sustainability good play spaces are designed and constructed using recycled or sustainably sourced materials. Long-term maintenance and sustainability are also vitally important considerations in the design process, but in successful play spaces do not overshadow the scheme's play value and ability to meet the play needs of children and young people. Good play spaces are designed and constructed bearing in mind sustainability but they are not necessarily tidy, and bits of scrub or long grass, fallen leaves and twigs, may all provide additional play opportunities.

10. Evolves as the children grow Play spaces benefit from a process of ongoing change and refurbishment. This is especially important because children grow up and change fast whilst the fixed equipment in their local play space tends to stay the same. Building some 'slack space' into the layout – space with no predefined function – can help introduce potential for change and evolution. Play areas that have every corner defined, so there is nowhere for children to invent their own play activities, can become dull very quickly, especially as children get older.

4.2 Create a Clear Visual Ranking

Children in this age group (2-4 years) can't easily tell what the "important" parts of an interface are. They tend to click on just about everything to see what happens; it's all part of the game for them. So you'll want to create a strong visual separation between the elements that users can interact with and those they can't.

Table 3 Consideration for 2–4-year-olds (Gelman, 2014)

2–4-year-olds	This means that	You’ll want to
Focus on details instead of the “big picture.	They can’t distinguish main elements of an interface from the details.	Create a very clear visual distinction between interactive items and design extras.
Can rank items by only one characteristic at a time (i.e., color, shape, and so on).	They get overwhelmed when there are too many variables competing for their attention.	Pick a smallish set of easily identifiable elements (like colors) and use them consistently throughout your design.
Can only associate a single function with an item or object.	If an item expands or makes a sound on rollover, they’ll believe that’s the sole purpose of that item and won’t know to click on it.	Limit the behavior of your navigation elements to navigation (for example, don’t have them pop up or make noise)
Can only see items on a screen in two dimensions, not three.	Everything on a screen looks like it’s in a single, flat plane to them.	Make your foreground items much clearer and more detailed than stuff in the background.
Are just learning to think abstractly.	They are unable to understand icons and symbols that are second nature to adults.	Use icons that are highly representative of the task you’re trying to communicate.

Table 3 Consideration for 2–4-year-olds (Gelman, 2014)

2–4-year-olds	This means that	You'll want to
Use sound to identify items in their environment.	They get confused when different sounds have different meanings (for example, a police siren and an ambulance siren).	Make sure that every sound you use has a specific meaning and function.
Are starting to develop their own identity	They develop a sense of self at around age 2, complete with gender identity, which forms very early	Create a design that allows for gender identification without forcing kids down a specific gender path

5. Education and play

5.1 The Reality of Children's Play Throughout the Ages

Flood (2013) Throughout history, regardless of whether or not the great thinkers, educators and governments valued play, children played with whatever materials were available to them. When European settlers landed in America, Australia and New Zealand for the first time, the Native American, Aboriginal and Mori children all played games that are still recognisable to us today. The first settlers to land in America observed Native American children involved in make-believe games mimicking adult pursuits of hunting, fishing, planting and harvesting. They played football, shinny (similar to hockey), quoits (rings), hoop and spear, bounce-on-the-rock, kick-the-stick, tossing games and chasing. These children had the finest of 'playgrounds' with acres of fields, meadows, streams and woodlands in which to build and defend forts, make bows and arrows, and play tag and hiding games. The European settlers, who wished to escape the cramped and dirty cities of their homelands, readily adopted these new ways and allowed their children much more freedom to play. They also maintained many games from their homelands, e.g. singing games, kites, blind man's buff, hopscotch, cards and dice games. Manufactured toys were limited (except for the

children of the rich in Europe) and most were made from scraps of material, wood and metal, e.g. rag dolls. Play during this time (seventeenth and eighteenth centuries) was very gender focused. Many observers of children and their play patterns worry that as children receive more and more manufactured toys their natural curiosity and inventiveness has declined. Many toys nowadays require solitary indoor play. Video games are in abundance, where the game manufacturer essentially decides what the child does. Because of heightened awareness of 86 EARLY CHILDHOOD EDUCATION & PLAY health and safety issues, many children no longer play together on the streets or in nature. Most spend large amounts of time inside or in sterile playgrounds and parks. Many psychologists and educationists worry that this will impede children's coping and decision making skills.

5.2 Styles and Types of Play

Play can be classified in two ways:

1. Overall style

Structured play

Free play

2 Types of play

Imaginative

Construction

Creative

Physical

Structured Play Structured play is guided, planned and led by adults.

Structured play can be useful but there is a risk that if it is too adult-led children will lose interest. Offering the right amount of support is absolutely essential in providing for valuable structured play.

Free Play Free play is not adult-led. Adults provide equipment, materials and resources for free play, but they do not direct it in any way. Advocates of free play believe that children learn much more from this style of play than from structured play, since they are more motivated by having created it themselves. In free play, children direct and figure things out for themselves and it is believed that children gain deeper understanding of what they are doing as a result of this. Free play can

take place when children are on their own, in groups, in pairs or engaged in parallel play (i.e. where children play side-by-side but not with one another). In the past, much of children's play was free play. Children did not have many manufactured toys and they did not attend crèches and pre-schools with structured activities. Instead, they played with what happened to be available to them. It is a worry that nowadays so much of children's lives is structured and adult led. Some parents feel that they are in an ever-competitive environment, expecting their children to be making observable progress in pre-school. Practitioners should communicate to parents that process rather than product is of importance in the early years.

Imaginative play Imaginative play includes pretend, symbolic and fantasy play. It is sometimes referred to as role play

Pretend play In this type of play, children practice and gain understanding of aspects of daily life. Children play school, shop, hospital, house, post office, restaurant, farm, etc. The role of the adult in pretend play is to provide an array of clothing and props for children to use. Clothing and props do not have to be 'perfect': children should be encouraged to improvise and make use of what is available to them. Small-world toys such as Play mobil can be used for pretend play.

Fantasy Play Fantasy play is most common for children aged 3–8. During fantasy play children pretend to be something or someone that they cannot ever possibly be, e.g. Spiderman or Batman. This type of play should decrease as reasoning increases.

Symbolic Play With this type of play children use objects in their play, but they pretend that the objects are something else. Symbolic play can be merged with imaginary play, e.g. pretending leaves are salad ingredients. Symbolic play becomes imaginary play (as describe above) when several objects are used together. For example, children can use mud, grass, leaves and berries as 'food'; they can sit on concrete blocks and makeshift tables eating food off slate 'plates', with sticks and pieces of stone as 'knives and forks'.

Providing for Imaginative Play Parents and practitioners can provide dress-up clothes, including clothing from other cultures. Small-world toys and props can be used to recreate different scenes, e.g. house, shop, restaurant, post office, bank and school.

Construction Play Construction play can either use manufactured or non-manufactured materials. Manufactured construction materials include products such as Aerofix models, LEGO, Scalextric, K'nex and Geomag. Children can also engage in productive construction play with non-manufactured materials such as boxes, egg cartons, kitchen roll, tins, glue, sticky tape, pieces of wood, nails, elastic bands, cloth and safety pins. The possibilities are endless. With construction play, some children (particularly older children) will have an 'end product' in mind; but this is not the most important part of the process for them. With this type of play, the adult can provide resources and ideas about what might be constructed. However, it is important not to try to direct this type of play or else children hand over to the adult.

Providing for Construction Play Parents and practitioners can provide construction blocks, cardboard boxes, tape, paper plates, kitchen rolls and other 'junk' material that can be used for construction.

Creative Play Creative play encompasses activities such as art, craft, drawing, painting, music and dance. The important thing about creative play is to provide plenty of materials and equipment to allow it happen. Creative play can allow children to express emotion and indicate upset or distress. Adults should not make judgments on children's creative work, since children become anxious and fearful about creating things that are acceptable to adults.

Providing for Creative Play Children should have access to a wide range of creative materials, e.g. paint, brushes, sponges, play-dough, clay, collage materials, sand, crayons, markers, chalk, glitter, glue, etc.

Physical Play Physical play can take place indoors or outdoors and it can involve equipment such as wheeled toys, climbing frames, balls, skipping ropes. During physical play, children run, jump, balance, climb and crawl. Physical play is vital for children's health: it not only keeps them fit

5.3 Benefits of Play to Holistic Development

Physical Development: Wellbeing

Physical play, particularly rough and tumble, deep and loco motor play, promotes gross-motor skills. Children develop balance and increase co-ordination through practicing skills such as running, jumping, climbing, skipping, walking on tiptoe, hopping, pedaling, etc. Physical play also promotes health and wellbeing because it increases appetite and tires children so that they sleep well. Physical development also involves the development and refinement of fine motor skills; creative and construction play are both particularly beneficial in this area. Play with small-world toys as part of imaginative play can also be useful, since children need to refine their motor-skills to make toy figures and animals stand up, etc.

Intellectual Development: Exploring and Thinking

Through play children can explore and think about a wide range of concepts in a nonthreatening way. Play cannot be 'wrong' so children are much more likely to take risks with their learning when they are engaged in play. Children can begin to understand important mathematical concepts, such as number, matching, ordering, sorting, making and recognizing pattern, adding and subtracting, and measuring (weight, length, time, volume, capacity, shape and space). Through construction play, children can practise reasoning and problem-solving skills. Some types of play (e.g. role play) allow children to explore aspects of their real life (e.g. a visit to the hospital or dentist). This helps them to understand these events and helps them to process concerns or worries.

Language Development: Communicating

Virtually all types of play involve communication. Children negotiate their roles, talk about what they are doing and talk about their plans for what will happen next. During sociodramatic play children can learn new vocabulary (e.g. 'cash register' if playing shop). When playing games with rules, children have to explain rules to newcomers and verbally deal with situations when the game rules are broken. Adults can promote language development by suggesting new vocabulary while children are playing and labelling areas of the play environment.

Emotional Development: Identity and Belonging, and Communicating

Emotional development involves children learning to deal with their emotions (both negative and positive) in a healthy way. Emotional development also involves the promotion of a positive self-image and high self-esteem. Emotional development can be greatly enhanced through play. While at play children can try out new things in a non-threatening way. Play cannot be 'wrong' so children's efforts are always rewarding to them, thus boosting self-esteem and helping children to develop a positive self-image. Physical play, particularly rough and tumble, gives children a safe outlet for negative emotions, e.g. anger and frustration. Role play and pretend play can give children the opportunity to act out scenes from their lives that may perhaps be bothering them, thus giving the adult an insight into how the child is thinking and feeling. Games that require co-operation between children and games with rules teach children to control their emotions and to deal well with situations that are not going their way, e.g. if the rest of the group don't want to follow a particular idea, the child may have to accept the group's decision even though they do not agree with it. Some games have a winner, which means that there will be losers also. Games such as these help children to cope with competition and deal with defeat. These games are particularly important nowadays, since many children come from small families. They do not have to deal with competition very often and sometimes they find it hard to handle when it does arise. They are used to parents 'letting them win' and can get upset when this does not happen. Play environments should reflect the diverse nature of our society. Play opportunities should, insofar as possible, be available to all children in the setting. This is why it is very important that settings make provision for children with special needs, allowing them to fully participate in all play activities offered. Cultural diversity should also be reflected in the play environment, e.g. dress-up clothes and cooking utensils from different cultures. Gender is another important issue to consider. Both boys and girls should be encouraged to participate in all types of play. If one gender seems to be dominating a particular area of the setting, this should be discussed with the children and a workable solution found.

Social Development: Identity and Belonging, and Communicating

Social development basically involves the development of three related skills:

- 1) the ability to interact effectively with others
- 2) learning and understanding the norms of the society in which the child lives and
- 3) moral development. Play can be a very effective way for children to learn and perfect these skills.

Social play requires that children negotiate, take turns and follow rules. Creative play often requires children to share materials and equipment, thus teaching them to request things and wait for them if they are not immediately available. Accidents that happen during play (e.g. a child falling during physical play) require the other children to show empathy and to get help. Role play helps children to practice everyday skills: taking care of babies, making and serving meals, asking for food in a restaurant, asking for and paying for items in a shop, etc. Play can be used to teach children who have difficulties in one or more areas of social development. For example, if a child in a setting has a tendency to pull toys from other children and not wait their turn, the teacher could organize a cutting and pasting activity where children have to share scissors and glue pots. The teacher can deliberately have fewer scissors and glue pots than are needed and they can then role play as part of the activity, showing the children how to ask nicely for things and to politely wait until it is their turn. (Flood, 2013)

5.4 Children's play in natural environments.

Their irrepressible appetite for play propels children to explore and interact with the physical world around them. Natural environments are particularly attractive, inspiring and satisfying to children as settings that supremely meet their play needs and desires. Such natural areas, 'wild spaces', exist in an array of sizes, shapes, conditions and locations. Playful qualities of natural environments. Natural spaces are dynamic—constantly changing in space and time. No two natural environments are alike, and the appearance of individual wild spaces varies with ambient conditions and the time of day/year. Furthermore, the flexibility of natural environments, allows

children to fulfil their various instinctive play behaviors: digging, splashing, climbing, building, breaking, balancing. Natural elements and objects provide children with plentiful “loose parts” (Nicholson, 1971) that can be moved and manipulated through play, as well as materials that are bendy, breakable, sticky, edible, combustible etc.

- Accessible
- Inviting
- Stimulating
- Flexible
- Challenging
- Comfortable.

Children’s sense of wonder, Young children in particular have a natural capacity for deep and direct connections with nature, which may decrease to some extent in later years (Kaplan & Kaplan, 2002; Wilson, 2007). Such relationships are intuitive rather than cognitive and may not easily be articulated through rational language, but nevertheless have potentially huge implications. (Chawla, 2002)

Children’s sense of place, By carrying out playful environmental transactions in natural settings, such as den building, collecting objects and exploring routes, children are responding to evolutionary psychological desires to connect with place and natural landscapes (Herrwagen & Oriens, 2002).

Children’s field of free action,. Such constraints may be mediated in different ways:

- Physical access, management and design of outdoor spaces.
- Cultural, societal and community attitudes and proscriptions.
- Direct interventions by parents, play workers, teachers and other adults who interact with children.

Environmental ethics in children’s natural play, Positive encounters with nature are important for both the child and, in the long term, the natural world (Moore, Cosco, 2000). The onus therefore is on enabling children to experience free play in natural environments without anxiety or conflicting emotions. Practical approaches may involve using extensive natural areas where any localised damage will have the chance to recover naturally and/or resilient natural environments and features that

can withstand intensive play activities (Maudsley, 2005). The attitudes and actions of accompanying adults are also shown to be crucial in developing environmental attitudes (Chawla & Hart, 1995; Wilson, 2007).

Useful approaches for supporting children's natural play,

1. Help children gain access to nearby nature for everyday experiences.
2. Identify, maintain and help protect local wild spaces, rough ground, waste land and unmanaged vegetation (the 'unofficial countryside') as special childhood places that support invaluable unsupervised, unplanned outdoor play (Pyle, 2002; Moore & Cosco, 2000).

3. Help children experience extended periods of uninterrupted free play in natural environments, and be sensitive to the effects of adult interventions on children's play reverie. Through unhurried natural play, children may experience their own influential 'spots of time' (Chawla, 2002; Wilson, 2007).

4. Encourage natural scruffiness within children's play areas—let outdoor areas go and grow wild. Let the space reflect the changing nature of the seasons. For example: leaving areas of vegetation uncut, leaving grass trimmings, autumn leaves, 8 fallen branches etc., creating areas of bare earth for digging and playing with mud.

5. Where children's outdoor play environments are limited in diversity and complexity (eg sports fields), enhance natural affordances by adding transportable natural materials

6. Be prepared. Check the safety and play potential of natural sites in advance; encourage children to wear/bring old clothes and waterproofs; bring tools, equipment and resources that might enhance the play in that setting; learn skills and techniques (eg rope knots, plant identification) that could be drawn on through exploring the environment with children.

7. Cultivate a sense of wonder with children when outdoors. Share excitement and enthusiasm for encounters with nature and take time to talk with children about their experiences (positive and negative) in natural environments. Find opportunities for spending time in natural areas, and reconnecting with your own sense of wonder.

8. Increase children's field of free action by being advocates of outdoor play. Communicate with other adults in the community about the benefits of children's natural play, share examples of good professional practice for overcoming barriers and where appropriate challenge social restrictions and stand up for children's right to play outside (Gill, 2007).

6. Previous works and Global Research.

6.1 Tokyo Toy Museum

Is a museum for young children which is in the area of Kindergarten. Inside have a toy that is suitable for the development of children. As well as organizing many activities for children to learn, with most toys focusing on natural materials such as wood and fabric and there is also a classroom that allows children to participate in creative and craft activities.



Figure 5 Tokyo Toy Museum



Figure 6 Tokyo Toy Museum



Figure 7 Tokyo Toy Museum



Figure 8 Tokyo Toy Museum



Figure 9 Tokyo Toy Museum

6.2 Singapore Art Museum

Art museum Which has artists' exhibitions rotated throughout which the work in this exhibition very relevant to research and inspiring for design in which the works of all 3 artists are distinctive in terms of using the senses to capture and touch as a medium for awareness Each person will have different features, including the use of light, color and sound as well.



Hiromi Tango

(b. 1976, Japan)

Lizard Tail

2016, 2017

LED lights, textile, wire, photographs, video
Site-specific installation, dimensions variable
Collection of the Artist

Have you been in a difficult situation before? How did you deal with it?

From the harshest deserts to your kitchen counter, lizards survive in a wide variety of environments. Have you ever seen a lizard lose its tail? Some lizards are known to drop their tails when in danger to distract their predators while they make their escape. Lizards are tough and adaptable creatures, and they can always grow back their tails later. Wouldn't it be helpful if we could also heal ourselves after emerging from challenging situations?

Touch the lizard tails gently, don't let them fall off! How does that make you feel?

Artist's publication supported by Dr Patricia Jungler

Cr: Nantiya, 4 AUG 2017

Figure 10 Singapore Art Museum



Figure 11 Singapore Art Museum

Unchalee Anantawat
(b. 1982, Thailand)

Floating Mountain
2013, 2017
Paper mache, wood, fibreglass, resin, yarn, rope, acrylic paints on metal structure
Dimensions variable
Collection of the Artist

Have you imagined visiting another magical world before? What did it look like?

Even when asleep, there is a possibility of adventure. The artist Unchalee was inspired by a dream to create *Floating Mountain*, to share with others a glimpse of other magical worlds we have yet to explore. She believes that there must be worlds, other than this one, that are waiting to be discovered. What wonders await us in these lands? Perhaps it is only with the powers of our imagination that we will be able to visit them.

Try your hand at colouring in your own floating mountain that you wish to visit!



Figure 12 Singapore Art Museum

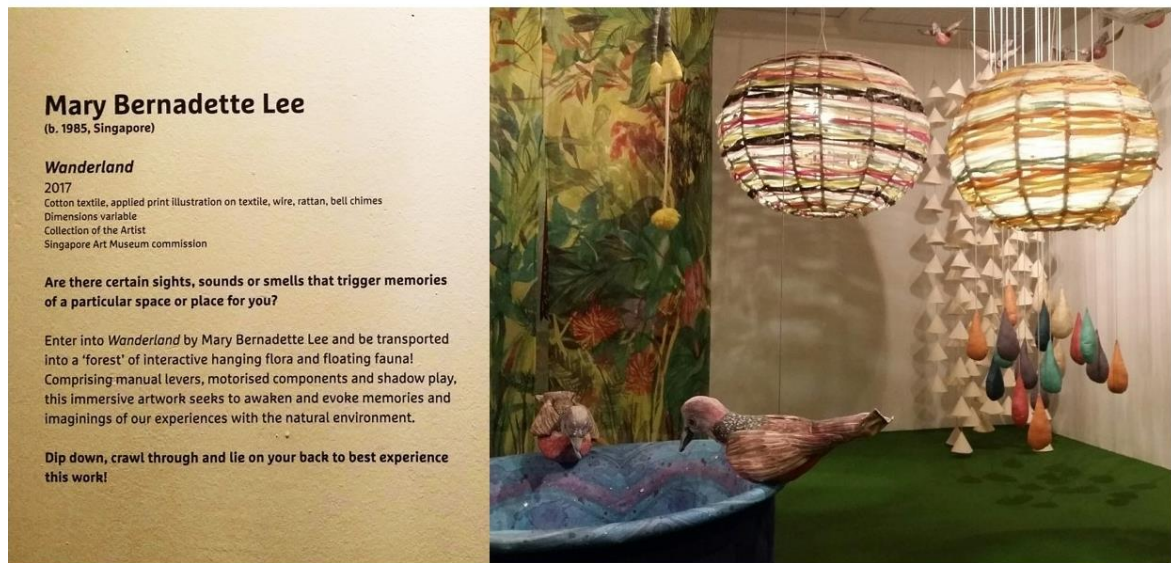


Figure 13 Singapore Art Museum

6.3 Sensory Playground

A playground that focuses on sensory stimulation in particular. In which the teacher will bring the children to play at this field before entering the classroom. In order to stimulate learning to keep children alert and in the field. Production uses common materials that are easy to find. But safe for children to use in production. The ground used for stimulating walking at each point will have different shallow depths so that the children must be careful in walking, running without carelessness and also helps to screen special children. This can be observed from walking. If a child does not step on a rough floor, avoiding or refusing to walk, it is possible that the child may have an abnormality. Parents will know and immediately take action to resolve.



Figure 14 Sensory Play Ground



Figure 15 Sensory Play Ground



Figure 16 Sensory Play Ground



Figure 17 Sensory Play Ground



Figure 18 Sensory Play Ground

7. Research

Marja-Leena Rönkkö and Juli-Anna Aerila (2015) *Children Designing a Soft Toy. An LCE model as an application of the experiential learning during the holistic craft process*. In a holistic craft process, the same person designs a visual and technical appearance, produces the design with craft materials and technologies, makes necessary changes to the design during its production and finally assesses the process and the finished product. Similarly, in the educational context, students should make craft products starting with the design process. These kinds of designing and hands-on activities nurture students' creativity and problem-solving skills and offer them an opportunity to test their ideas and see them realised. Testing and further developing

pedagogical approaches to holistic craft is important from the perspective of the renewal of the national core curriculum (2016) in Finland, which emphasises holistic approaches and the integration of different content areas. This study presents an experiential learning model of combining literature education, craft education and ethic-moral education. David Kolb's model of experiential learning gives a solid and systematic theoretical base for this LCE model (one combining Literature, Craft and Ethic-moral education). The teaching experiment is implemented as a craft process supported with first-grader children's literature and activities based on a story. It seems that children can derive benefit from literature and activities during craft making process. In addition, referencing literature enables the teacher to combine the craft process with multiple learning targets, fostering both ethical and content skills. We present the LCE model both in the light of an experiential learning model and the pragmatic implementations it gives rise to. According to our experiments, experiential learning can be meaningfully applied to the holistic craft process and craft education. Furthermore, the LCE model helps children to commit to holistic craft by nurturing a personal attachment.

Şule Atilgan (2013) *Toy as an object of prosumption and designer as a craft consumer*. Emerged late 1990's, defined as an artistic movement today, "urban toys or vinyl's, art toys" are evolving with do it yourself (DIY) projects and are contribute DIY culture. Likewise it fostered DIY networks. In this study, designer / art toys movement will be examined in the context of "craft consumer" and "prosumption". Thanks to Web2.0 provide proper medium, designer toys developed with DIY network activities and spread with sharing knowledge and experiences. This 21th century art – design movement bring new craft-designer out. This study aimed to analyse and categorize designer-art toys movement as part of new emerging manual labour; design, and modelling, illustrating and reproducing definite number of toys: small-scale urban production. Online-offline networked Do It Your Self activity as part of small production profiles and alternative manufacture and consumption forms will be examined. This article targeted two subjects: gathering and sharing knowledge from DIY networked data and propagating and marketing the product of that network. To define profile of

following object and the designer, 256 memberships is examined on sample social network Flickr; about country, age, and profession.

Persson (2013) *Exploring Textiles as Materials for Interaction Design*. As computational technology and new materials enter the world of textiles, our view on textile materials is challenged. Textile interaction design suggests a new design space in which the fields of textile design and interaction design are merged. This work contributes to the introduction of textiles as material for interaction design and focuses on spatial and temporal design of the dynamic elements of textiles – the elements that enable interaction. The result is various interactive textile material examples which are meant to inspire new expressional uses of textile materials thought of as slow, interacting hardware able to inhabit our everyday environments through responsive light, tactile connections, and informative decorations etc. Design experiments conducted within this thesis are framed by a research program, which is set up as an initial guideline to explore visual and tactile interactive properties of knitted textiles. Together with practical knowledge, the result is a theoretical framework that frames essential features of an interactive textile design where the defined design variables introduce a way to formulate what it is we design when we design for dynamic elements. By introducing notions such as the potential and precision of interaction, design variables relating to both physical and programming design are derived from the design of the dynamic elements of a material. A retrospective analysis of the experiments in relation to four acknowledged interaction design dimensions establish a link between the fields of interaction design and textile design. This work is based on the design experiments Electrical Burnouts, Costumes and Wall Hanging, Touching Loops, Designing with Heat, Functional Styling, Repetition and Stretching Loops, where the implemented structures are seen both as materials for further design and examples meant to provide inspiration in a more general sense.

Gielen (2009) *Essential concepts in Toy Design Education: Aimlessness, Empathy and Play Value*. The paper aims at contributing to the professional development of toy design education programs. It draws from the practice of a children's toy design course at Delft University of Technology. It identifies three major concepts that greatly influence toy quality and that students find difficult to

understand and apply: aimlessness, empathy and play value. The paper describes how these concepts are attended to in the educational format of the toy design course.

Aimlessness is a central element of play: the player is motivated for the activity by an interest in the process, not by a desire for a certain lasting outcome. This distinguishes toys from other products and toy design from general design. Students tend to look for 'problems' to be solved by using a toy rather than offering possibilities for interesting play processes. Within the Delft course, students are requested to discern between children's own objectives in play and those of parents and themselves as designers. Some creativity techniques are used that do not focus on finding solutions for problems but on exploring the solution space around ideas.

Empathy with children and their needs, wishes, preferences and skills does not come from books alone, neither does looking back at one's own youth provide a solid vision on play quality. Some tools and techniques for stimulating empathy with children are used in the course. The more obvious one is direct contact with children throughout the design process. Some other sources that enrich empathy are also discussed. Play value is a term used to describe the overall enjoyment of a child with a certain toy. It consists of a complex of factors such as complexity and challenge, appropriateness for the context, correspondence to the character of the child. It is very difficult to predict children's use of toys, but detailed assessment of the various factors contributing to play value does give indications of qualities and weaknesses in the design of the toy.

Tyler and Likova (2012) *The role of the visual arts in enhancing the learning process*. Visual art learning is reliant on a complex system of perceptual, higher cognitive, and motor functions, thus suggesting a shared neural substrate and strong potential for cross-cognitive transfer in learning and creativity. Within just a few weeks, for example, human infants can imitate an action such as sticking out the tongue in response to someone sticking out his tongue at them – how does the infant know just what motor action plans to implement based only on a visual input? Mirror neurons may account for this ability, translating visual input to motor output, underlying a connection between visual arts and movement, and the auditory arts and music. From pre-historical times, visual art has been a form of communication deeply imprinted in

human nature; the act of experiencing art and esthetic appreciation in the “receiver” also has the power of cross-cognitive effect any time during individual development. Compositional universals have been shown to govern the design of visual artworks across ages and cultures.



Chapter 3

Research Methodology

Research Methodology to carry out the research process. Researchers have studied the tools used to collect data. The following issues. To collect information, research tool consisted of the research process is divided into 3 phases according to the research objectives. Can be divided as follows.

1. Participant observation to collect data study and analyze the local hand weaving material and handicraft technique in North Eastern area.

1.1 To collect and analyze the local hand weaving material

1.2 To collect handicraft technique in North Eastern area.

2. Questionnaire is used to collect information from the manufacturers in the production process.

3. Non-participant behavior observation used to observe the preschooler reaction and play behavior with the play set.

4. Unstructured interviews used to query expert opinions on design of the play set.

Phase 1 Survey and Data Collection in Local production process and materials: Researchers has entered the storage area. The tools used in this step are participatory surveys and questionnaires.

- Participant observation used to collect data in textile surface at this stage, the researcher used participatory observation method to collaborate with local community to explore and collect the data of making surface process. There are various of methods available in the local community in the research area. Make a note and practice to create the surface from the local manufacturer in the community.

- Questionnaire is used to collect information from the manufacturers in the production process. The questionnaire was used. To ask the producers in the community for their opinions on each process. And the results of the production process. To be used as a design information.

Phase 2 non-participant observation on play Behavior and the development of preschool children: By starting to design basic toys. Then bring the set of toy to the children to play. Observe the playing behavior and unstructured interviews used to discuss with the experts and specialist about the playing behavior. The result of playing the toy and more for further improvement in the design process. For important information in the design process is the reaction of preschooler. The researcher therefore designed the initial toy set.

Phase 3 To develop textile surface for stimulate sensory perception of preschoolers and design a product for preschoolers from new textile surface: Summarize and collect all the results from the research tools used above. The results are synthesized to process for creating the right design for preschoolers by way of crafting in this research is the needle works. From concept to acquisition then put to test and experiment on the standard level to get a set of toys with quality crafts.



Research Methodology

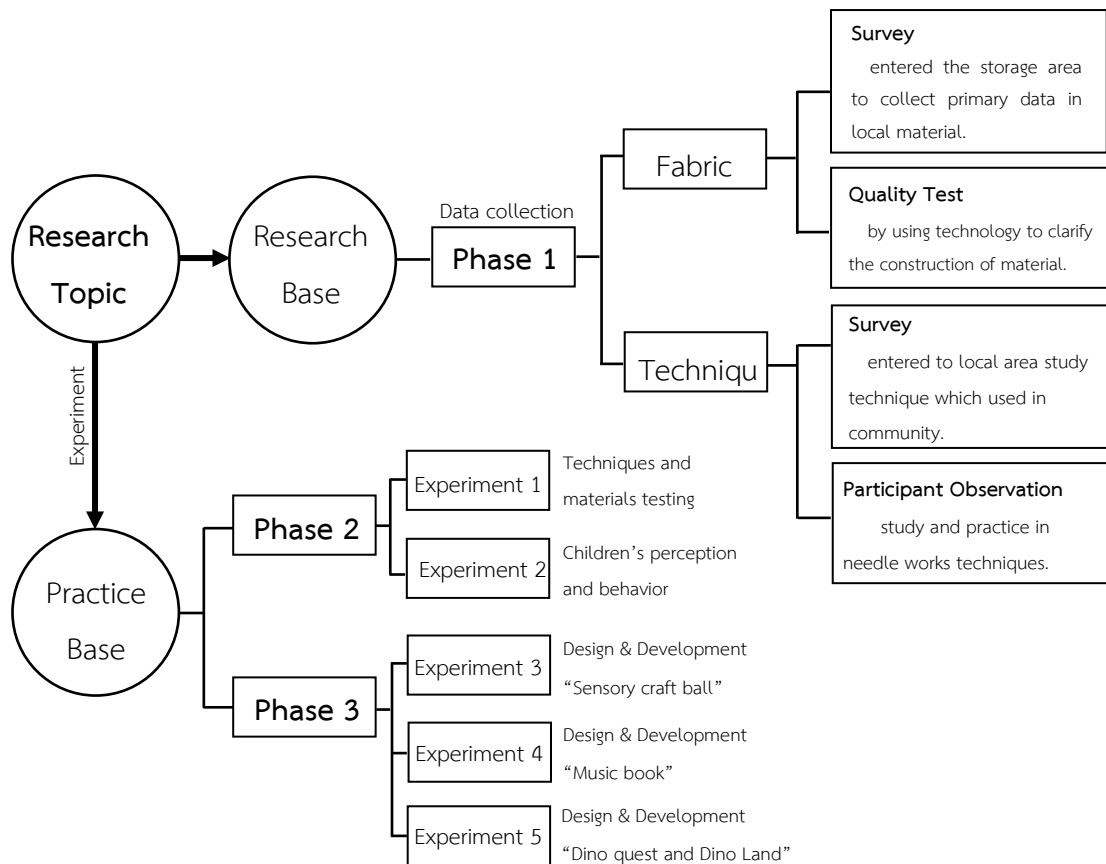


Diagram 2 Research Methodology

Phase 1 Survey and Data Collection in Local production process and materials: Researchers has entered the storage area. The tools used in this step are participatory surveys and questionnaires

Participant observation used to collect data in textile surface at this stage, the researcher used participatory observation method to collaborate with local community to explore and collect the data of making surface process. There are various of methods available in the local community in the research area. Make a note and practice to create the surface from the local manufacturer in the community. To know the scope of production capacity.

Hand woven fabrics which studied in this research area are from natural fibers including with Cotton, Hemp and Silk

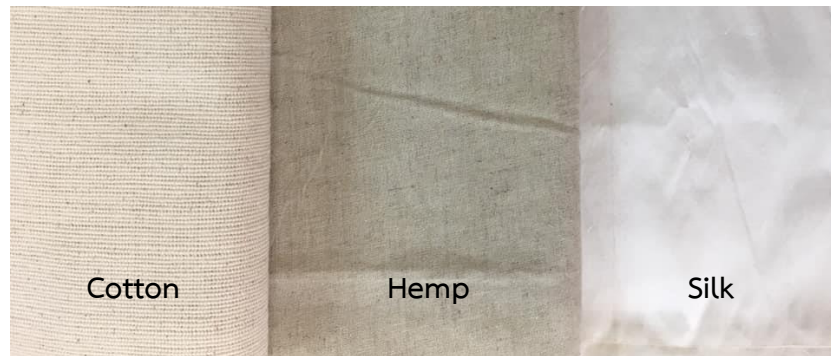


Figure 19 Natural Fabric including with Cotton, Hemp and Silk

These fabrics when observed with the eye visual will find that the fiber size and the weaving structure affects to the surface of the fabric after weaving. Found that the fabric with the most rough surface is cotton, hemp fabric and silk fabric has the smoothest surface. In order to provide in-depth information on the research, the researcher bring 3 types of hand-woven fabrics to study the structure at the fiber level to provide in-depth detail for further research studies by using Scanning Electron Microscope (SEM) Used in two main research areas: three-dimensional surface imaging and element analysis by sticking on the two conductive tapes on the liver Then to coat with gold or carbon to help the reflection of electrons

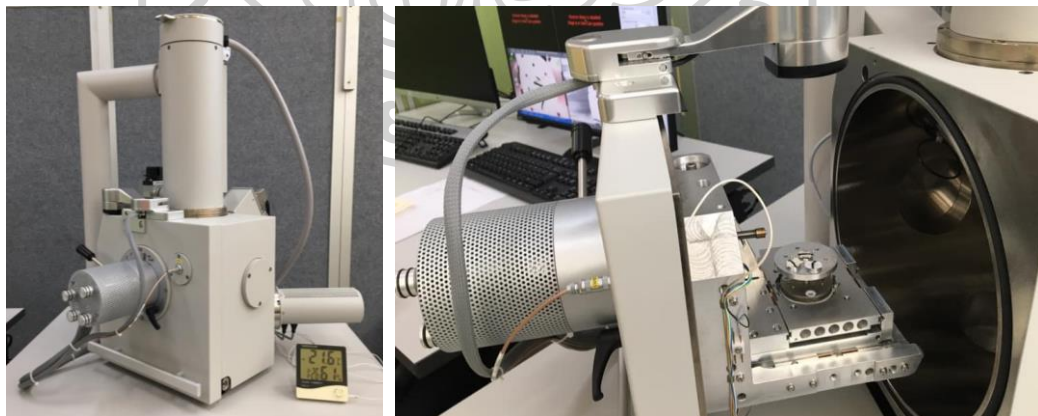


Figure 20 Scanning Electron Microscope (SEM)

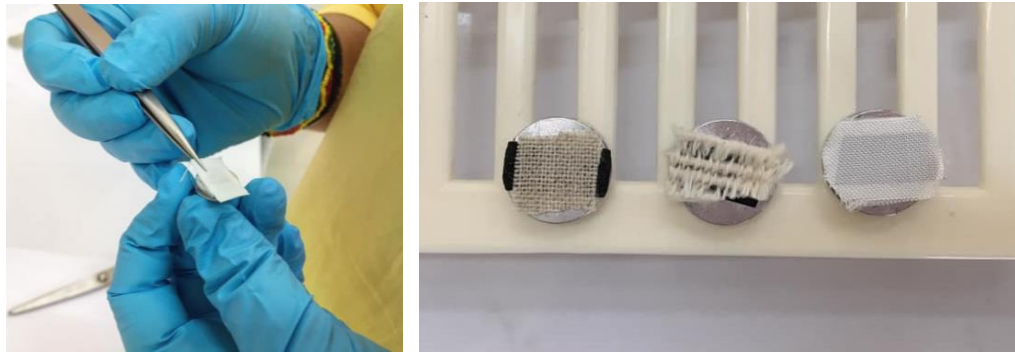


Figure 21 Sticking on the two conductive tapes

Benefit of knowing the structure of the woven In addition to creating different surfaces is air flow due to the size of the yarn and the space between yarn may cause of the air flow and it can be In the process of drying the fabric. When the fabric is fast drying or the accumulation of dust mites is less. Including carrying the color and washing, color fastness fade also results from the size of the fiber as well.

Table 4 Fiber size by Scanning Electron Microscope (SEM)


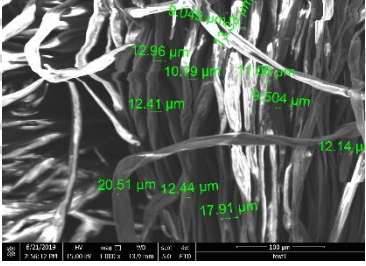

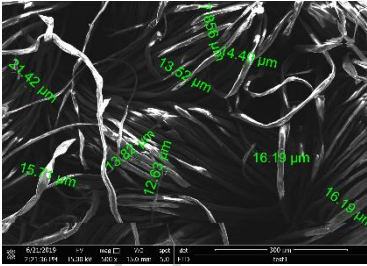

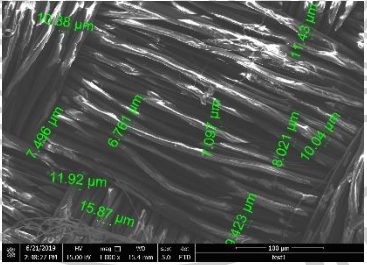
Type	Physical	Fiber size	Description
Cotton			The largest fiber cause of fabric has the best ventilation. The texture of fabric quite soft due to the structure of the yarn is big and soft. The space between fibers are large the accumulation of bacteria, dust and mites are rare due to the fiber size is large easy to wash the pigment out of the fiber.

Table 4 Fiber size by Scanning Electron Microscope (SEM)

Type	Physical	Fiber size	Description
Hemp			<p>The fiber size is medium good for ventilation. The texture of fabric quite rough due to the structure of the yarn is strong.</p> <p>There is a lot of space between fibers accumulation of bacteria, dust mites, is therefore rare.</p> <p>Good color absorption Color removal if frequent washing less than cotton fiber.</p>
Silk			<p>The smallest fiber ventilation is fair texture of fabric quite hard due to the structure of the yarn is tightly strong. The space between the fibers is rare may cause of accumulation of bacteria, dust and mites may more than above. Good color absorption color for removal if frequent washing less than cotton and hemp.</p>

When the type of fabric is obtained the researcher has dyed the fabric with the process of natural color. Color obtained from natural plant groups when dyed with cotton will give a soft color, not encouraging the child to be too alert according to the learning guidelines of Rudolph Steiner (1861-1925). The design of the environment is concerns warm colours, soft materials and rounded corners and is without plastic toys. Wooden blocks and simple natural materials are provided. Sewing materials and workbench with child-sized but working tools are available. The equipment is versatile; the storage containers can be used in a multitude of ways to stimulate children's imagination. (French, 2007) After getting the fabric that has passed the natural dyeing process. To want to know the quality of the fabric that has been obtained or the quality of the color fastness is used before being used as a toy set for preschool children. The researcher therefore tested rubbing test with standardized tools according to the principles of Thai industrial standard part 5 colour fastness to rubbing by this industry standard Set up based on ISO 105-X12: 2001 Textile-Tests for colour fastness-Part X12: Do;our fastness to rubbing , ISO 105-F09: 2009 Textile-Tests for colour fastness-Part F09: Specification or cotton rubbing test, ISO 105-X16: Textile-Tests for colour fastness-Part X16: Colour fastness to rubbing-small areas and ISO 139: 2005 Textiles-standard atmospheres for conditioning and testing.



Figure 22 Rubbing Tester

Preparation of test example pieces of fabric cut a test piece size at least. (50 x 140) millimeter 2 pieces for dry rubbing and 2 pieces for wet rubbing by using each pair of test pieces One piece cut the long side to the size with the thread standing The second piece cuts the long side parallel to the thread. Adjust the condition of the test piece and the standard abrasive cotton at the temperature. (20 ± 2) Celsius, relative humidity, percentage (65 ± 4) At least 4 hours by test pieces and standard cotton scrub each piece separately.

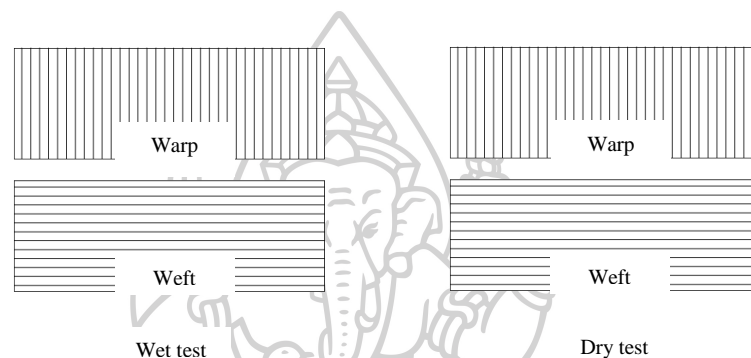


Figure 23 Rubbing Tester

The main test is samples are rubbed with a standard cotton scrub in dry and wet conditions. Scrubbing heads that use a cylindrical scourer with a diameter (16 ± 0.1) millimeter, with the abrasive head in a straight line periodically. (104 ± 3) Millimeters and with pressure (9 ± 0.2) Newton

Dry rubbing test

- Bringing standard abrasive cotton that has been adjusted To cover the scrubbing heads by giving the weaving line parallel to the movement of the scrubbing head And scrub back and forth at a rate of 1 cycle per 1 second in a straight line along the length on the dry test piece periodically (104 ± 3) millimeter with pressure (9 ± 0.2) newton. To rubbing go and back to 10 times (go 10 back 10)

- Remove the standard abrasive cotton from the machine and place it in the standard room. To adjust the condition and eliminate the fibers that are discharged from the sample while performing the test and stick to the abrasive cloth as it may affect the evaluation

Wet rubbing test

- Standardized cotton scouring scale Bring to wet the whole piece by dipping in distilled water and then weighing again let the fabric weight increase by 95% to 100% to scrub

- Remove the standard abrasive cotton from the machine. Dry and then placed in a controlled room To adjust the condition Eliminate the fibers that fall out of the sample while testing and stick to the abrasive cloth as it may affect the evaluation.

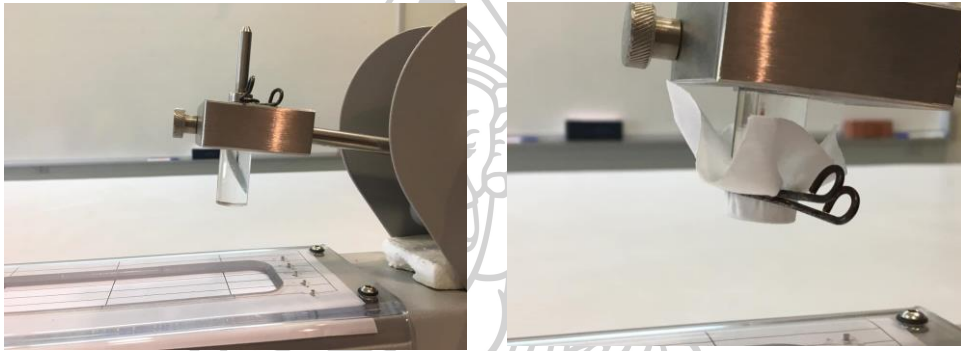


Figure 24 Preparation of scouring heads Ready for Rubbing Tester.



Figure 25 Place the cloth on the machine to prepare for rubbing.

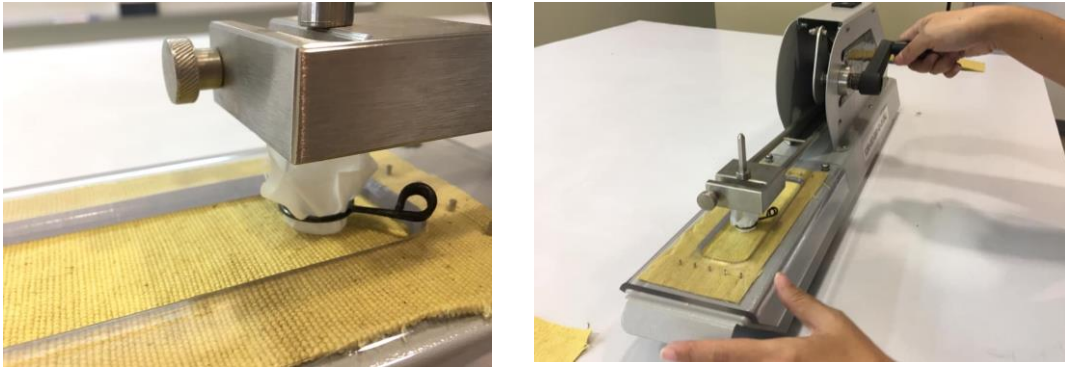


Figure 26 Start the rubbing test.

Reporting



Figure 27 Light cabinet used and grayscale sheet

Reading the value assessing change in color of the sample fabric that has been removed the color of the fabric more or less. By comparing the score from 5 there is no color disintegration from the fabric to 1 which has obvious color degradation. and assessing staining from comparing the gradient measurements from 5 is no color drop to 1 there is a lot of color fall by separating the color values individually. Start from the sample fabric group that is tested by dry form first. Read the color calibration values for both parts of weft yarn and warp yarn compare assessing change in color from the sample fabric and assessing staining that is on standard cotton and then record the results.

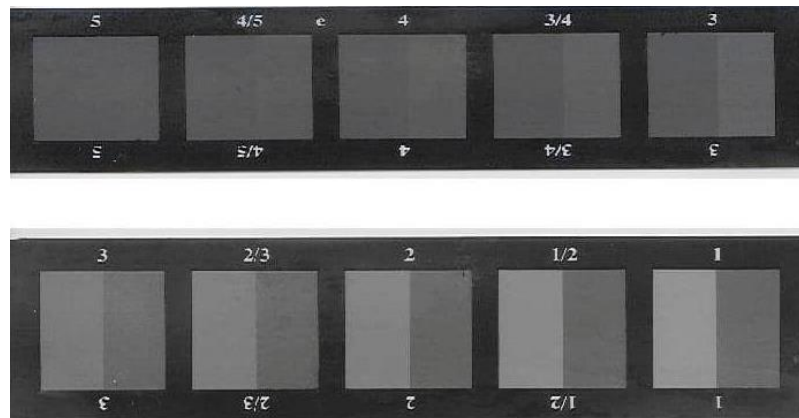


Figure 28 assessing change in color

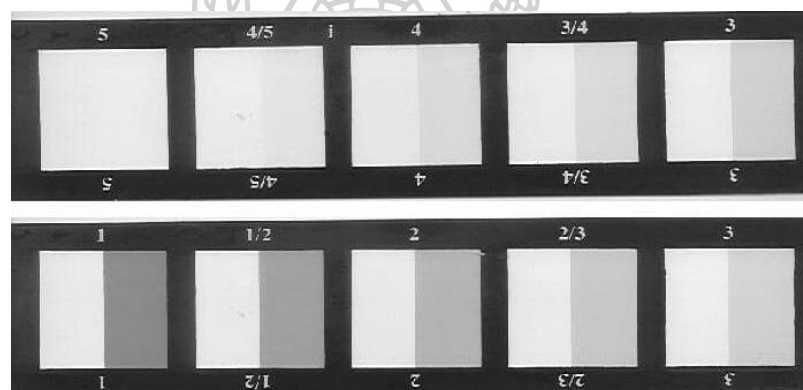


Figure 29 assessing staining

1.2 Questionnaire is used to collect information from the manufacturers in the production process after the production process. The questionnaire was used. To ask the producers in the community for their opinions on each process. And the results of the production process. To be used as a design information. Analysis of Qualitative data: The scoring of process and the texture of the surface in each techniques. (1) The process of textile surface production by Sewing, Crocheting and Weaving could be divided into three parts; the fluffy of the texture, making duration and the durability of textile. Rating by the 40 local producers in local manufacturer based on the scoring criteria with 5 rating scales (5 = Excellent, 4=Good, 3=Average, 2= Fair, 1= Poor)

Table 5 Table of content analysis of textile surface design by types and methods

Topic		Sewing Technique					Crocheting Technique					Weaving Technique				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1.	Fluffy															
2.	Making duration															
3.	Durability															

Phase 2 non-participant observation on play Behavior and the development of preschool children: By starting to design basic toys. Then bring to the children to play. Then observe the playing behavior and unstructured interviews used to discuss with the experts and specialist about the playing behavior. The result of playing the toy and more. For further improvement in the design process. For important information in the design process is the reaction of preschooler. The researcher therefore designed the initial toy set.



Figure 30 Function on sewing techniques



Figure 31 Function on Crosheting techniques.



Figure 32 Function on Crosheting technique.

Experiment 1: To know the production process the features of each production method or function that are hidden within each technique, such as sewing certain patterns that can increase the interior surface of that space In order to create different decorative textures If we learn to apply these methods to be useful in conjunction with the use of appropriate methods of play, each method that is suitable for the age, development of children in order to get fun toys. There are different ways of learning. And techniques that we have developed together to be a toy developed from local handicrafts.



Figure 33 The set of toys in experiment 2

Experiment 2: For this phase, there are 2 sets of experiments that the researcher has done. The first time, the researcher made 4 sets of basic toys. In order to conduct preliminary experiments with non-participant observation use questionnaires with parents And teachers about the appropriateness of toys under various topics before making toys for children have tried playing then observe and record the results together using this process with both sets of toys in the first set will focus on basic learning. Children 's perceptions that affect color, shape, shape, texture and how to respond to surfaces in different ways By observing the interest behavior when touching the toy for the first time, how to play, playing behavior while playing including playing time in each toy for the second set of toys that focus on awareness and the interest of the child towards the surface in various forms in particular can notice that the color tone used in the second set is all white to require the child to focus on the surface of each object and observe the playing behavior playing time and creativity in trickling play

Non-participant behavior observation used to observe the preschooler play. While designing toys based on the research process during the research period, Researcher bring designing toy to preschool to play. Researchers and experts Observed play behavior with not involved to let the preschooler play to be fully expressive and no time limit. To get the true behavior of the playing toy. In the beginning,

Two observing behaviors were observed at the Phranakhon Rajabhat University Demonstration School 11 preschoolers and the Sense Art Tutor 10 preschoolers. Recorded results and then summarized.

Children's perception by using questionnaires to ask the opinions of parents, experts and people who involved in viewing and preschool children by scoring rating scale with 5 rating scales (5 = Excellent, 4=Good, 3=Average, 2= Fair, 1= Poor) according to the following topics.

Table 6 Questionnaire for specialists and experts about children's perception.

No.	Topic	Rating Scale				
		1	2	3	4	5
1	Good for Children's perception : Support children in Touch and Feel perception.					
2	Appropriate Design : Appropriate for children to play.					
3	Color Attraction					
4	Appropriate Material : The material is suitable for children.					
5	Safety : Be safe When brought to play.					
6	Marketing Chanel : Interested in buying products.					

In addition, there is a behavior observation form of children while playing by the researcher observed with teachers, experts and parents then took notes according to the following topics. 1. First pick. 2. Playing Duration. 3. Playing Behavior. and 4. Color Attraction.

The design of this basic set of toys has a total of 4 sets in each set with different recognition purposes. The 1st set about the color of the object using a sphere produced by knitting into 4 basic knitting balls in order to observe the child's response

to what color will affect the most. The 2nd set focuses on the perception of shapes with different shapes then observe the behavior of the child towards the object fill out the information as specified above. The 3rd set touch surfaces In this set, the toy will be white. In order for children to focus more on the surface Decrease stimulation on the other side, let the children observe and choose to handle using different surfaces to determine the decision. And the 4th set is a combination of both touch and style Direct and indirect matters Active touch (focus on the object properties) and Passive (focus on the sensation experienced) (Raisamo & Raisamo, 2011)



Figure 34 The basic set of toy used to observe basic behavior

Phase 3 To develop textile surface for stimulate sensory perception of preschoolers and design a product for preschoolers from new textile surface:

Summarize and collect all the results from the research tools used above. The results are synthesized to process for creating the right design for preschoolers by way of crafting in this research is the needle works. From concept to acquisition then put to test and experiment on the standard level to get a set of toys with quality crafts.

Unstructured interviews used to query expert opinions on designed toys: Unstructured interview within the framework of the research. To ask the expert. Observing the behavior of preschoolers for reaction of preschooler with a proper play or not. How that set of toy can promote the development. Include suggestions that will be useful for further design.

Experiment 3: Children's behavior Which focuses on the response of Preschoolers that affect different textured toys In which to design this toy set Have used sensory perception guidelines By means of a craft that can be produced in the community of 2 sets produced by the knitting process.



Figure 35 Sensory craft ball

In that first set is the subject of active touch (focus on the object properties). Children can use their eyes to analyze Decide on picking up toys The appearance of the surface in various forms has an effect on the decision to choose the pick of the child, such as the surface has a circular pattern May give a feeling of being softer Or smooth surface Stimulate curiosity in picking over rough surfaces etc.

For Set B, it's about the focus on the sensation experience. The child will focus on the item after touching. This set of toys can also be included. Smooth surface balls on the inside, packed with different surfaces Players will not be able to separate with the naked eye. Until touching Therefore will learn that inside is what kind of object by using hands to touch and imagine, plus experiences that have been seen before the researcher has used the bell in conjunction with the sound effect, causing the stimulation of curiosity, wanting to touch and interest in the object even more. When choosing a smooth surface Children can choose the shell that will cover the ball at leisure. In this set, there are various surfaces to choose from, matching up to 3 pairs by inserting a rope through the hole of the shell. Then pull it together similar to dressing up a ball.

For the method of playing, all 2 sets are not played as fixed formats. Because the researcher wants to use the free play style play method that players can Create your own play according to your imagination. And playing leaders such as teachers or parents will design the playing guidelines or applying that toy together with teaching materials or other activities



Figure 36 Sensory craft ball

Once the toy set is finished before giving each toy to children There are descriptions of toys. And basic playing methods for teachers And assistants in child care After that Describe the various learning topics that need to be learned from the child's play behavior obtained from playing this set of toys for teachers. And teacher assistant To evaluate Each child follows the topics in the following table. By giving each side a score rating scale with 5 rating scales (5 = Excellent, 4=Good, 3=Average, 2= Fair, 1= Poor)

Table 7 Questionnaire for specialists and experts about children's behavior

No.	Topic	Rating Scale				
		1	2	3	4	5
1	Social Development					
2	Intellectual Development					
3	Physical Development					
4	Communication skills Development					
5	Creative Play Development					

Non-participant behavior observation used to observe the preschooler play. While designing toys based on the research process during the research period, Researcher bring designing toy to preschool to play. Researchers and experts Observed play behavior with not involved to let the preschooler play to be fully expressive and no time limit. To get the true behavior of the playing toy. In the beginning. Two observing behaviors were observed at the Phranakhon Rajabhat University Demonstration School 11 preschoolers and the Sense Art Tutor 10 preschoolers. Recorded results and then summarized.

Experiment 4 : It is a matter of applying to the method of play and learn other models including the size that affects the attractiveness of children In this experiment the researcher has designed various surfaces by using the concept of the music story as well, because the song story is widely used and well known focuses on the application of products to a variety of opportunities by selecting songs that are popular and recognized that parents, teachers and users will know that story as well as consulting with music experts about the suitability of the songs chosen for this experiment, the songs are: 1. Twinkle, Twinkle, Little Star, 2. Over the Rainbow and 3. Puff, the Magic Dragon. All 3 songs are songs from different eras, all styles are well known today by having consisting of a story book.



Figure 37 Design Inspiration (Fables for kids)



Figure 38 Design Inspiration (Fables for kids)

Experiment 5: This experiment Inspired by designs from dinosaurs Due to the northeastern part of Thailand Have excavated dinosaur remains in many provinces, a total of 9 species, some species are only in Thailand and is becoming popular with children today, there are museums, dinosaur learning centers for children to learn and learn. In this design the researcher has designed 2 sets of toys. The first set Inspired by Play Mat and Quiz Card games and dinosaur figurines found in Thailand. Set A = Dino Quest and set B = Dino Land. For dino quest there is a way to play is for children to open card then the parents read the instruction on the card for the children to find the answer on the large play mat using wire skeleton dinosaur create a pattern on the fabric using digital print and put different surfaces inside each skeleton this toy focus on exploration and support learning from observation with the story of passive touch and active touch.

Final Project “ Texture nosaurus” : Designed from the data which collect in each experimental develop and analyzing the playing behavior of children by observing from the inquiry of experts. Find interesting stories in the North – Eastern region of Thailand .The process of designing a dinosaur beginning with studies of various species characteristics and then starting to perform the image state. Reducing the details to the most basic shapes, easy to understand, not complicated because one part is to focus on the surface with details of each species



Figure 39 Texture nosaurus

In addition to the results of the observation the experiment also includes a questionnaire to the teacher who supervised the class while the children were playing this "Texture nosaurus" toy set. The assessment is divided into 5 topics according to the child development and overview of the toy set by giving a criteria with 5 rating scales (5 = Excellent, 4=Good, 3=Average, 2= Fair, 1= Poor)



Table 8 Questionnaire about child development.

No.	Topic	Score				
		5	4	3	2	1
1	<p>Physical Development</p> <p>: he ability of the body to balance and move (Gross Motor Development) for example, jumping (Fine Motor-Adaptive Development) Hand and eye coordination</p>					
2	<p>Cognitive Development</p> <p>: The ability to learn the relationships between things and oneself is a (mental processes) that we use to think, learn, find reason, solve problems and communicate. (Language Development)</p>					
3	<p>Emotional Development</p> <p>: Ability to express feelings and control the expression of emotions appropriately In various emotions such as smiling, crying, laughing, afraid, sad, sad, angry, including creating good feelings (self esteem)</p>					
4	<p>Social Development</p> <p>: The ability to create relationships with others Understand others (personal-social) Able to help themselves in daily life (self help, self care)</p>					
5	<p>An overview of the interesting sets of toy “Texture nosaurus”. From the handicraft process which is developed to be further developed into toys to promote development for preschool children aged 2-4 years</p>					

The researcher collect data and create an instrument after gathering methods of close surfacing in different techniques. Furthermore, the study issues beneficial to the designing were determined under approval from experts in relation with local products groups, production categorization, and practices with suggestions from the local knowledgeable persons. Finally, a questionnaire was created to collect local production information to realize potentials, advantages, drawbacks of each technique as well as its durability.

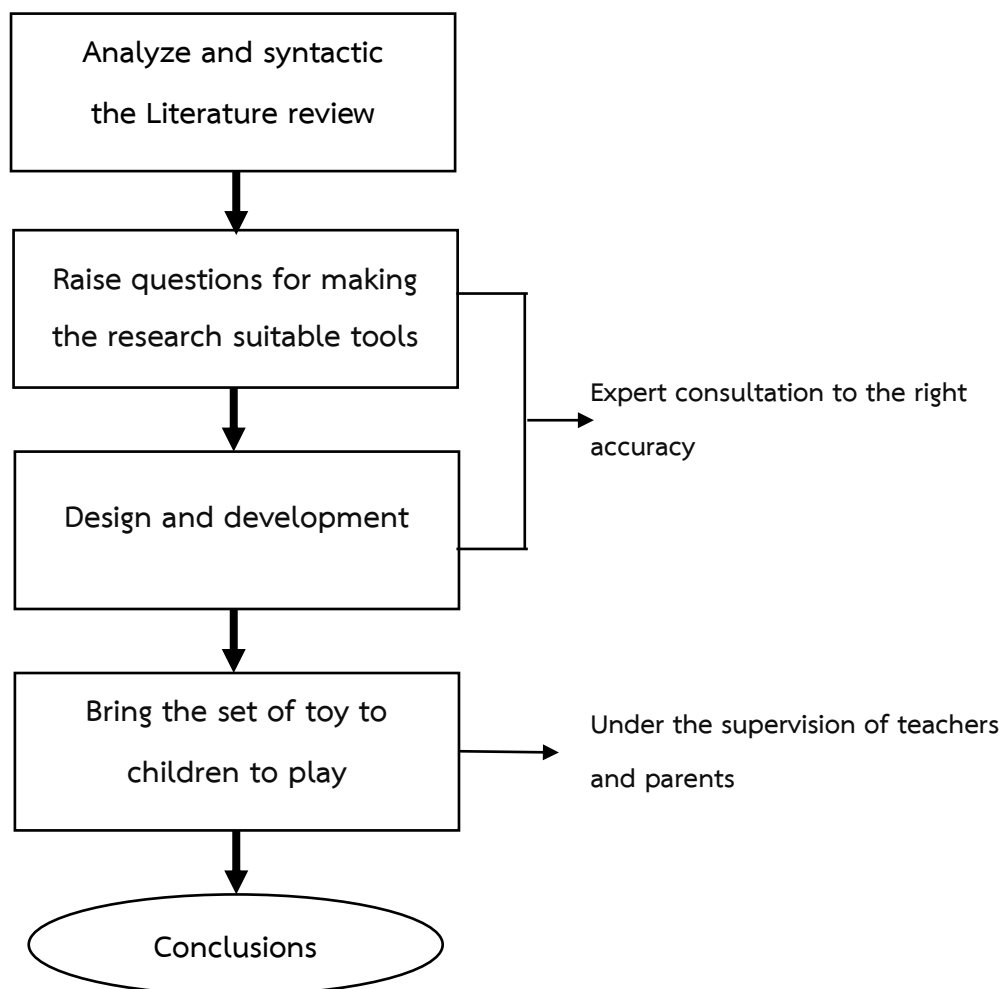


Diagram 3 Experiment process

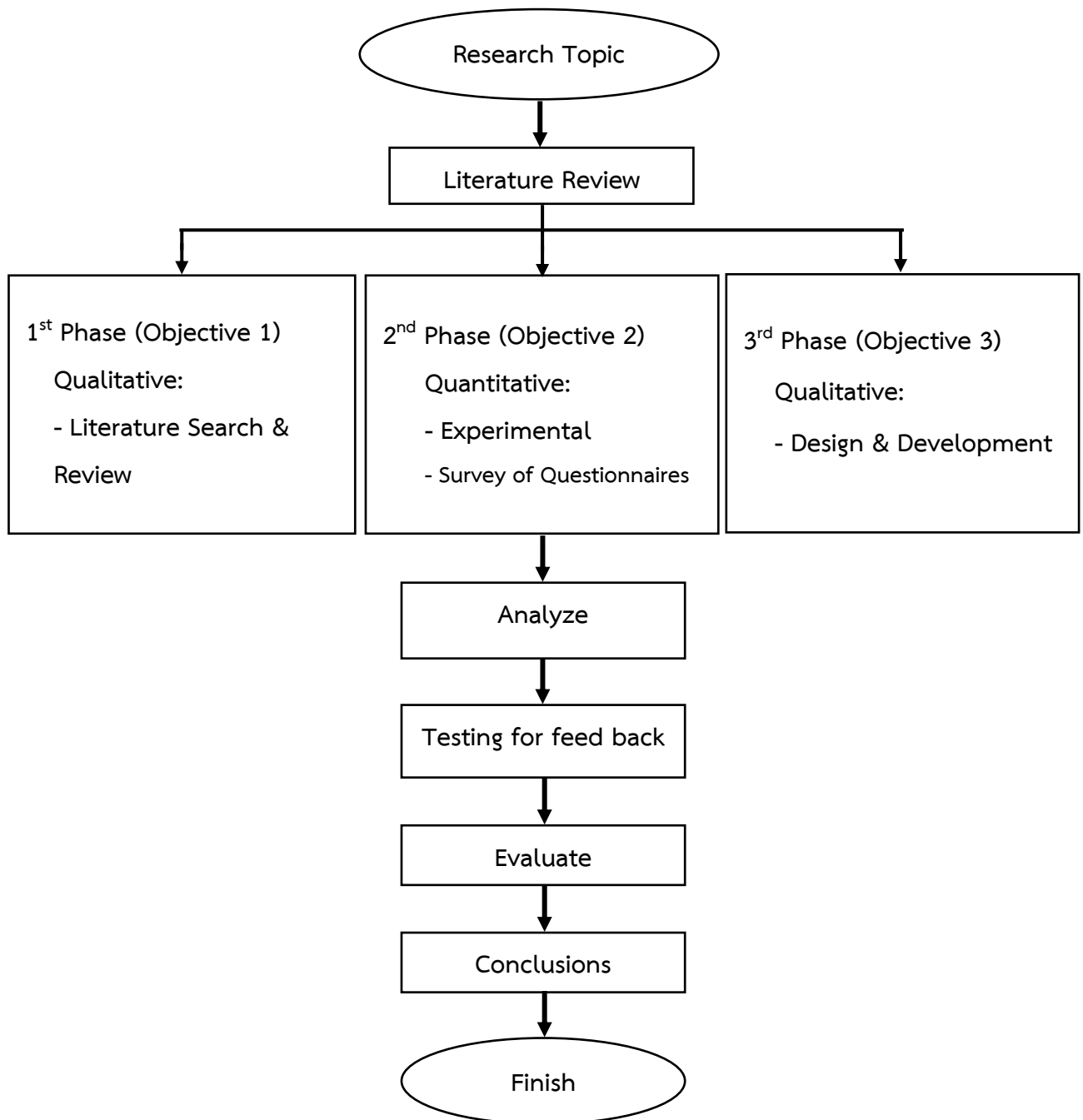


Diagram 4 Design research process

Chapter 4

Design Process

This part of research is a practice base in which the researcher has collected relevant data analyze, classify and synthesize into categories to conduct experiments on topics that need to be studied according to objectives under the implementation of the research methodology. Until it came out as a design step in the final process of this research which can summarize the results in the following steps

1. Experimental analysis
2. Design Development

1. Experimental analysis

From the study and experiment according to the research process previously, the researcher can summarize the results of each experiment as follows to compare the pros and cons each time and to develop the design in the next step.

Table 9 Analysis of each experiment.






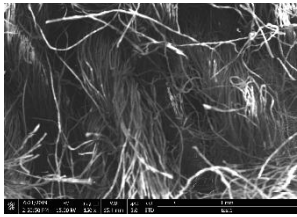
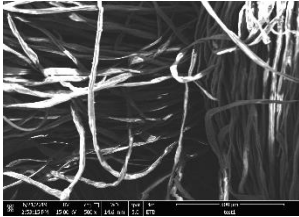
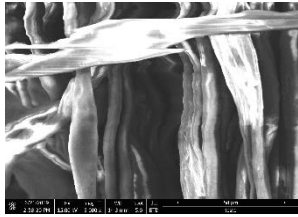
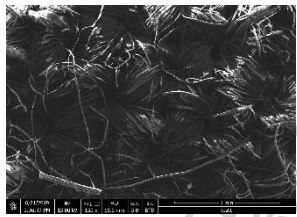
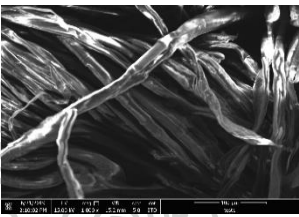
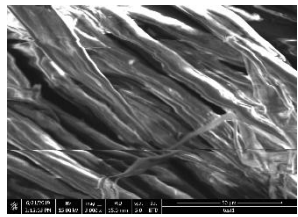
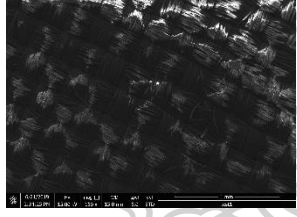
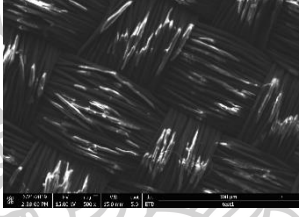
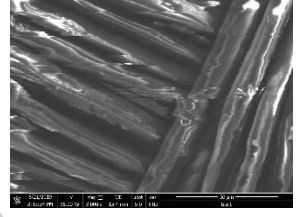
No.	Design	description	notice
1		Needle work techniques is good for making soft toy and can develop to lots of design with hidden function. (some technique)	Safe for children
2		Children 's perceptions that affect color, shape, shape, texture how to respond to surfaces toy for the first time, how to play, playing behavior	Matching the similar object.

Table 9 Analysis of each experiment.

3		<p>Combination of both touch and style Direct and indirect touch and Play style with free style and construction play with more attention span.</p>	<p>Free style play is feel free to play and create their own way to play.</p>
4		<p>Only children teacher, parent (user) who know or has experience with the fables can understand.</p>	<p>Too limit way in using this type of toy to play and adapt.</p>
5		<p>Good interaction with children in both texture and concept of design various way to play with creativity.</p>	<p>Simply shape and color with texture on surface make much more imagination.</p>

Results from using the Scanning Electron Microscope (SEM) is to know the depth structure and minerals found in natural woven fabrics. To know the structural characteristics fiber size arrangement which affects ventilation, if it is well ventilated and good air flow and comfortable while wearing. Accumulation of bacteria and dust mites are less than the fabric that is not well ventilated Including to the carrying of the color in the dyeing If the fibers are large the permeability of color pigment while dyeing will be well, but at the same time if there is a gap between the weaving structure Washing out the color is also very effective, resulting in fast fade color if there is frequent washing. Which these things used to have experiments by visual level in local community practice before. For this research The researcher has used innovation to help with testing. And analyze results Which can compare the results of the 3 types of fabric as follows.

Table 10 Fiber size by Scanning Electron Microscope (SEM)

Type	Magnification 500x	Magnification 1,000x	Magnification 3,000x
Cotton			
Hemp			
Silk			

From the table can explain that: Cotton is the largest fiber cause of fabric has the best ventilation. The texture of fabric quite soft due to the structure of the yarn is big and soft. The space between the fibers is large. The accumulation of bacteria, dust and mites are rare due to the fiber size is large easy to wash the pigment out of the fiber. The fiber of the Hemp is medium. Good for ventilation. The texture of fabric quite rough due to the structure of the yarn is strong. There is a lot of space between the fibers. The accumulation of bacteria, dust mites, is therefore rare. Good color absorption Color removal if frequent washing less than cotton fiber. And the last is Silk the smallest fiber for the ventilation is fair. Texture of fabric quite hard due to the structure of the yarn is tightly strong. The space between the fibers is rare may cause of the accumulation of bacteria, dust and mites may more than above. Good color absorption color for removal if frequent washing less than cotton and hemp. So, in this research The researchers chose to use cotton in creative work because it is the best in ventilation. Suitable for production as a toy for preschoolers as well, and also

has a texture that is interested, larger than other fibers, has a large fiber size. And have different volumes in each line resulting in different skin types, responding to research needs to create toys with a variety of texture types because these contact surfaces affect children's learning development in terms of sensory aspects In touching various surfaces, encouraging learning and imagination.

Evaluate the level of stain by using gray scale. Separate readings, classified by type of test is applied wet or dry, put cotton pieces and sample pieces in the light cabinet with lights D65 Daylight In the dark room, reading the values will have 2 types: assessing change in colour and assessing staining. After reading the value by comparing from the gray scale to make it easier to present results and understand to read more points can present the results according to the table as follows.

Table 11 Assessing change in colour and Assessing staining for Dry test

Dry test				
Color code	Weft yarn		Warp yarn	
	Assessing Change in colour	Assessing staining	Assessing Change in colour	Assessing staining
YE01	5	4	5	4/5
YE02	5	4	5	4
YE03	5	3/4	4/5	3/4
PI01	5	4/5	5	4/5
PI02	5	3/4	5	3/4
GR01	5	2/3	5	2/3
BL01	4	2	3/4	2

The results of assessing change in colour of the sample fabric that has been removed of the fabric more or less by comparing the score from 5 there is no disintegration of color from fabric to 1 there is obvious color disruption and assessing staining from comparing the gradient measurements from 5 is no color drop to 1 is a lot

of color fall Will find that the dry test assessing change in colour quite a few but assessing staining be a lot especially in the dark color which is the blue color with the fall on the most white fabric the score is 2.

Table 12 Assessing change in colour and Assessing staining for Dry test

Wet test				
Color code	Weft yarn		Warp yarn	
	Assessing Change in colour	Assessing staining	Assessing Change in colour	Assessing staining
YE01	5	4	5	4
YE02	4/5	4	4/5	4
YE03	4/5	2	4	2
PI01	5	4/5	4/5	4
PI02	4/5	3	5	3
GR01	4	2	3/4	2
BL01	4	1	3	1



Figure 40 Bring the results to be dry prepare to read results

Results of assessing change in colour of the sample fabric that has been removed the color of the fabric more or less by comparing the score from 5 is no color disintegration from the fabric to 1 which has obvious color degradation. and assessing staining by comparing the gradient value from 5 the loss of color is much more than 1 which is the very color of the fall found that the wet test with a score of each side less than the dry test especially in the dark color groups, such as green and blue, with obvious color shedding from the sample fabric can compare the score 3 for blue abrasive cloth piece along the warp yarn and the color drop is the highest. The score is 1 that means fabric dyed with natural colors there is a lot of color disruption when tested with abrasion, which can be solved by boiling the color with the fabric for longer time and washing the fabric until the wash water looks clean and clear will help reduce the faded of color.

Questionnaire is used to collect information from the manufacturers in the production process after the production process. The questionnaire was used. To ask the producers in the community for their opinions on each process. And the results of the production process. To be used as a design information. Analysis of Qualitative data: The scoring of process and the texture of the surface in each techniques. The process of textile surface production by Sewing, Crocheting and Weaving could be divided into three parts; the fluffy of the texture, making duration and the durability of textile. Rating by the 40 local producers in local manufacturer based on the scoring criteria with 5 rating scales (5 = Excellent, 4=Good, 3=Average, 2= Fair, 1= Poor)

Table 13 Table of content analysis of textile surface design by types and methods

Topic		Sewing Technique					Crocheting Technique					Weaving Technique				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1.	Fluffy			●							●		●			
2.	Making duration			●						●						●
3.	Durability			●						●						●

The finding result focusing on the design process of textile surface were as follow; for the softest and fluffiest textile surface was found on crocheting, sewing, and weaving respectively. The making duration was found that crocheting spent the shortest duration while sewing spent the longest duration. For durability, the most durable technique was from weaving, crocheting and sewing, respectively. On the children's sensory perception observation after playing a set of toy, it was found that preschool children were interested in textile surface of craft toys differently. They preferred volume surface than flat surface, while fluffy surface let them felt safe, and sound craft toys attract children's attention very well.

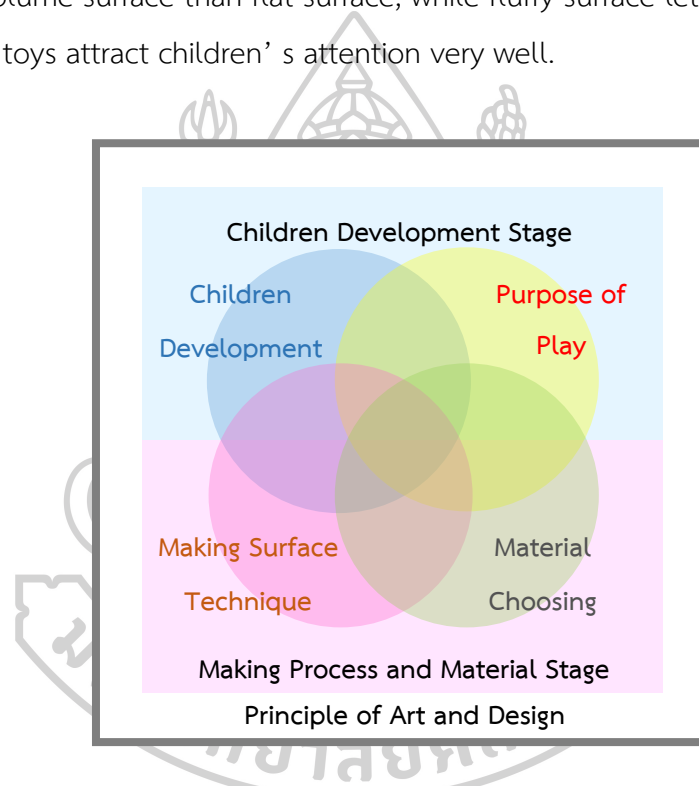


Diagram 5 Model Principle of Craft Toy Design

The concept of Apply Surface Design to Touch and Feel Stimulation Toy, consists of 2 main stages. The first one is “Children Development Stage” including with children development by age both physical and cognitive learning merged with beneficial purpose of play that children will get and how the toy can promote their touch and feel perception. Second is “Making Process and Material Stage” this stage is also important, it concerns on techniques and materials that designer choose. It must be suitable for the first stage as above. Techniques and Materials should not be complicated in term of industrial process. It refers to time and cost that would be spent in the production line. And all of these must should be aware of the safety and remind the principle of art and design should be in every steps of designing.

The data was analyzed in each process, especially; the appropriate techniques to use in craft toy design process. Designers have to understand the behavior development of children and purpose of playing each piece of toy. Designers should choose the appropriate technique and materials. The design principles must be taken into consideration under safety conditions as well. Based on the synthesis of all the above information, it can be concluded that the application of textured surfaces, it must have well understanding on the production process and choose the right materials. Management of scrap should be consider to reduce the cost of materials. So the designer have to understand the behavior of each period of children development correctly and clear purpose of play. It will be able to design the suitable toys and the play process that will match with the requirements of the play. Moreover, safety must be taken at all stages of production in order to get the complete handicraft and high quality of products to enhance the value of handicraft in the community.

In addition to the table for an overall understanding of each previous experiment the research results are summarized as pictures came out as follows.

Design & Experimental | Phase 1 Survey and Data Collection in Local production process and materials
 : Researchers have entered the storage area. The tools used in this step are participatory surveys and questionnaires.

Technique & Material
 Surface making by Needle work technique in local handicraft communities.

Their original work



Natural material in local area

Participant observation to collect data in textile surface at this stage to collaborate in each province. To explore and collect the data of making surface process.
 Make a note and practice to create the surface to understand the scope of the production capacity.

Design and Development



the scope of production capacity.

Figure 41 The analysis of experiment 1



Figure 42 Development of Sewing techniques

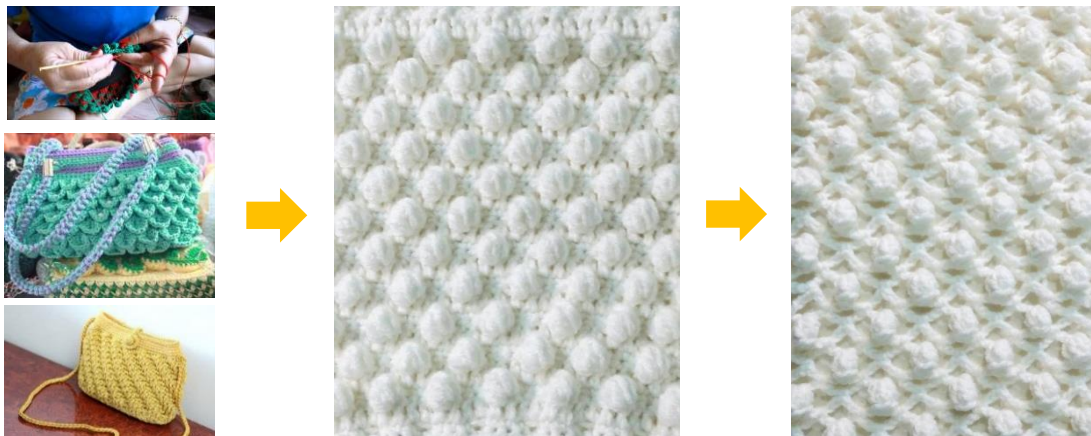


Figure 43 Development of Crosheting techniques



Figure 44 Function on sewing techniques

Experiment 1: After learning the production process the features of each production method Will also be able to learn certain features that are hidden within each technique, such as sewing certain patterns that can increase the interior surface of that space In order to create different decorative textures If we learn to apply these methods To be useful in conjunction with the use of appropriate methods of play, each method that is suitable for the age, development of children in order to get fun toys. There are different ways of learning. And techniques that we have developed together to be a toy developed from local handicrafts



Figure 45 The analysis of experiment 2

The results of the questionnaire by asking the opinions of parents, experts, and people involved in viewing and preschool children by rating the rating scale as follows.



Figure 46 Set 1: Children's Perception: Color

Set 1: Children's Perception: Color this consists of a knitted with in 4 colors using the basic colors of 3 colors: red, yellow, blue, green and observe basic behavior towards color stimulation or attract attention from children values obtained from experts the results according to the topic is Good for Children's perception = 4.33, Appropriate Design = 4.16, Color Attraction = 4.66, Appropriate Material = 4.66, Safety

= 4.86 and Marketing Chanel = 4.00 the average summary of all 6 aspects to this set of toys is 4.46 and results from observing with non-participatory behavior while giving this set of toys to children. Play at leisure Under the close supervision of experts And mentor can summarize results according to the topic as follows .First pick is red ball, Playing Duration take time to play with this set of toy average about 10-15 minutes, Playing Behavior observed is a roll-to-play game, to send the ball together and throw the ball in the age group 3 and above and Color Attraction the attention of children from the color chosen at a good level.



Figure 47 Set 2: Children's Perception: Shape

Set 2: Children's Perception: Shape this set consists of 3 basic geometric shapes, including shapes, equilateral triangle, circle shape and square shape. In order to know which shapes affect the perception And attract the most attention By the score obtained from experts Get results according to the topic is Good for Children's perception = 4.33, Appropriate Design = 4.50, Color Attraction = 4.50, Appropriate Material = 4.33, Safety = 4.66 and Marketing Chanel = 4.66 the average summary of all 6 aspects to this set of toys is 4.49 and the results from observing by non-participatory behavior while giving set of toys for children. Play at leisure Under the close supervision of experts And mentor Can summarize results according to the topic as follows First pick is triangles shape, Playing Duration Take time to play with this toy. Average about 3-5 minutes, Playing Behavior Which can be observed is squeeze and crumpled objects and throwing the ball in the group of children aged 3 years and over and Color Attraction Attracting the attention of children from the color chosen At a good level.



Figure 48 Set 3: Children's Perception: Texture

Set 3: Children's Perception: Texture in this set, it consists of a knitting ball and sheets with different surfaces with a different method of creation consisting of sewing and knitting technique used to create the surface the color used in this set is white to require children to focus on the issues of touching different surfaces rather than being stimulated using various colors by the score obtained from experts Get results according to the topic is Good for Children's perception = 4.66, Appropriate Design = 4.16, Color Attraction = 4.00, Appropriate Material = 4.50, Safety = 4.66 and Marketing Chanel = 4.16 the average summary of all 6 aspects of this set is 4.35 and results from observing non-participatory behavior while giving set of toys for children to play at leisure under the close supervision of experts and mentor can summarize results according to the topic as follows First pick is the surface created by the knitting method from the yarn, Playing Duration take time to play with this set of toy average estimated at 3-5 minutes, Playing Behavior the observation is that the digging in the surface of various objects and the matching of objects with similar surfaces. Which is an object that has the same production process and Color attraction is attracting the attention of children from the color chosen is at a fair level because the whole set of toys is white. Therefore do not have a variety of colors to attract or arouse interest when compared to other toys.

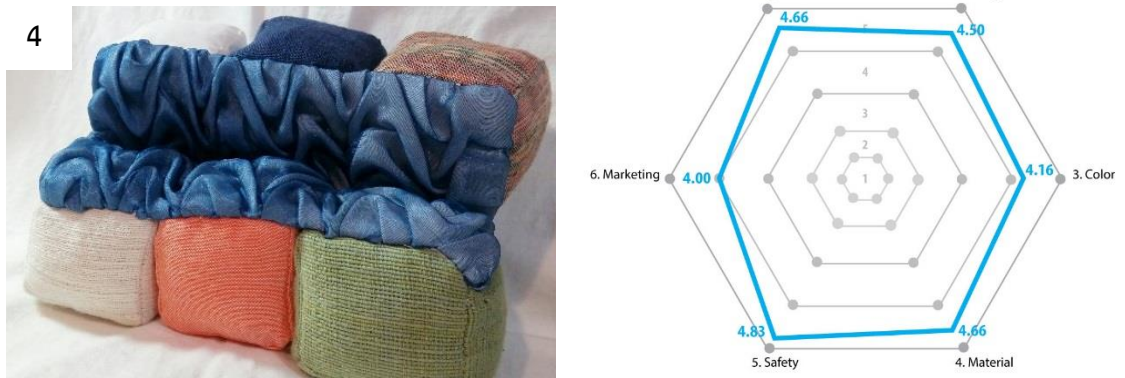


Figure 49 Set 4: Children's Perception: Perception

Table 14 Total score for experiment 2

No.	Topic	Set of toy				Total
		1	2	3	4	
1	Good for children's perception: Support children in Touch and feel perception.	4.33	4.33	4.66	4.66	4.49
2	Appropriate Design: Appropriate for children to play.	4.16	4.50	4.16	4.50	4.33
3	Color Attraction	4.83	4.50	4.00	4.16	4.37
4	Appropriate Material: The material is suitable for children.	4.66	4.33	4.50	4.66	4.53
5	Safety: Be safe When brought to play.	4.83	4.66	4.66	4.83	4.74
6	Marketing Channel: Interested in buying products.	4.00	4.66	4.16	4.00	4.20
Total		4.46	4.49	4.35	4.46	4.44

Total average score in this experiment including with children's perception is good = 4.49, appropriate design = 4.33, color attraction = 4.37, appropriate material = 4.53, safety = 4.74 and marketing channel = 4.20 the average sum of all 6 aspects of this set of toys is 4.44. The summarize of average score shown that maximum score is 4.74 which in point of safety can say that this making process and techniques are acceptable from parents, teachers and guardian in term of safety toy for their children.



Figure 50 The analysis of experiment 3

For this set of toys Set A the first group is 11 children aged 2-4 years. the Phranakhon Rajabhat University Demonstration School assessment results based on various topics of the first group of children with toys A is Social Development get the average score equal to 5, Intellectual Development get the average score equal to 3, Physical Development get the average score equal to 4, Communication skills Development average score is 3 and Creative Play Development The average score is 3, the total average score of the first group of children obtained from playing this set of toys. With the sum equal to 3.6 which is in good rate.

The second group is the age group of children. 2-4 years 10 people at the Sense Art Tutor evaluation results based on various topics of the second group of children with toys A is Social Development get the average score equal to 5, Intellectual Development Get the average score equal to 3, Physical Development average score equal 3, Communication skills Development average score equal to 3 and Creative Play Development average score 3 The overall average score of the first group of children obtained from playing this set of toys With a total of 3.4 which is in the good criteria.



Figure 51 The results of the scores

For the set of toys Set B The first group is the age group of children. 2-4 years with 11 pre school at the Phranakhon Rajabhat University Demonstration School Assessment results based on various topics of the first group of children with toys B is social development get the average score equal to 3, Intellectual Development the average score equal to 3, Physical Development the average score equal to 3, Communication skills Development the average score equal to 3 and Creative Play Development the average score equal to 3 The overall average score of the first group of children obtained from playing this set of toys with the sum equal to 3 which is in the medium

The second group is the age group of children. 2-4 years with 10 pre schoolers at the Sense Art Tutor evaluation results based on various topics of the second group of children with toys B are Social Development the average score equal 4, Intellectual Development the average score equal 5, Physical Development the

average score equal 3, Communication skills Development the average score equal 4 and Creative Play Development the average score equal 4 the overall average score of the first group of children obtained from playing this set of toys With the sum equal to 4 which is good.

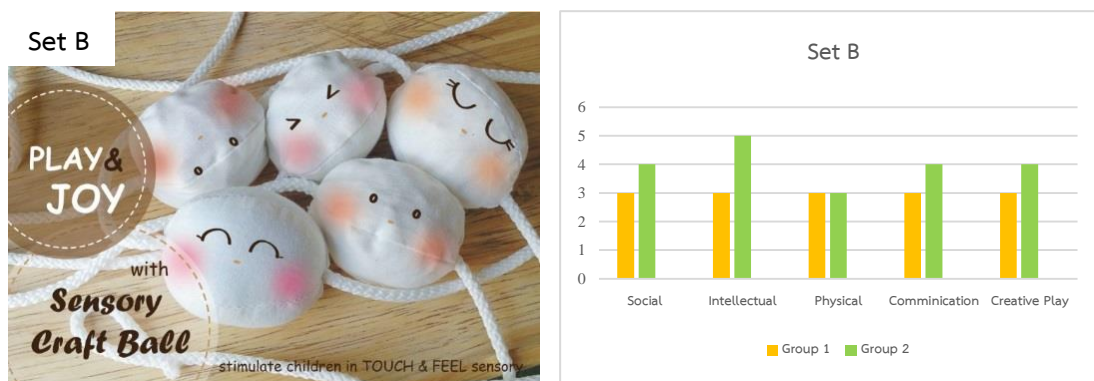


Figure 52 The results of the scores of set B

Table 15 Total score for experiment 3

No.	Topic	Set of toy		Total
		A	B	
1	Social Development	5	3.5	4.25
2	Intellectual Development	3	4	3.5
3	Physical Development	3.5	3	3.25
4	Communication skills Development	3	3.5	3.25
5	Creative Play Development	3	3.5	3.25
Total		3.5	3.5	3.5

When comparing the sum of the scores of the whole set of toys with 2 Set when compared to the following Set A total score from both 2 the group that is evaluated after playing is 3.5 which is in good rate Set B total score from both groups that is evaluated after playing is 3.5 which is in Good rate too.

Design & Experimental

Phase 3 To develop textile surface for stimulate sensory perception
: Summarize and collect all the results from the research tools synthesized to process for creating the right design for preschoolers by way of the needle works.

Inspire by Quiet Books



QUIET BOOKS
pages, pictures, & toys that soothe & entertain

Waldorf education



Rudolf Steiner
(1861-1925)

- *Austrian scientist and philosophical thinker
- *Developed his own form of spiritual science, called Anthroposophy
- *Founded Waldorf Education

Design and Development

Water



Wind



Body



Earth



Sun



Rainbow



Twinkle, Twinkle, Little Star



Over the Rainbow



Puff, the Magic Dragon



2 Dimension design wasn't attracted from children. Too much of the condition of playing method reduce creative activity also concept inspiration should be local and normal will make the design with significant.

Attractive
Size & Concept
are important!!!

Figure 53 The analysis of experiment 4

Twinkle, Twinkle, Little Star



"Twinkle, Twinkle, Little Star"	
Wolfgang Amadeus Mozart	
Nursery rhyme	
Published	1808
Lyricist(s)	Jane Taylor

Over the Rainbow



"Over the Rainbow"	
Song by Judy Garland	
Published	1939
Genre	Pop, Jazz
Composer(s)	Harold Arlen
Lyricist(s)	E.Y. Harburg

Puff, the Magic Dragon



"Puff, the Magic Dragon"	
Single by Peter, Paul and Mary	
Released	January 1963
Format	Vinyl single
Recorded	1962
Genre	Pop, folk

Figure 54 Design Inspiration (Fables for kids)

The result of this experiment is works well in groups that have experience listening to these tales before. But the group that has never been known before will take time to understand The form of use is limited by the content of the story and the song, making the creative play still not able to express clearly. Including the size

of the work out. The size of A3 paper or 29.7 x 42 cm, making the absorbed attention of children is quite limited in access. Or interested in playing in this design



Figure 55 Play Matt and Dino quest

The result of this play is the issuance of commands to be followed on the quiz card has not been well received by children of this age. Because he is more interested in the things that lie ahead For example, when some children see a large play mat, they run up and step on it. When found that inside the skeleton of each dinosaur is a different texture causing exploration learn to catch each one which the soft surface will be the most popular once the pedal is soft, then use the handle Some parts that have sound will use hand beating make a noise.

And set B, is the free play style. There are 9 dinosaurs in a variety of surfaces and the floor covering is dinosaur environments such as ground, river etc. Play style is that children can use their imagination. Playing fully free no restrictions on playing may be limited to the number of players meaning there are 9 dinosaurs because they are inspired by 9 dinosaur species which found in Thailand.



Figure 56 Dino land

From this experiment found that Playing in a free style format can make players have imagination. Extending the creativity of the playing process. According to his own imagination Which is consistent with the third experiment that is just a ball knitting Variety of surfaces But players can invent ways of playing As well as imagining and comparing things that they used to know This time, too, aside from children being able to imagine the personality traits of each dinosaur. According to the surface that he has touched with the most reduced form So that children can focus more on the contact surface how will it feel after being caught? To each type of surface in which color influences perception and imagine also, for example, the yellow dinosaur Children also think that dinosaurs are similar to ducks. Pink dinosaur Is similar to a pig As for the style of play, girls love playing role-playing Let each dinosaur represent itself Or assign the personality to that dinosaur And create stories while playing But in some boys The shape of some dinosaurs Which has a long body, a long tail, like a gun or a knife. Is a weapon that he knows Therefore doing some fighting and in line with the second experiment is a matter of matchmaking some children match the same surface. Without anyone telling when it was discovered that on the play mat, there was a water wave using smocking methods and dinosaurs with the same pattern the child then matched the same surface. Or similar put it together

From the experiment of all 5 previous sets of toys, the design process can be summarized into the following stages: Is to start with the analysis of the data

obtained set the issues that need to be studied in order to make the right data collection tools by expert consultation. Face validity indicates the questionnaire appears to be appropriate to the study purpose and content area. It is the easiest validation process to undertake but it is the weakest form of validity. It evaluates the appearance of the questionnaire in terms of feasibility, readability, consistency of style and formatting, and the clarity of the language used (Haladyna, 1999; Trochim, 2001; DeVon et al, 2007). To the group of experimental data players under the supervision of Teachers and parents closely the researcher is observing. Typical strategies include writing field notes or audio or video recording social action. Recording behavior overtly might be interpreted by participants as exceptional or intrusive, thus potentially affecting their behavior (Williams, 2008)

Once the key points in each category that we have studied are As for the design process, it must start from the study of materials, dyeing, and choosing the concept to be designed to suit the area and user group, that is, children aged 2-4 years old.

Due to this research The study area of the research is the Isan region, therefore, must know the conditions of the Isan region first, what they look like Northeastern Part This region is naturally a high level plain called northeast plateau. Northwestsoutheast oriented Phu Phan ridge in the northeastern portion separates this part into two basins. One is a large high level plain in the west. Another is smaller and slope towards the east. This part is divided into 20 provinces i.e. Nong Khai, Bueng Kan, Loei, Udon Thani, Nong Bua Lam Phu, Nakhon Phanom, Sakon Nakhon, Mukdahan, Khon Kaen, Kalasin, Maha Sarakham, Roi Et, Chaiyaphum, Yasothon, Amnat Charoen, Ubon Ratchathani, Sri Sa Ket, Nakhon Ratchasima, Buri Ram and Surin.

Season From the meteorological point of view the climate of Thailand may be divided into three seasons as follows:

- Rainy or southwest monsoon season (mid-May to mid-October). The southwest monsoon prevails over Thailand and abundant rain occurs over the country. The wettest period of the year is August to September. The exception is found in the Southern Thailand East Coast where abundant rain remains until the end of the year

that is the beginning period of the northeast monsoon and November is the wettest month.

- Winter or northeast monsoon season (mid-October to mid-February). This is the mild period of the year with quite cold in December and January in upper Thailand but there is a great amount of rainfall in Southern Thailand East Coast, especially during October to November.

- Summer or pre-monsoon season, mid-February to mid-May. This is the transitional period from the northeast to southwest monsoons. The weather becomes warmer, especially in upper Thailand. April is the hottest month. (Climatological Group Meteorological Development Bureau Meteorological Department, 2015)

In addition to the general topography the northeast also has a unique style of art and culture. Including skirts and various materials especially silk which is famous for the Isan region referring to the previous test of the properties of textiles, we found that the fabric that is suitable for the production of toys should be cotton because the skin is clear to touch good ventilation is also important

Design Development

Design process beginning with raw material preparation choose colors by using natural colors for dyeing cotton. The various raw materials for dyeing are from various plants. That is available in that locality pastel tone was used in this collection due to the process of dyeing from natural which is related to Waldorf color theory, soft and smooth tone similar tone natural. Make children focus on the total of environment and object not only on color. For natural dyeing process almost done by hot process can divide in to 3 step below;

Step 1: Preparing material, first of all clean the raw material boil the water in this step can put some Acidic substance or Alkaline substance such as salt or vinegar depend on fabric and color tone (this step should make an experiment)

Step 2: Dyeing process, before put the fabric or yarn in to the prepared color should make well clean. Boil the fabric (should separate the piece use only color water) boil it for a time about 20-40 mins (depend on kind of yarn)

Step 3: Finishing process, after the fabric or yarn absorb enough color the last process is finishing or fixing the color by put some substance at this process by bring the fabric to wash in water and soak in saline can reduce the fade.



Figure 57 Natural dyeing process

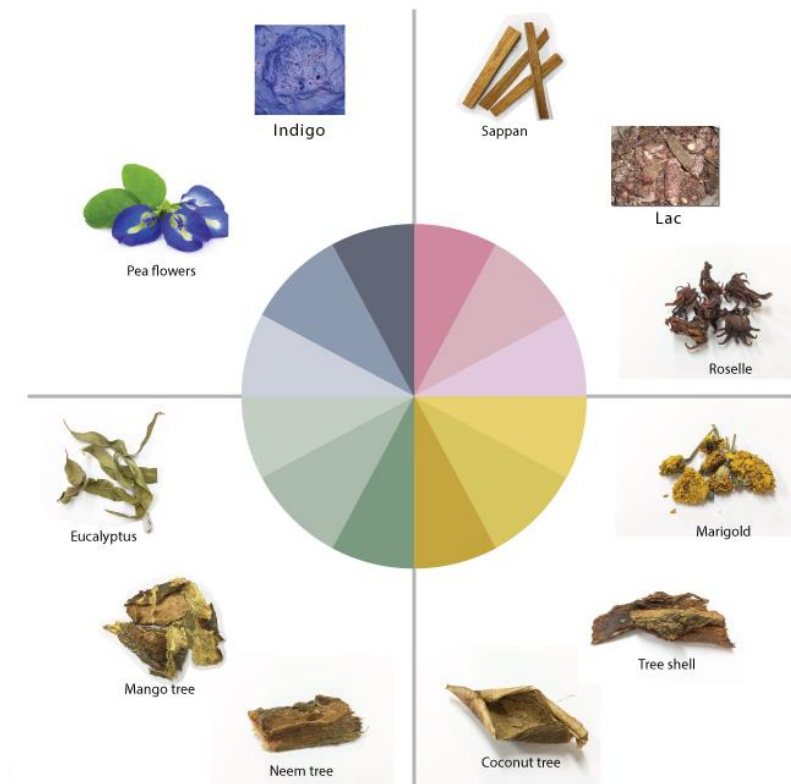


Figure 58 Color wheel from natural

After getting the desired fabric the researcher has tried it. And choosing patterns to create fabrics that are suitable for the work piece with various methods suitable for both feeling Artistic awareness Manufacturing Processes Production time, including the cost of production as well. Because ultimately, the development of this research is to get more marketing channels as well in which the researchers summarized the 6 smocking surface construction patterns as follows.



Figure 59 Smocking pattern 1

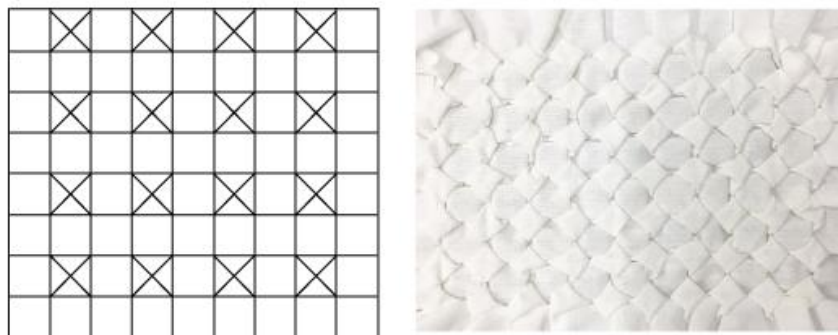


Figure 60 Smocking pattern 2



Figure 61 Smocking pattern 3

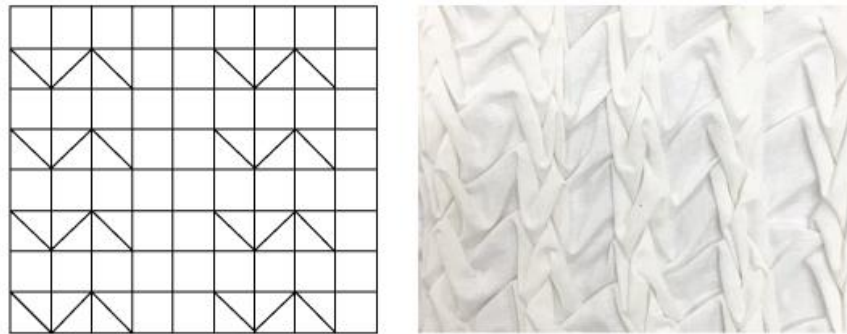


Figure 62 Smocking pattern 4



Figure 63 Smocking pattern 5

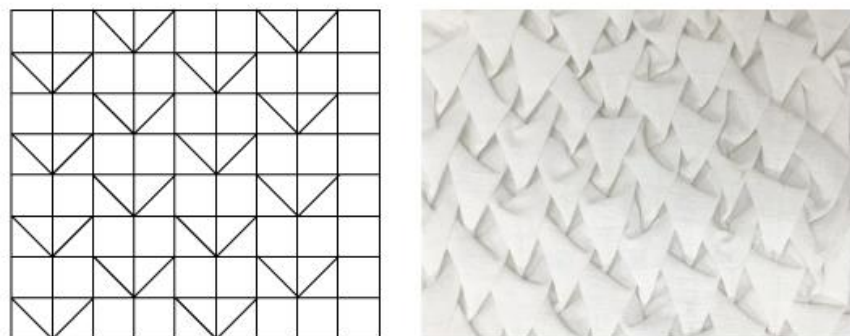


Figure 64 Smocking pattern 6

The smocking techniques have various pattern with many function in each pattern which we can combine with other techniques. Each pattern has own charactor or feeling of movement that can choose the proper pattern to fit the design. We can see that in each form of creating patterns that Caused by repeated stitching in the

same direction Until causing the pattern on the other side of the fabric In rhythm that corresponds to the pattern that was drawn In which the said pattern gives different emotions According to artistic theories, such as pattern 1, weaving patterns Giving a feeling of rapid movement Or weave together firmly Adapted to the species of fast-running dinosaur, 2-legged stand, 3rd pattern, like leaf pattern. Used to create surfaces for herbivorous dinosaur species. Pattern 6 The pattern that appears Similar to water waves Giving a feeling of gentle movement Suitable for dinosaur species that can feed or live in the water, for example. Do this with the creation of other patterns as well.

Once the pattern has been obtained The next step is to Start designing the work piece Beginning with the study of dinosaurs, habitat, environment, and characteristics of each species. The ornament of the surrounding objects were inspire from the dinosaur era. Divided in to 5 catagories and design to be as accessories and blocks for set up the environment for Texture nosaurus.

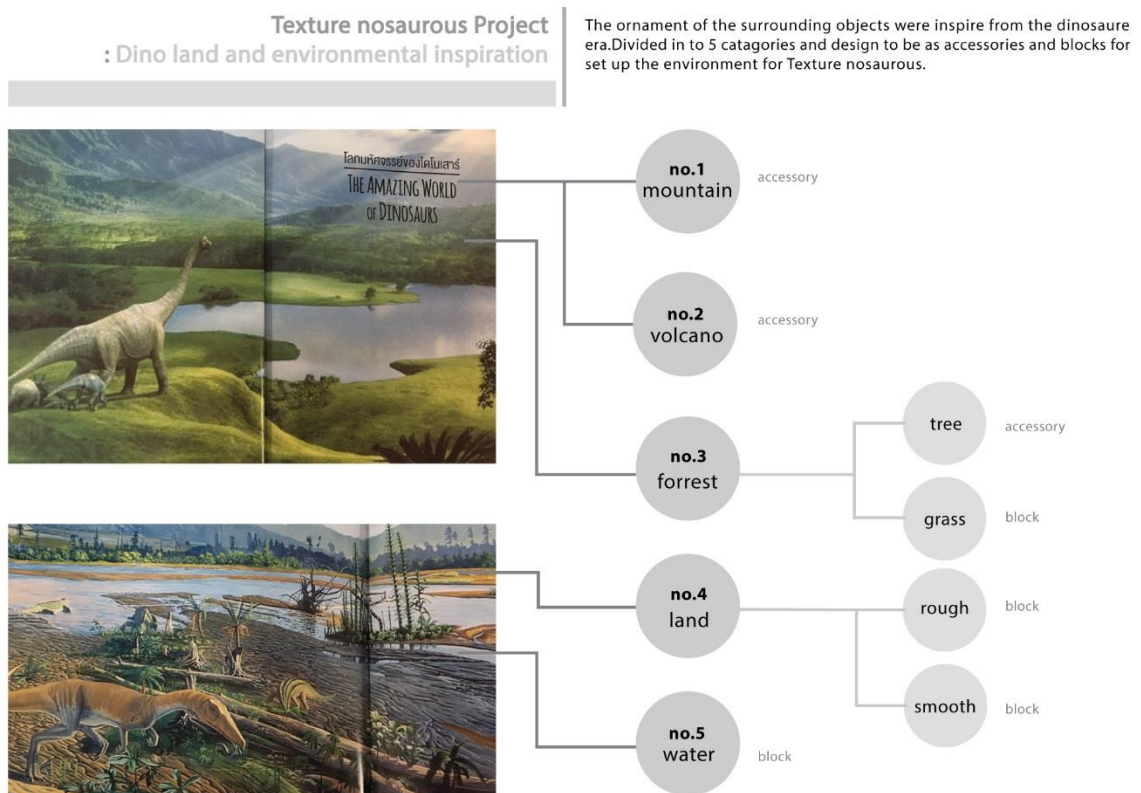
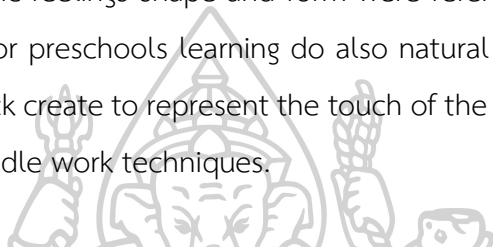


Figure 65 The ornament of the surrounding objects

Then start designing the components that we will use to create the atmosphere of the dinosaur age. The researcher has specified the play in a free play format, allowing the player to create can imagine as for the atmosphere designed as a blog For players to assemble and plan your own play inspired by the above content, namely images and information of the dinosaur age the surface of the land can be summarized as follows: ground water, dry ground smooth ground, stone floor and grass, with each surface using construction methods through analysis choose the right also according to artistic feelings shape and form were reference on basic geometric and trapezoid shape for preschools learning do also natural from inspire from wave. The texture of the block create to represent the touch of the nature such as grass rock and wave by using needle work techniques.



Texture nosaurus Project : Dino land shape & form

Shape and from were refference on basic geometric and trapezoid shape for preschools lerning do also natural from inspire from wave. The texture of the block create to represent the touch of the nature such as grass rock and wave by using needle work techniques.

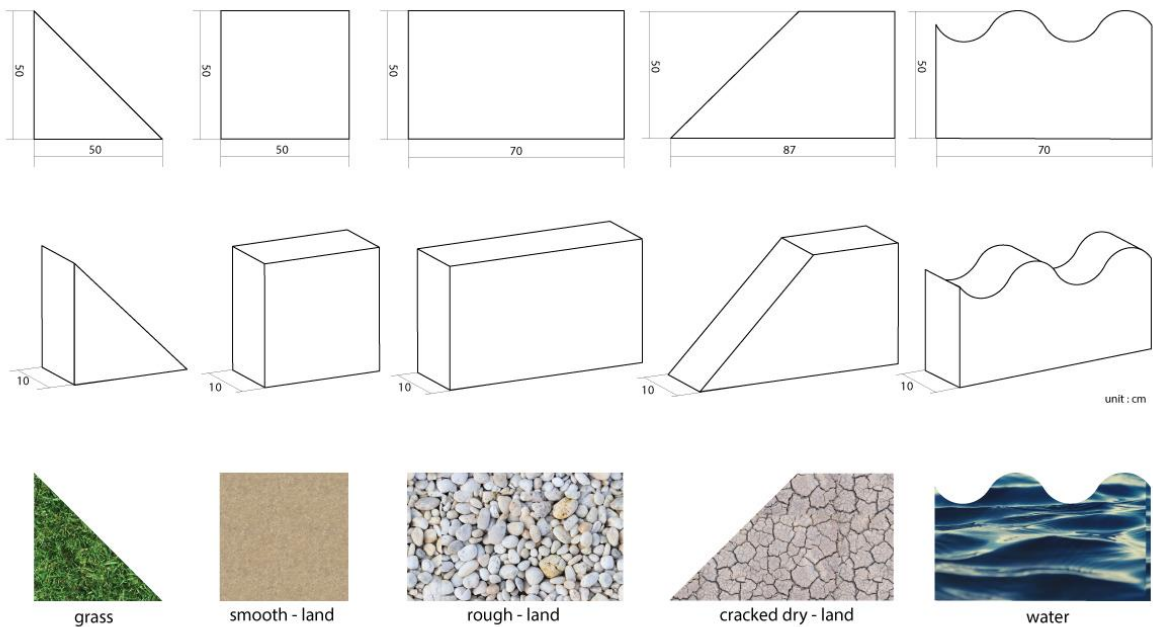


Figure 66 The ornament of the surrounding objects shape & form

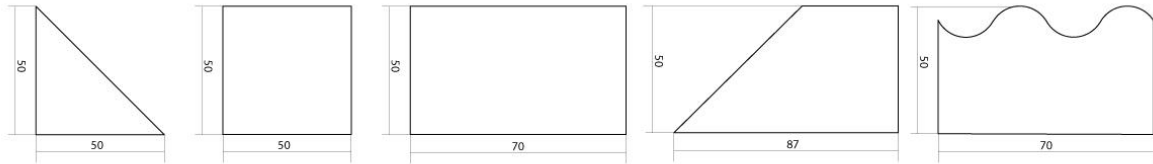
After the pattern and details have been received, for texture patterning techniques to achieve similarity and texture pattern recording. The triangle in the surface presentation is a method of knitting crochet using a dark green yarn. With embellishment loops stitch, the ground will have a total of 3 surfaces. Presented with various smooth methods. The smooth surface is a square shape using the extra large hand blender with normal weaving. But gets a different feeling, with more volume, ground or rocky areas used the rectangular shape is presented with smocking techniques. Then, add polyester to increase the level of different surfaces. Clear, dry, cracked ground. Use trapezoidal shape with fabric quilting to see cracks more clearly is to put the bag inside the shape to make some crack sound. The water wave pattern offers a smocking surface, using the top glass fabric to give the same airy feeling. Wavy stitching in the outfit is available in both blue and white.

When receiving all production details the next step is making scale models. To check the ergonomic suitability that the proportions and shapes are suitable for preschool children or not by choosing a representative of children whose size, weight, height according to the criteria of good development to try out To test shape and from of the block proper with ergonomic of preschooler or not especially the way how to carry must be fit with their ergonomic and size. The appropriate size of shape and form maybe cause of their creation and imagination of playing behavior.

Texture nosaurus Project : Dino land shape & form

To test shape and form of the block proper with ergonomic of preschooler or not especially the way how to carry must be fit with their ergonomic and size. The appropriate size of shape and form maybe cause of their creation and imagination of playing behavior.

unit : cm



Play behavior

The instruction was given to the preschooler before playing. At the beginning preschooler follow the instruction by set an environment for the objects (Texture nosaurus) after the player get used to the shape and form we can notice that the way to play was change player has his own idea to set up the block. The imagination and creation was establish, role play is one of play style in this time. The size of the block is big enough for player to step on and get involve to the make believe situation.



Figure 67 The ergonomic scale test

The instruction was given to the preschooler before playing. At the beginning preschooler follow the instruction by set an environment for the objects (Texture nosaurus) after the player get used to the shape and form we can notice that the way to play was change player has his own idea to set up the block. The imagination and creation was establish, role play is one of play style in this time. The size of the block is big enough for player to step on and get involve in the situation.

When testing the proportion size suitability selection of various techniques in each piece of work presentation began to produce in the next step by specifying the color and pattern as described above.

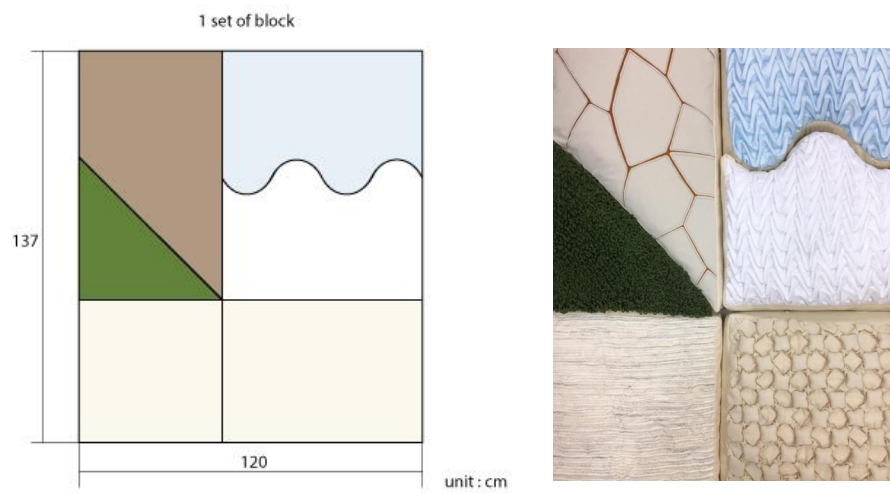


Figure 68 The set of the surrounding objects block



Figure 69 The techniques were used on the block

The process of designing a dinosaur beginning with studies of various species characteristics and then starting to perform the image state. Reducing the details to the most basic shapes, easy to understand, not complicated because one part is to focus on the surface with details of each species are as follows. During the past thirty years, the Thai-French expedition led by Dr. Varavudh Suteethorn (DMR, Bangkok) and Prof. Eric Buffetaut (CNRS, Paris), has focused on the Mesozoic non-marine fossil vertebrates from Thailand, ranging in age from Late Triassic to late Early Cretaceous. The results of surveys and excavations clearly indicate that northeastern part of Thailand (corresponding to the Khorat Plateau) has an excellent record of fossil vertebrate faunas distributed in many localities. A set of continental sandstones, siltstones, mudstones, freshwater limestones and conglomerates that deposited during the Mesozoic Era in the Khorat Plateau and parts of adjacent Laos and Cambodia (Philippe et al. 2004) forms the Khorat Group. Its total thickness is nearly 3,000 m and it ranges in age from the Late Jurassic to the Early Cretaceous (Aptian-Albian) (Department of Mineral Resources, 2001). It is subdivided into five Formations, which are in ascending order: Phu Kradung, Phra Wihan, Sao Khua, Phu Phan and Khok Kruat formations (Cuny et al. 2008; Racey, 2009). The Khorat Group has yielded a succession of non-marine fossil vertebrates such as dinosaurs, pterosaurs, crocodiles, turtles, bony fishes and sharks. These vertebrate remains are mostly collected from three formations, that is, the Phu Kradung (Late Jurassic to Early Cretaceous), Sao Khua (Berriasian-Berremian), and Khok Kruat (Aptian-Albian) formations (Buffetaut & Ingavat, 1985; Buffetaut & Suteethorn, 1999; Tong et al. 2003; Cavin et al. 2004; Lauprasert et al., 2007, 2009). These fossils are very useful for studying the biostratigraphy and palaeogeography of the area. Here we focus only on the following fossil localities found in the Khorat Plateau.

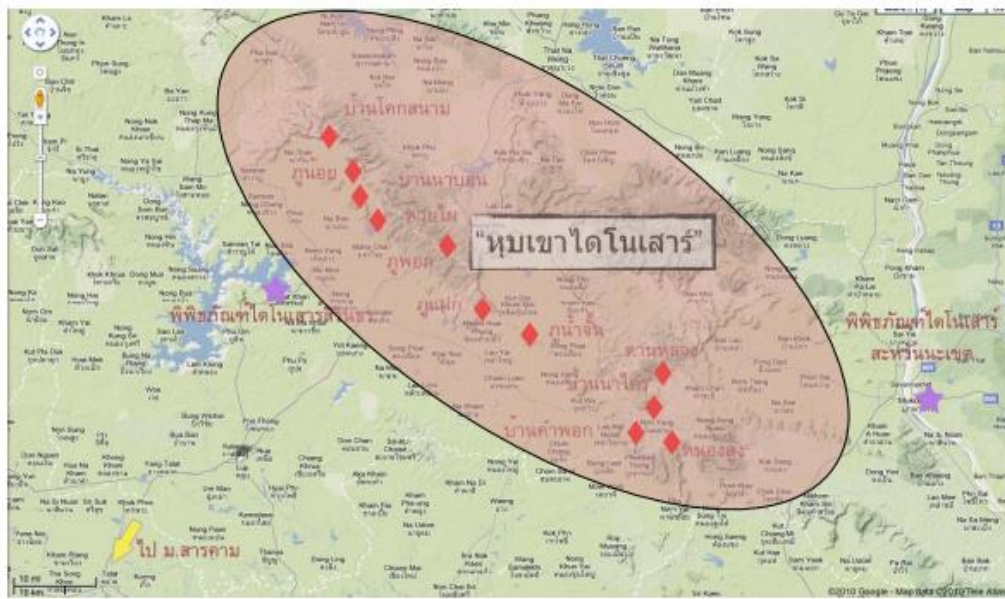


Figure 70 Dinosaur valley of northeastern Thailand (shaded color) (Komsorn Laoprasert, 2010)



Details of all 9 species found in Thailand with all of the following

1. *Isanosaurus attavipachi*

Is the oldest herbivorous dinosaur that has a large neck and long tail, walking on four legs, a prototype found in bones and muscles, fractures, bones and bones. After the experiment, it was found that the printing of the text from the reading was approximately 13 to 15 April, found in the sandstone layer, about 210 million years old, a top herbivorous dinosaur, Saurischia, sub-rank Sauropodomorpha. Sauropoda Subdivision Rank from the stone layer of the small rock category "Isan" (Isan) comes from the north-east, north-north, and the word "sauros" is Greek, meaning reptiles. be honored But Mr. Preecha Attavipanyee Department of Mineral Resources Department Director.

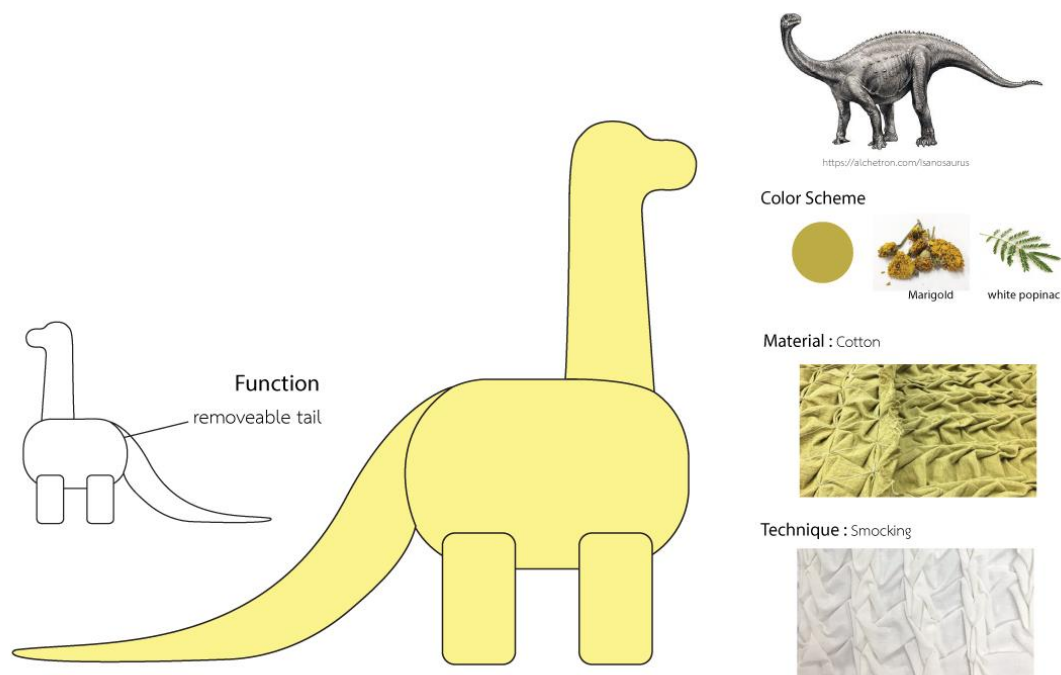


Figure 71 *Isanosaurus attavipachi*

2. Kinnareemimus khonkaenensis

Kinnareemimus khonkaenensis Ostrich dinosaurs fast run, with no teeth. Which eats both plants and animals as food About 1-2 meters in length, lived in the early Cretaceous period about 130 million years ago, found in Khon Kaen and Kalasin.

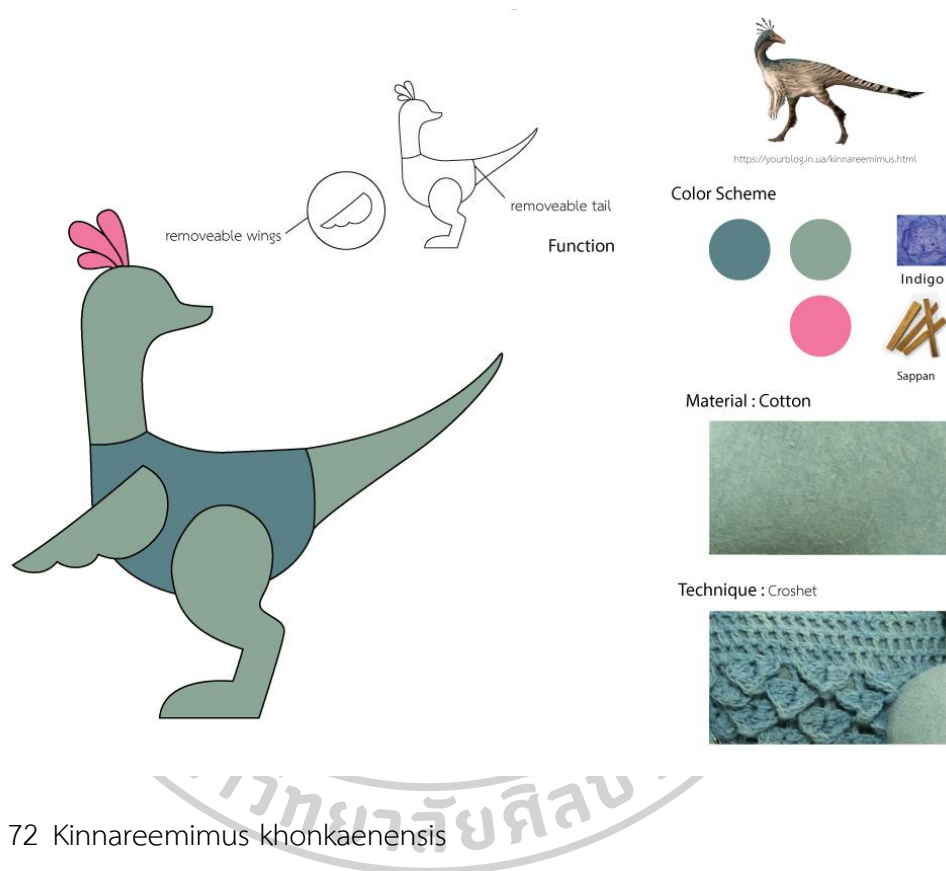


Figure 72 Kinnareemimus khonkaenensis

3. Phuwiangosaurus sirindhornae

Phuwiangosaurus sirindhornae is a herbivorous dinosaur walking 4 feet in length, about 15-20 meters long. A new dinosaur And new types of the world Living in the early Cretaceous period, about 130 million years ago, found in Khon Kaen, Sirindhorn is the name of the type of dinosaur. Set up to honor the Princess Maha Chakri Sirindhorn Princess Maha Chakri Sirindhorn Who cares In the field of paleontology.

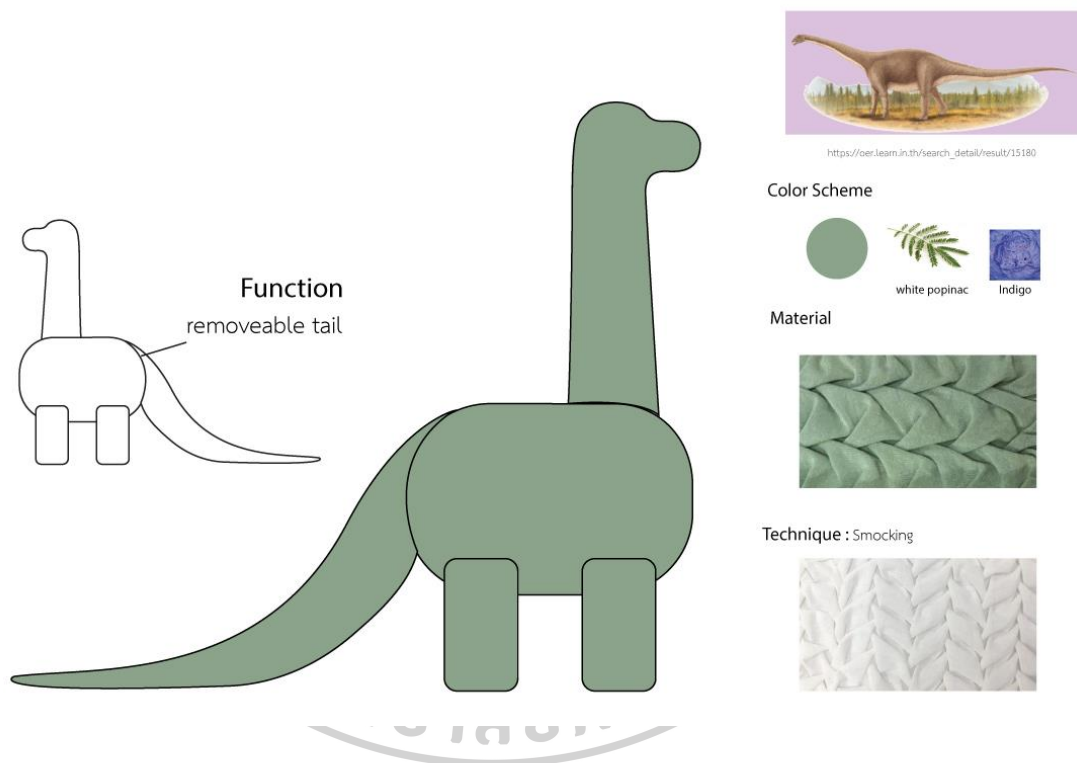


Figure 73 Phuwiangosaurus sirindhornae

4. Psittacosaurus sattayaraki

Psittacosaurus Satayarakki is a small herbivorous dinosaur. The length of about 1 meter is in the serpent group. (Dinosaur Paknok) lived in the middle Cretaceous period about 100 million years ago. In the past, dinosaurs were found in Central Asia. The area of Shantung, Mongolia and Siberia. The discovery of this fossil in Thailand, therefore confirming that when the Cretaceous era Indochina is part of the mainland of Asia. Found in Chaiyaphum Province Named in honor of Mr. Nares Sattayarak, who discovered the fossils first.

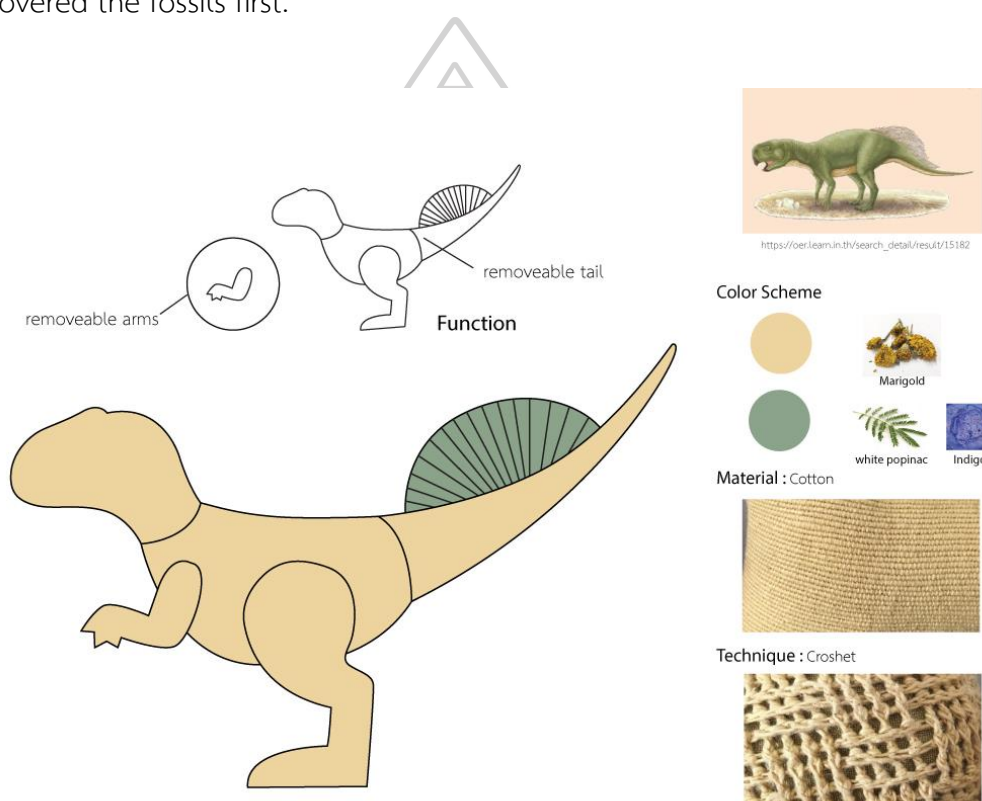


Figure 74 Psittacosaurus Satayarakki

5. Ratchasima Saurus suranareae

Here we report a new iguanodontian dentary found from the Lower Cretaceous Khok Kruat Formation, Nakhon Ratchasima, northeast Thailand. A unique character, which is an elongated and flat shape of the dentary ramus, makes it possible to assign the specimen to the new genus of non-hadrosaurid iguanodontian, Ratchasimasaurus suranareae gen. et sp. nov. R. suranareae shows both primitive and derived characters, such as a caudally inclined coronoid process and alveolar trough with a primitive crown impression, and a derived buccal shelf between tooth row and coronoid process. The discovery of a new iguanodontian from the Indochina Terrene, considering that the previously reported “Probactrosaurus-like” iguanodontian, points out a great diversity of this group in the late Early Cretaceous in Thailand, and corresponds to the Asian iguanodontian diversity at that time.

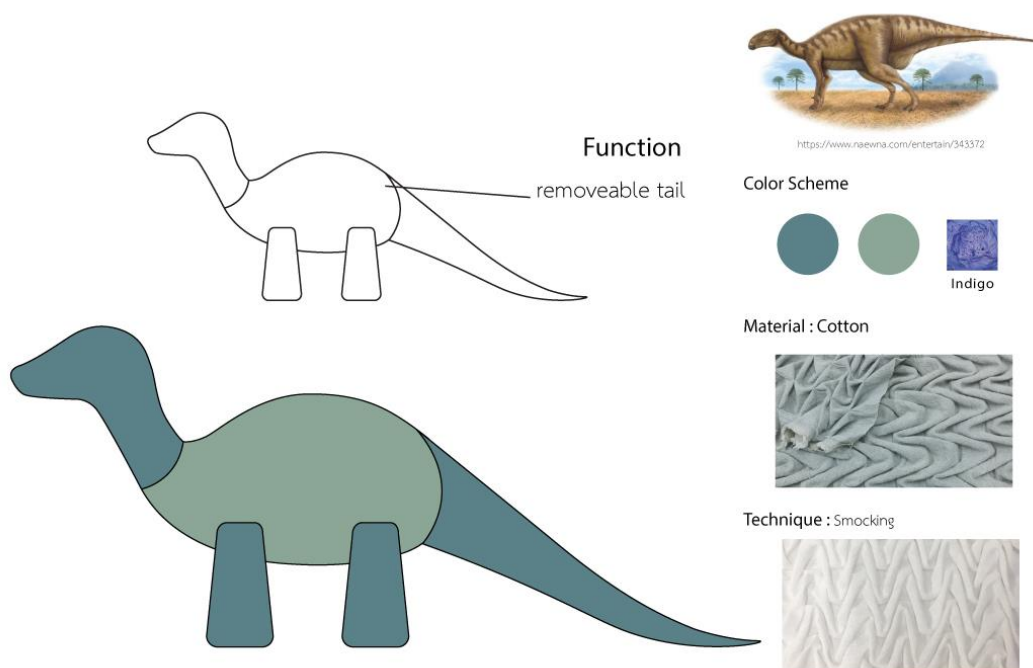


Figure 75 Ratchasima Saurus suranareae

6. Siamodon nimngam

Siamodon nimngami is a new ornitho dinosaur. New type of world from Thailand found the upper jaw bone obtained from the sandstone mine, Ban Saphan Hin, Nakhon Ratchasima Province In the Khok Kruat rock category In the middle of the Cretaceous period, about 100 million years ago. In addition, teeth and skull parts belonging to this dinosaur are also found. The origin of the Siamodon originated from Siam. Which is spelled as odon to emphasize the similarity with Iguanodon, the origin of the name of the type, in honor of Mr. Wittaya Nimngam who gave examples for education.

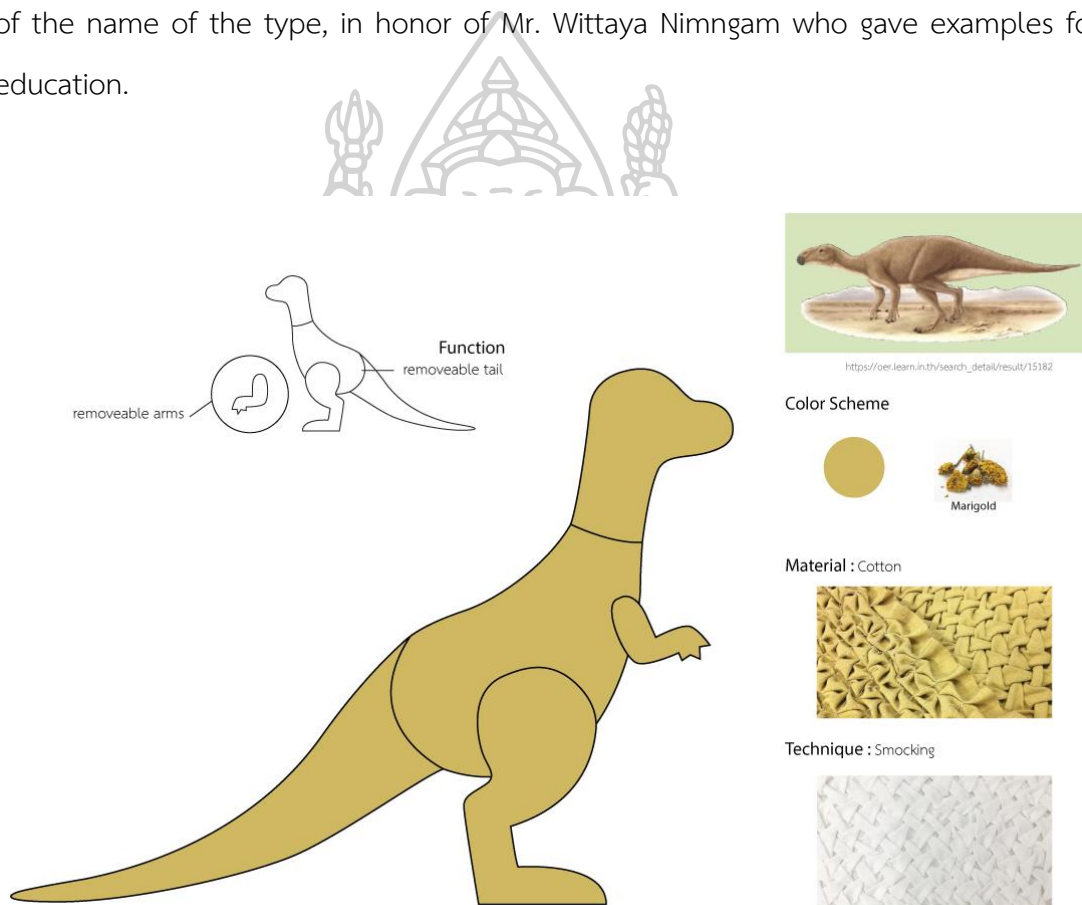
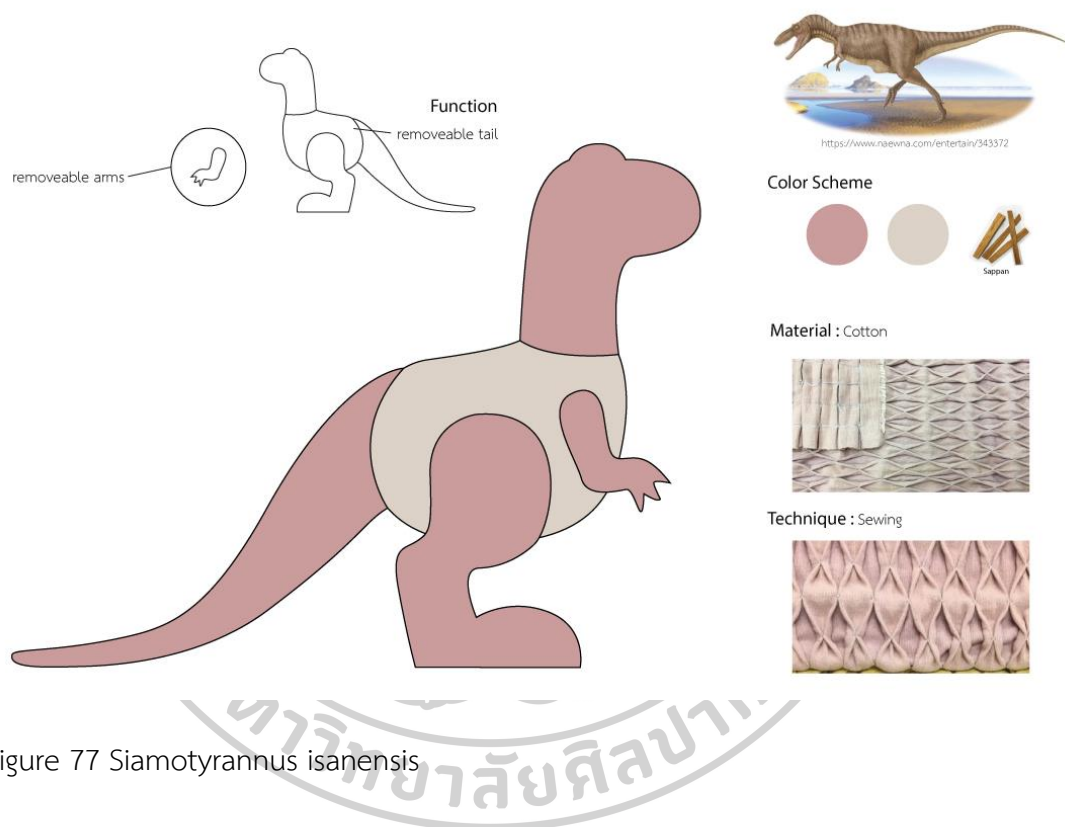


Figure 76 Siamodon nimngami

7. Siamotyrannus isanensis

Siamotyrannus isanensis (Siamotyrannus isanensis) is a large carnivorous dinosaur, walking 2 feet in length about 6.5 meters, has a large and strong hind legs, found only the bones of the tail, hip bones and tails in perfect condition. Living in the early Cretaceous period about 130 million years ago, found in Khon Kaen, Kalasin, Chaiyaphum, Sakon Nakhon, Udon Thani and Nakhon Ratchasima.



8. Siamosaurus suteethorni

Siamosaurus suteethorni is the first large carnivorous dinosaur found in Thailand, walking 2 feet, about 7 meters long. The teeth are conical with grooves and alternating ridges throughout, resembling the teeth of crocodiles. Assuming there is a source of water on the waterfront And eat fish as food Living in the early Cretaceous period about 130 million years ago, found in Khon Kaen, Kalasin, Chaiyaphum, Ubon Ratchathani, Sakon Nakhon, Udon Thani and Nakhon Ratchasima. Named in honor of Mr. Warawut Suthithorn, a participant in the survey

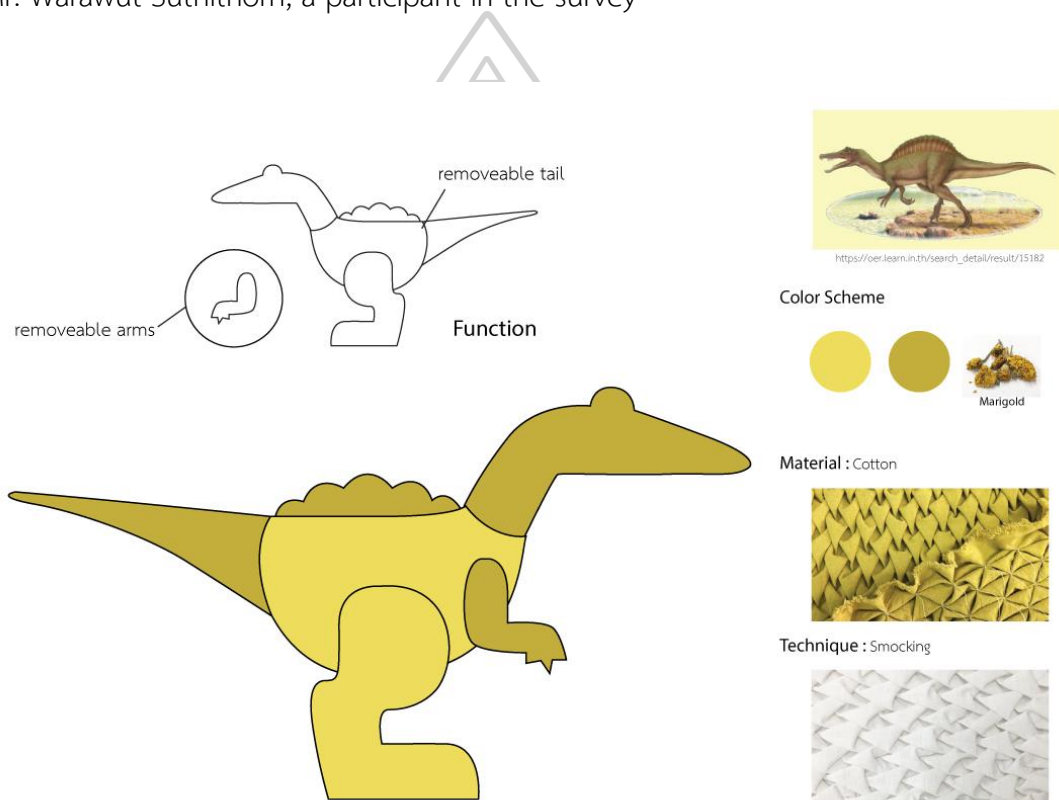


Figure 78 Siamosaurus suteethorni

9. Sirindhorna khoratensis

Sirindhorna khoratensis is an iguonodon herbivorous dinosaur with a length of 6 meters, 2 meters high, weighing about 1 ton. Fossils are found as important parts that have special characteristics unlike anywhere else in the world, including pieces of skull bones that wrap the brain Parts of the jaw bone and teeth and other parts of the bone many pieces together organized as a dinosaur, the Ugandan Dontia group. (Iguanodontia) Hadadotid (Hadrosauroidea) that has an old style Or the early dinosaurs of the platypus. The origin of the family name Set up to honor Her Royal Highness Princess Maha Chakri Sirindhorn Princess Maha Chakri Sirindhorn on the occasion of the fifth anniversary of the 60th birthday of April 2, 2015. The name is named to honor the place found is Nakhon Ratchasima.

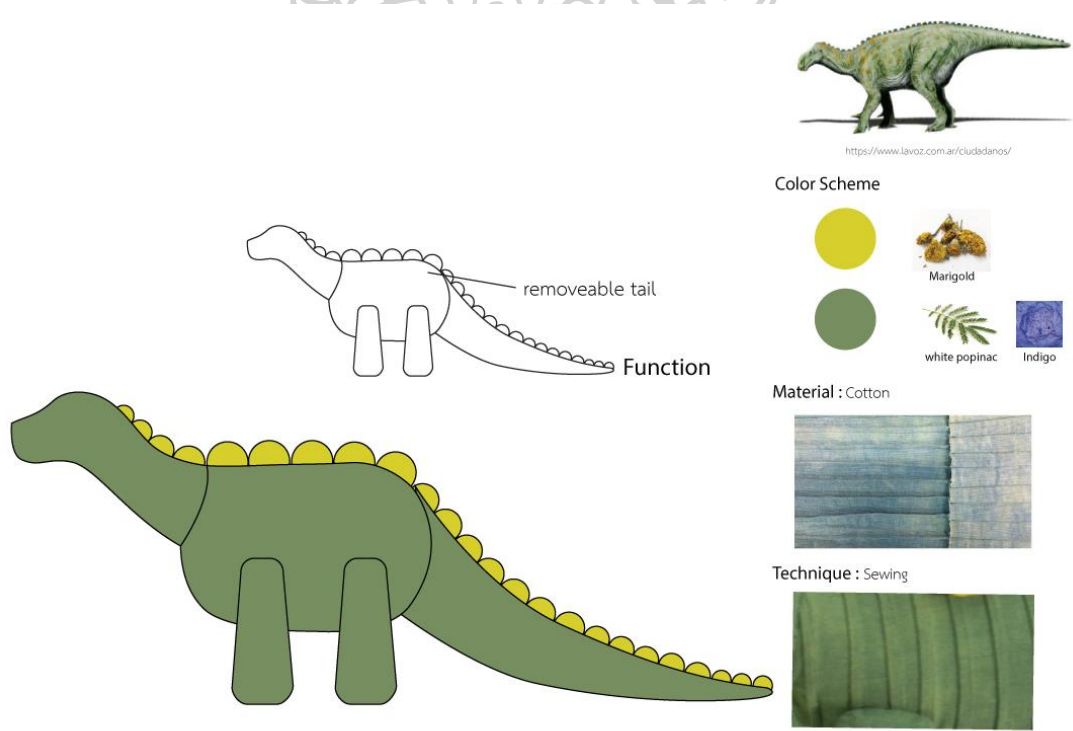


Figure 79 Sirindhorna khoratensis

When knowing the details of each species, determining the color, determining the texture creation technique the next step is to define the scales of each one by referring to the actual data of the discoveries and start drawing for production testing the ergonomic proportion of the child pre-school age.

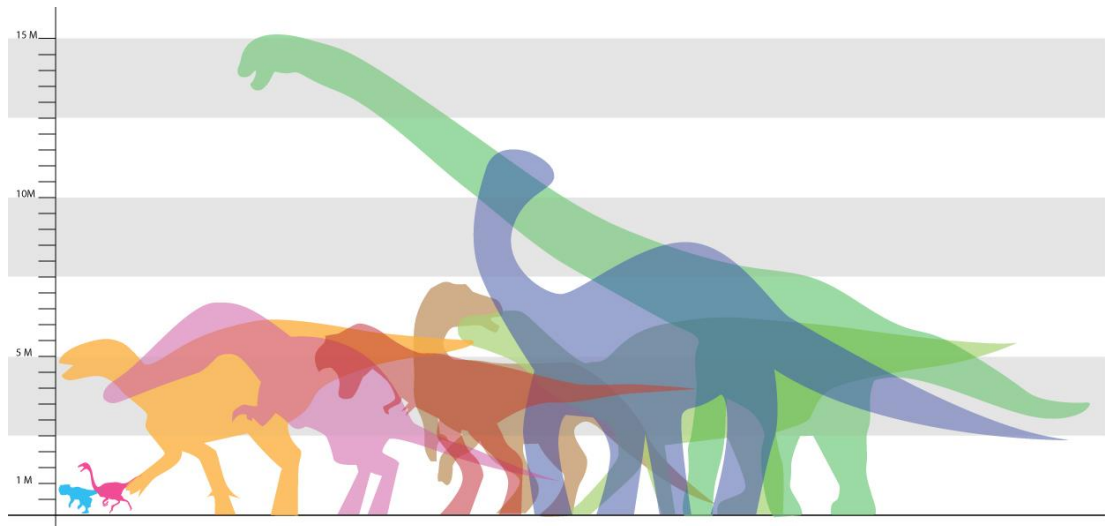


Figure 80 Dinosaur size

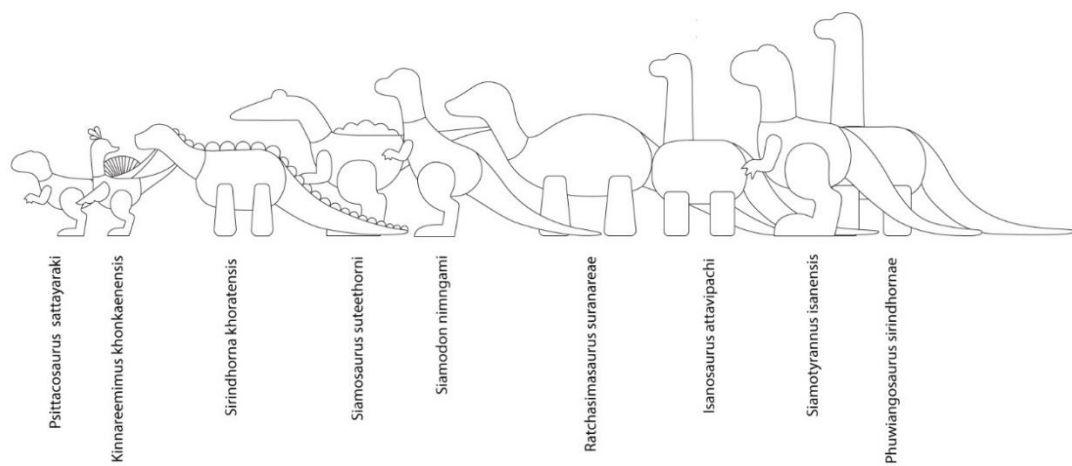


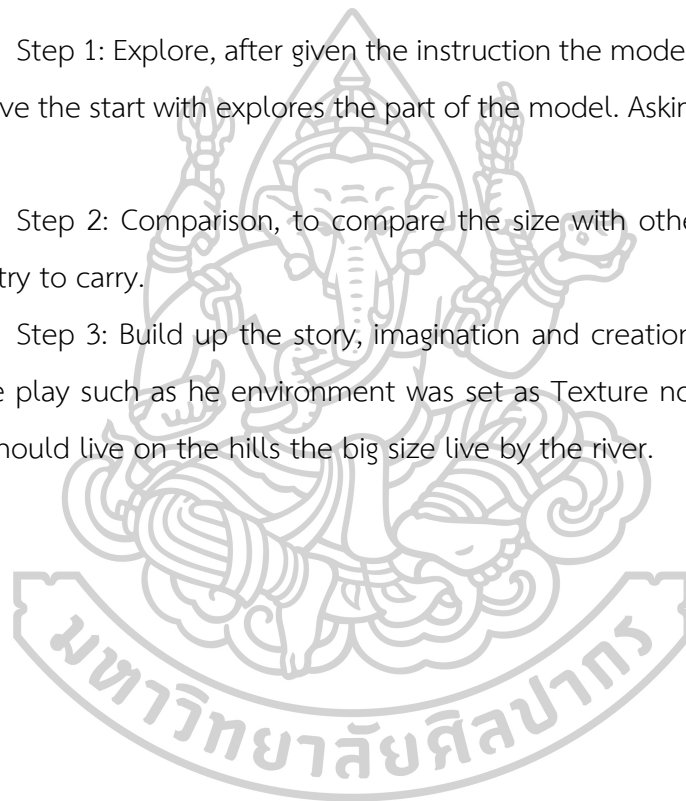
Figure 81 Dinosaur size

To test and check the scale of “Texture nosaurus” to fit the ergonomic of preschooler by making the model and shown them how to play and make an observe with the check list such as griping , carrying , compounding , sizing and also to the play behavior and weight which is concern with the safety process. The aim of this test is to check the size of the “ Texture nosaurus” by making the model and bring to the representative of the preschooler to play the make an non-participant observation analyze the data which was collect under the concern topic. Playing step can conclude by 3 step.

Step 1: Explore, after given the instruction the models were contribute to representative the start with explores the part of the model. Asking and understanding the model.

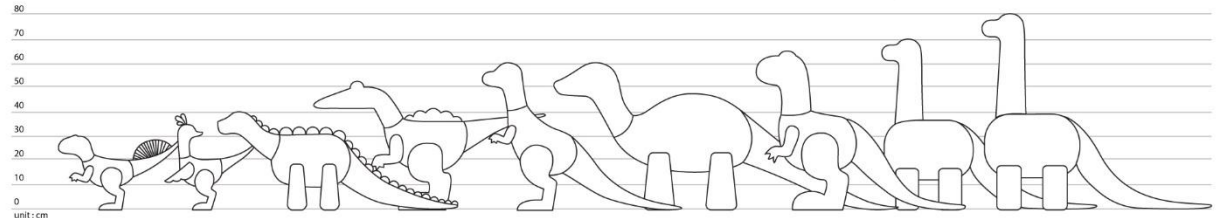
Step 2: Comparison, to compare the size with others, rise up to check weight and try to carry.

Step 3: Build up the story, imagination and creation were shown in this step by role play such as he environment was set as Texture nosaurus’s home the small size should live on the hills the big size live by the river.



Texture nosaurus Project : Dino land shape & form

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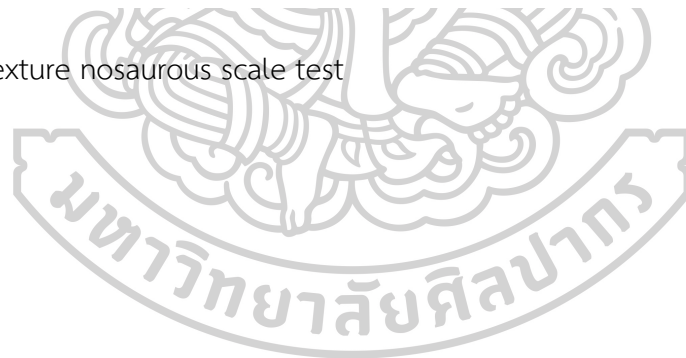
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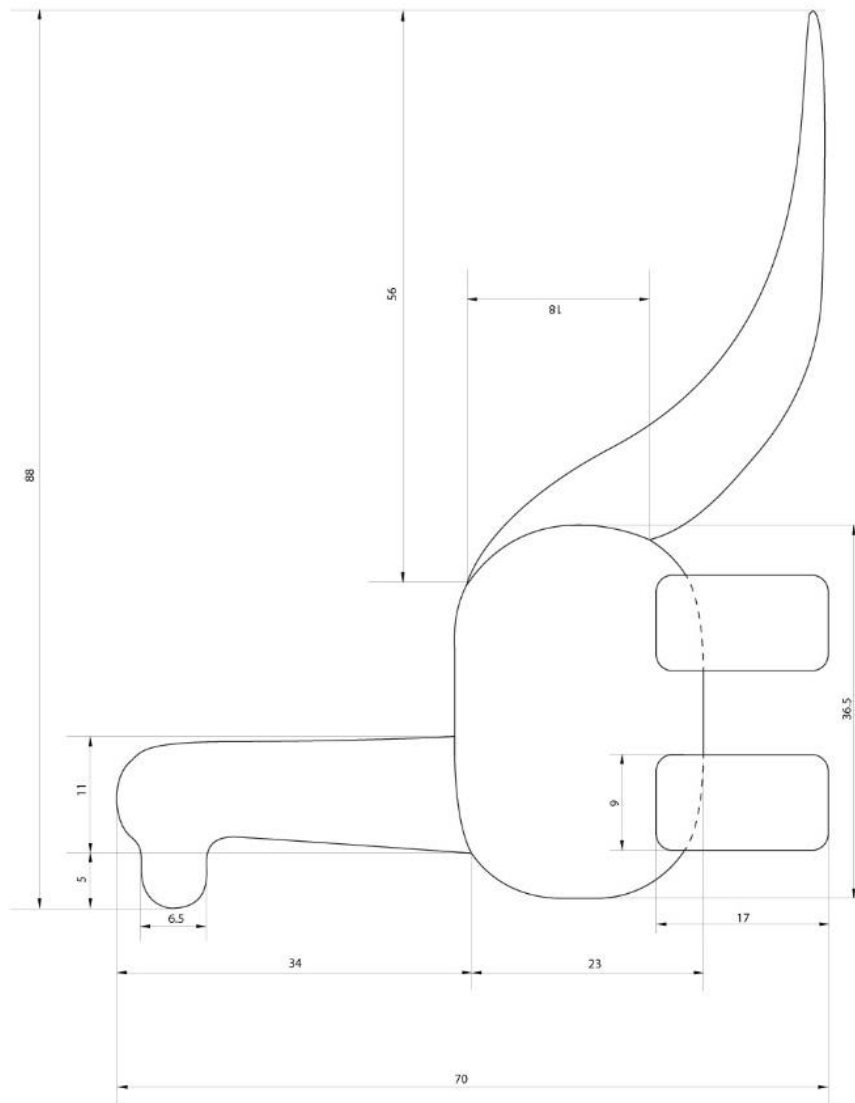
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Figure 82 Texture nosaurus scale test





Unit : CM
Scale : 1:3

Isanosaurus attavipachi

Figure 83 Mechanical drawing of Isanosaurus attavipachi

Unit : CM
Scale : 1:2

Kinnareemimus khonkaenensis

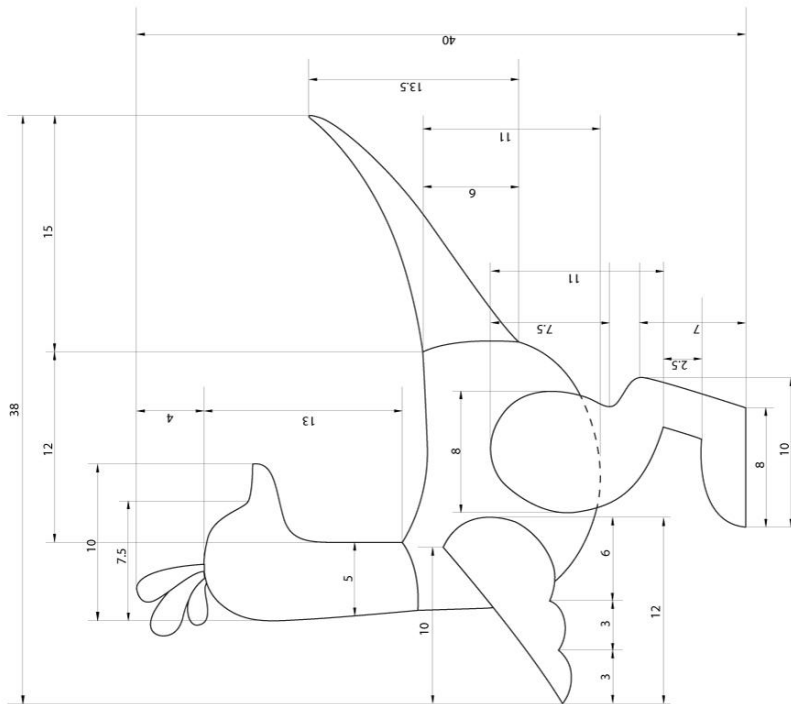
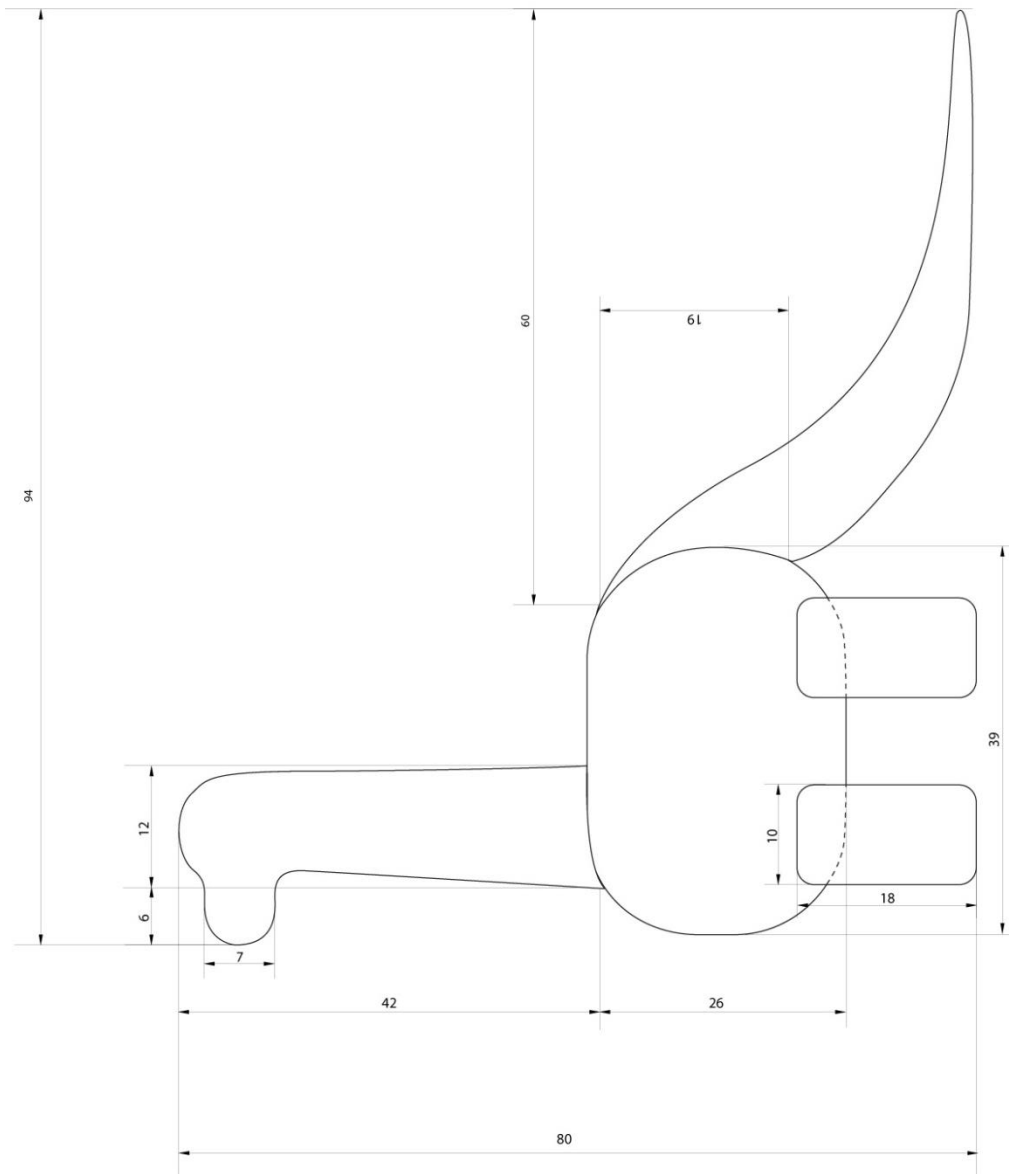


Figure 84 Mechanical drawing of Kinnareemimus khonkaenensis



Phuwiangosaurus sirindhornae
Unit : CM
Scale : 1:3

Figure 85 Mechanical drawing of Phuwiangosaurus sirindhornae

Unit : CM Scale : 1:2
Psittacosaurus sattayaraki

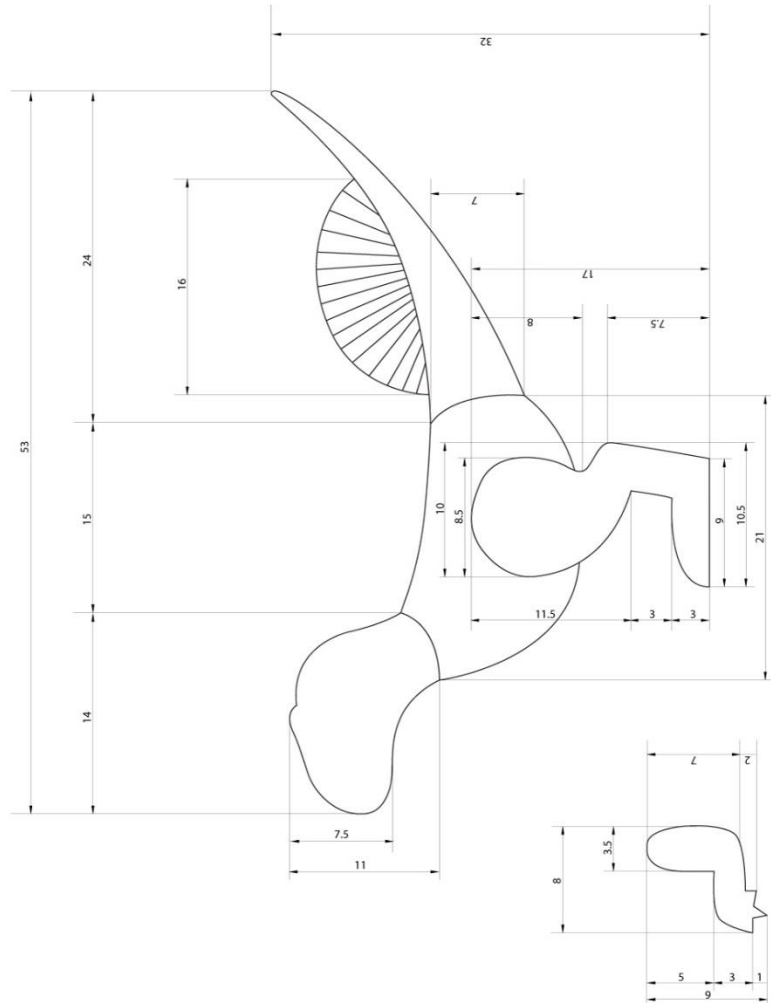
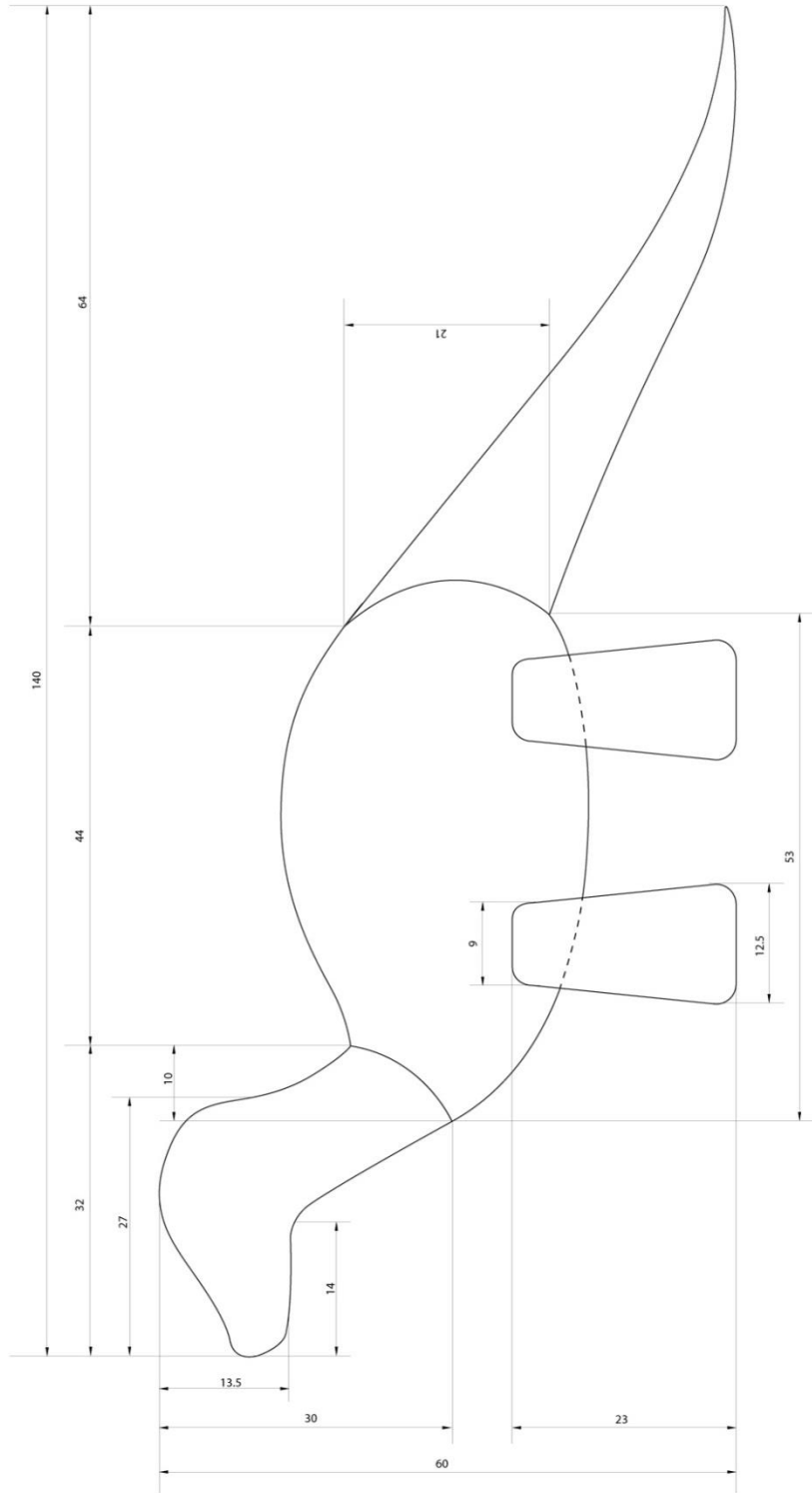
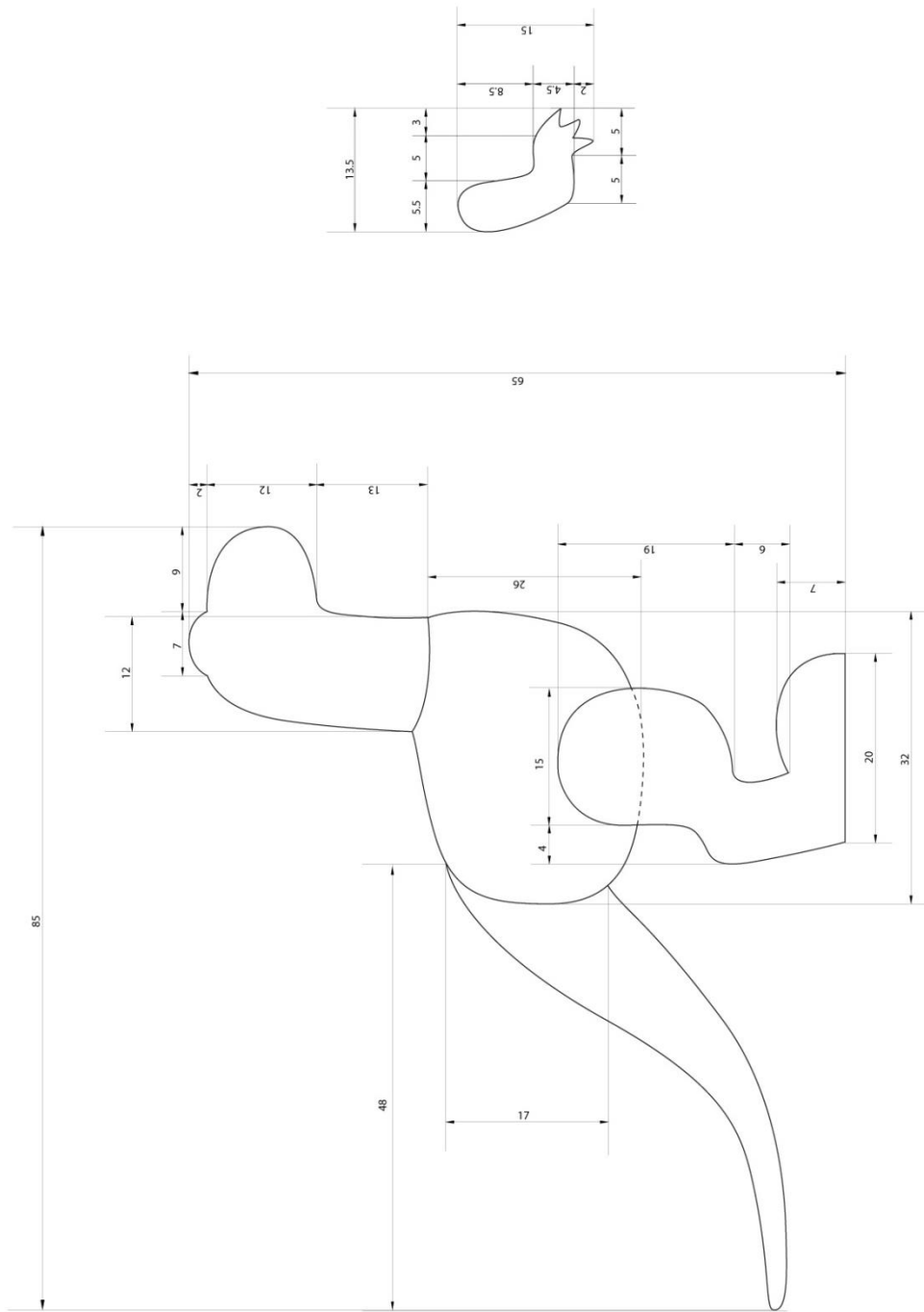


Figure 86 Mechanical drawing of Psittacosaurus Satayaracki



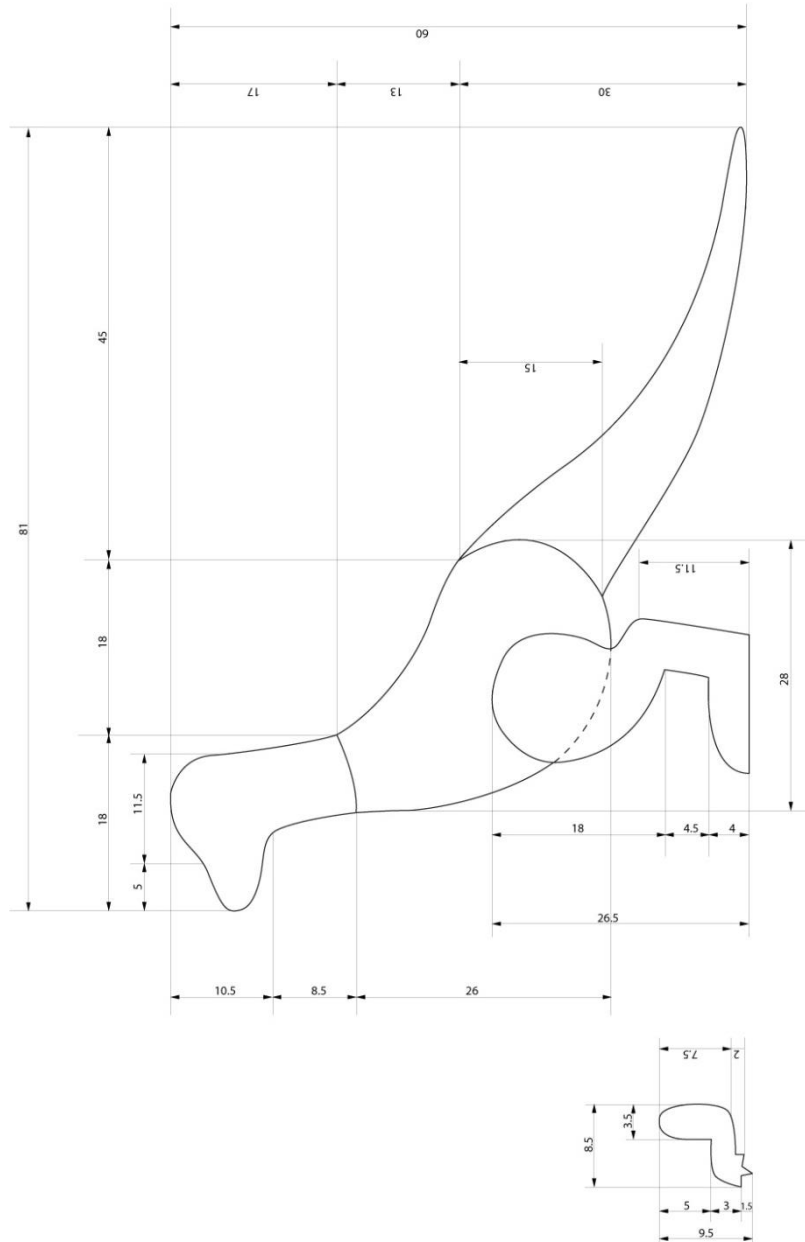
Ratchasimasaurus suranareae
 Unit : CM
 Scale : 1:3

Figure 87 Mechanical drawing of Ratchasima Saurus suranareae



Siamotyrannus isanensis
Unit : CM
Scale : 1:3

Figure 88 Mechanical drawing of Siamotyrannus isanensis



Siamodon nimngami
 Unit : CM
 Scale : 1:3

Figure 89 Mechanical drawing of Siamodon nimngami

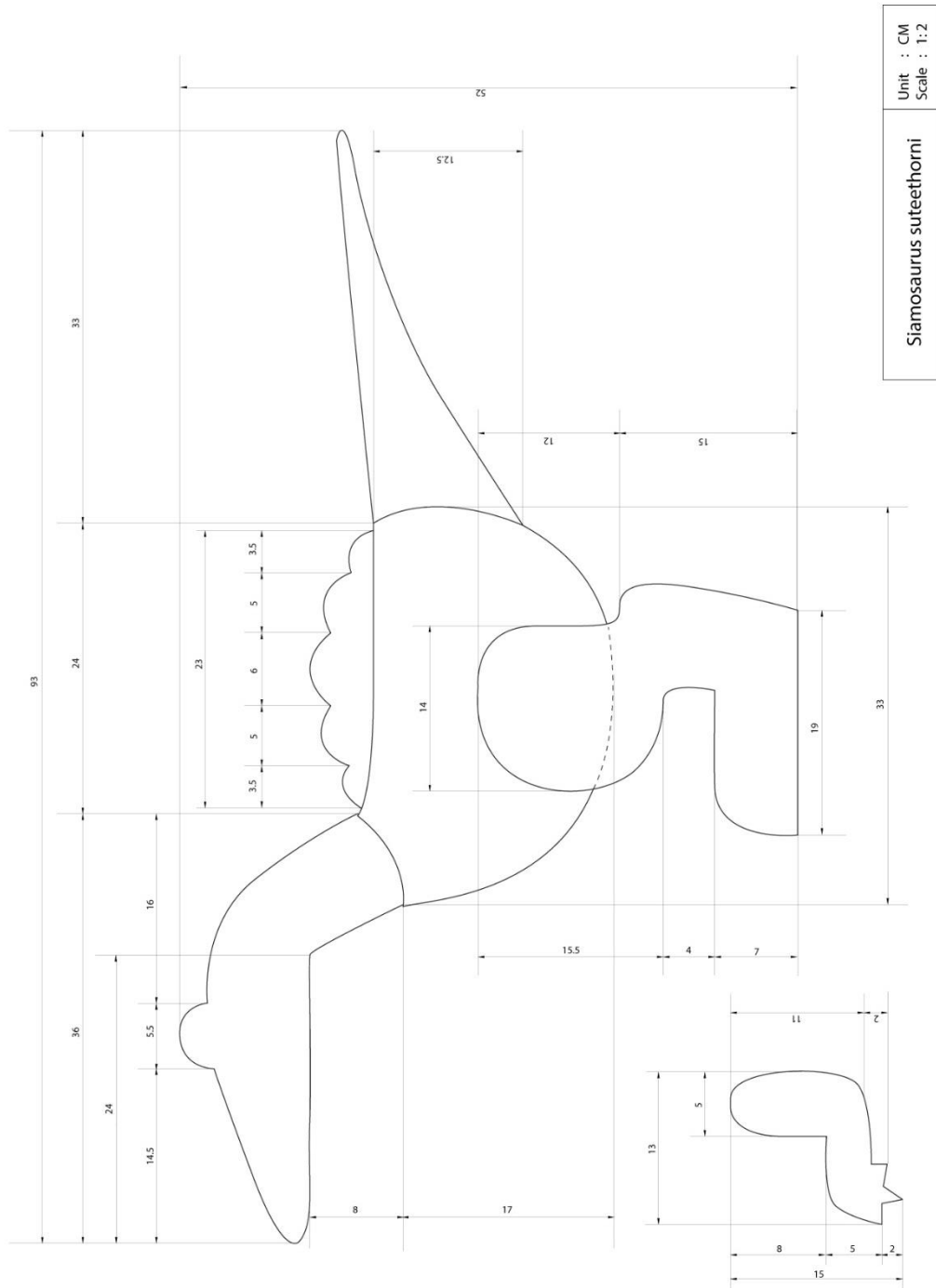
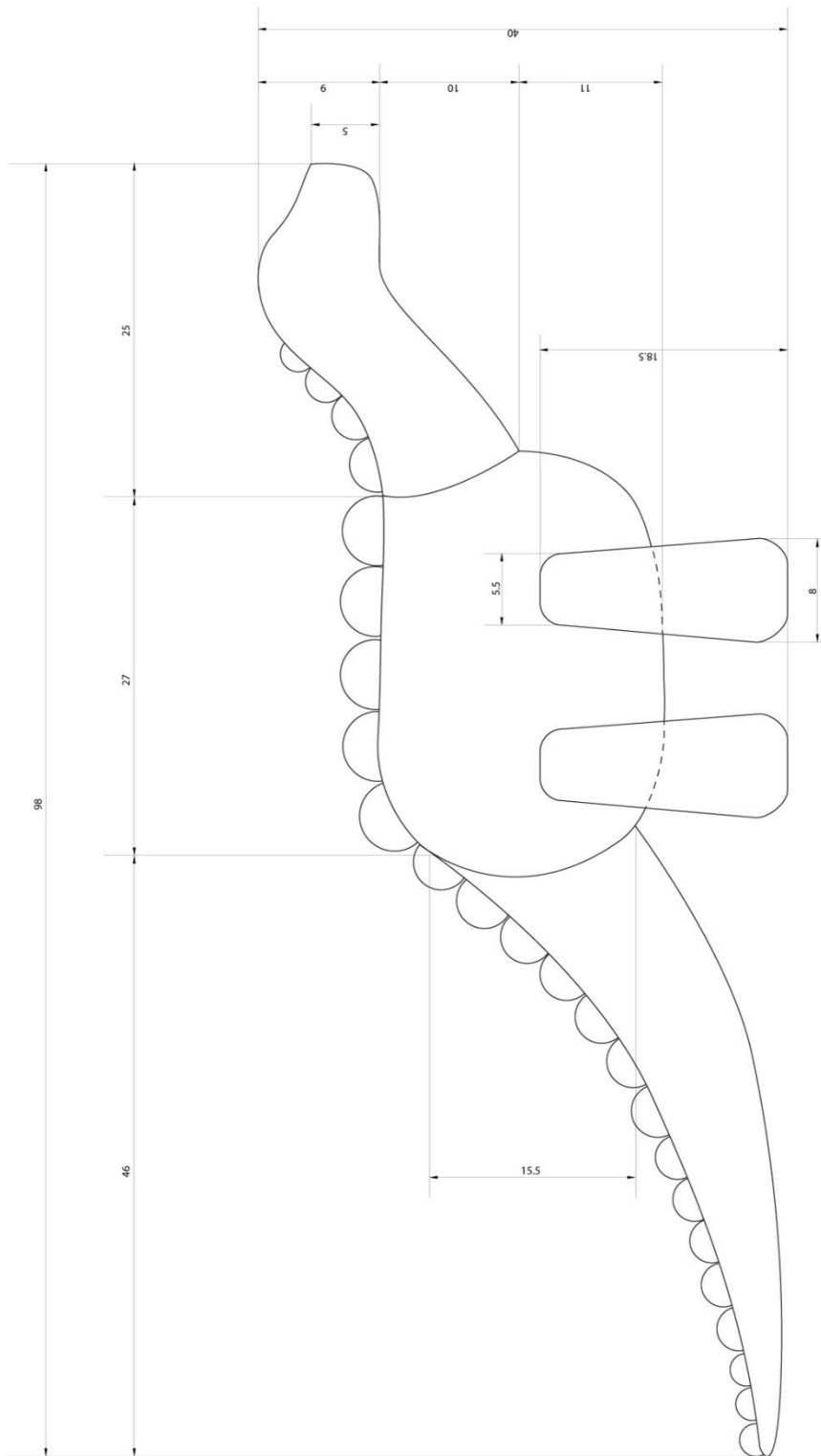


Figure 90 Mechanical drawing of *Siamosaurus suteethorni*



Sirindhorna khoratensis
Unit : CM
Scale : 1:2

Figure 91 Mechanical drawing of *Sirindhorna khoratensis*

The first step in starting production is make the fabric surface according to the various patterns already specified. Then start laying the pattern in the proportion specified onto the fabric with a needle then cut and then sew together each piece stuffed with special polyester fiber That can be used for children by having a soft fiber texture Finer than general.



Figure 92 Smocking techniques pattern



Figure 93 Crosheting techniques pattern



Figure 94 Set of block and set of Texture nosaurus



Figure 95 Removable parts

The seeing and touching sensory provides a perception of quality, light, color, depth of an object by awakening our nerves because the body is ready to perceive. (Nimkulrat, Kane & Walton, 2016)



Figure 96 About product

Movement, understanding and exploring how body and its capacity for different actions. (Park, 2019)

Social interactions, are an important component of nearly every aspect of our lives. The development of skills begin and continues to evolve as an individual grows and develops. (Alber, 2018)

Creative play, using different mediums to explore their specific and unique qualities. (Park, 2019)

Texture nosaurus : about product

Movement. understanding and exploring how body and its capacity for dffernt actions.(Wenna Park, 2019)



Social interactions, are an important component of nearly every aspect of our lives. The development of skills begin and continues to evolve as an individual grows and develops.(Joni Alber, 2018)



Creative play, using different mediums to explore their specofic and unique qualities.(Wenna Park, 2019)



Figure 97 About product

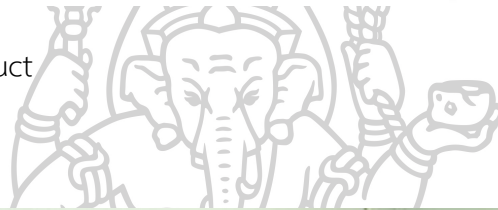


Figure 98 Texture nosaurus



Figure 99 Physical Development while playing.

Shows how to use Gross Motor to jump over each block. It is a practice of balancing on various surfaces and at the same time, children playing with a dinosaur doll have to use both their arms and legs to support them in order to be able to balance on the dinosaur doll.



Figure 100 Cognitive Development while playing

This section shows creativity, problem solving in entrepreneurship towards the creation of dinosaurs in their own way. In which each dinosaur doll will have a tail and arms that can be disassembled so that players can assemble create dinosaurs as they wish in which players must learn to disassemble, find solutions to problems if each assembly has different difficulty



Figure 101 Emotional Development while playing

while playing get from playing this set of toys is with both fun learning and may have to face resentment or obstacles to play in which the players must try to play and find solutions to immediate problems in the future such as bringing each doll to put on since all work is handicrafts therefore there are some limitations with the work especially the issue of supporting too much weight or the center of gravity is not equal if players do not control their balance well throw the weight down on all dolls can contribute to falling and rolling although he felt injury but players must have emotional control. Learn to fit the weight in order to be able to sustain or even handling, if not placed properly remembering to put it in difficulty



Figure 102 Social Development while playing

This toy is well supported in terms of social development because children are more fun to play with friends than playing alone. Children will exchange ideas between blocks, help each other during transportation some blocks are designed to be the longest for arm range of the child may be not comfortable when the child is carrying but the purpose is in order to help each other to hold and carry that block together and assembling each dinosaur piece together if players help each other to make the assembly easy and exchange ideas. Working as a team as well.

The finding result child development were as follow; for Physical Development was found on 5 = Excellent next is topic of Cognitive Development was found on 4=Good. Emotional Development was found on 3=Average. Social Development was found on 4=Good. And An overview of the interesting sets of toy “Texture nosaurus”. From the handicraft process which is developed to be further developed into toys to promote development for preschool children aged 2-4 years was found on 4=Good.



All data that have collect from the method can arrange the discussions in to the proper diagram below.

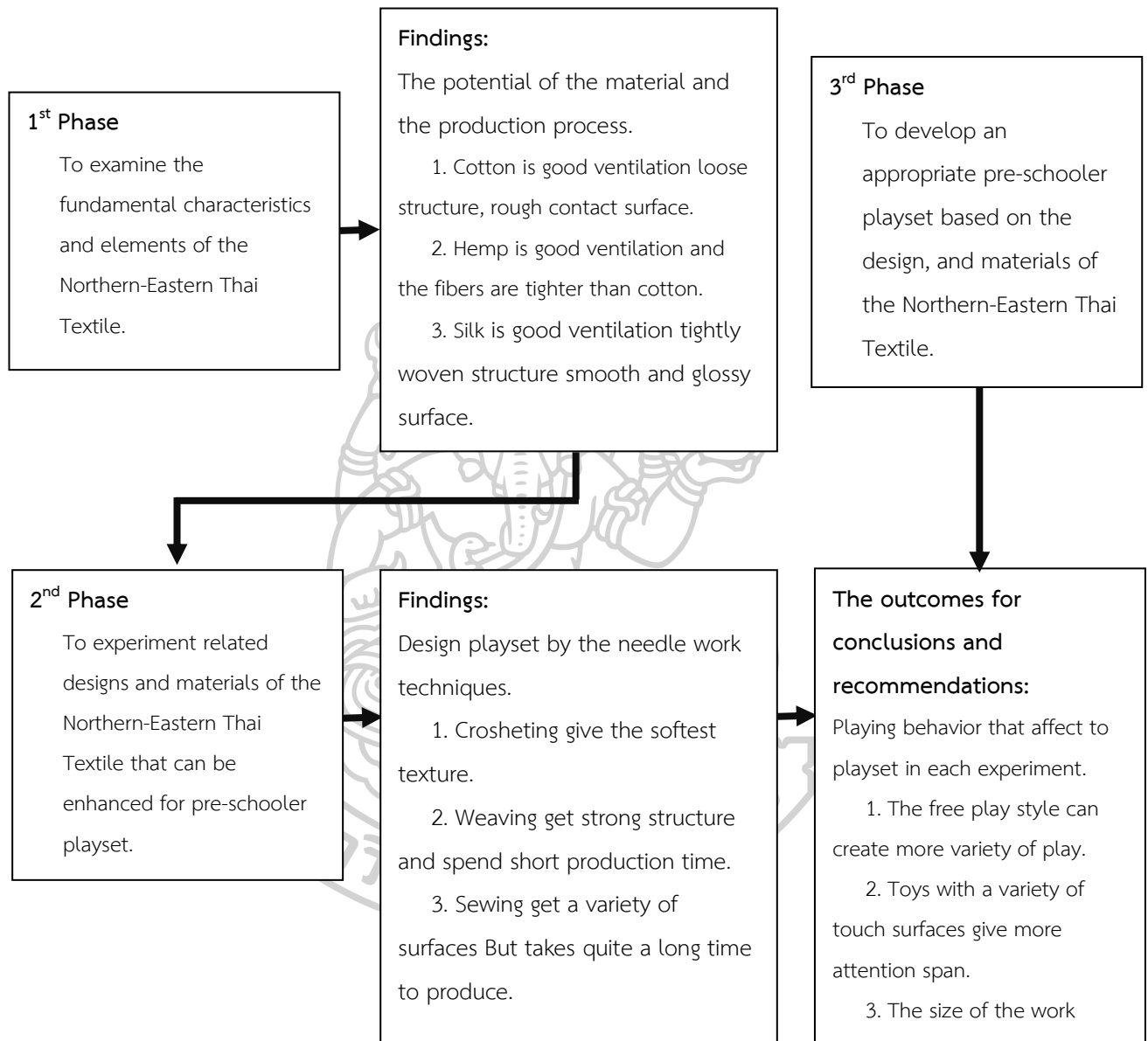


Diagram 6 Summary of data from method.

Chapter 5

Conclusion and Recommendation

The last part of this research is a summary of all work content both in terms of data analysis in various fields associated to summary of the final design and recommendations for those interested or ways to further research in the future.

5.1. Conclusions

5.1.1 Conclusion of literature review

The first research it is about making toys using the LCE model (one combining Literature, Craft and Ethic-moral education) method. In this research, children are asked to draw, design, and create characters themselves. Then in the art of creative crafting produce that image in 3D, which during production children will learn to solve problems. Resulting in new creativity in a holistic craft model in which learning and solving problems by using handicraft methods together Interesting and consistent with this research by using crafting methods to create pieces and communicate the work out to the children learn and play. Other than that, the process during production causing immediate problem solving, allowing children to learn and new ideas arising during problem solving making it a concept to design a toy set to be a free-form toy can have the extension of creativity during playing by the style of play although choosing to use how to play free style as the main format but some parts also have the form of construction play as well to create a thought process systematic problem solving while playing which can be observed from the work pieces that players created in the following order.

The second research is about the creation of 3D model toys or art toys by talking about the production model of the products in the market today that there is a production process. By using many industrial production processes but at the same time having a small market online sales using DIY defined as an artistic movement today, "urban toys or vinyl's, art toys" are evolving with do-it-yourself (DIY) projects

and are contribute DIY culture, which demonstrates the need for crafts. That is more widely accepted in the toy market therefore, the process of expanding the handicraft using local materials will be a new marketing channel for the entire toy product group and local raw material groups as well.

The third research is about textile design by integrating various engineering processes to achieve a more dynamic quality of textiles. This work contributes to the introduction of textiles as material for interaction design and focuses on spatial and temporal design of the dynamic elements of textiles - the elements that enable interaction. The result is various interactive textile material examples which are meant to inspire new expressional uses of textile materials that demonstrate the importance of textile textures. Important to the feelings of users even though it is a technological use but the feeling of touching the surface is still important was the inspiration for this research although there are additional functions, the importance is the surface that the user or the child can experience and feel.

5.1.2 Conclusion of the Experiments

Each experiment is done to answer the questions and the objectives of the research which can be explained as follows

1. To examine the fundamental characteristics and elements of the Northern-Eastern Thai Textile. In the matter of this local material upon entering the study area and surveying, it is found that the most popular fibers in the northeastern region consist of Cotton, Hemp and Silk. From the (SEM) test, inspecting the structure of each type. In order to be aware of the fact what each fabric's properties look like aside from the visual test from doing this try, found that transferable fabric the best ventilation is cotton because of its large fiber size causing more space between the lines better air flow the accumulation of dust is less suitable for use as a toy for children because some children of this age may still be accustomed to bringing things into the mouth if the doll is made of cotton spotted with saliva will dry faster because the fabric structure has more space between the fibers for various techniques used to create contact surfaces summarized from the local industry of local people it can be concluded that Needle works consist of sewing, knitting and weaving.

2. To experiment related designs and materials of the Northern-Eastern Thai Textile that can be enhanced for pre-schooler playset. In this section, the researcher has designed a set of basic toys in order to let the children who are the data group to play with the researchers, parents and teachers to observe complete with an evaluation form and questionnaires on some issues, questioning parents and teachers about the information and recommendations on the production methods of toys by applying the surface construction on local textiles surface as well the feedback from the questionnaire came out well, most informants agree and support the creation of children's toy designs from this method and material, making it safe and wanting to support products that use local materials. In response to the child's play from the observation that most children dare to handle toys manufactured craft method by feeling safe once it is soft children will play more comfortably and confidently. The form of skin that children like and attracts the most is the active touch skin. When seen, it will be interesting to reach out to touch immediately and compare match with items that have similar surfaces it is learning from previous experiences that have been seen before.

3. To develop an appropriate pre-schooler playset based on the design, and materials of the Northern-Eastern Thai Textile. To achieve complete research results therefore, Before reaching the final design stage there have been many previous experiments mentioned above. The researchers have summarized the results of all of the above experiments and bring important issues suitable for learning taking to develop further in the production of work for the community to design as a toy set "Texture nosaurus" the design of the work has been tried to see the feedback and the basic benefits that users will receive according to the criteria of development for children with evaluation criteria on each side according to the development framework in all 4 areas Physical Development, Cognitive Development, Emotional Development and Social Development according to the standard of early childhood curriculum the evaluation results comes from the teachers who controls during children's play there were 30 children who gave information, divided into 3 groups, 10 person per group, each group took 30 minutes to play.

5.1.3 Conclusion of materials

From the topic of this research the design issues can be divided into 2 major points: the development of techniques and raw materials from the north-eastern region to develop and expanded to benefit in another way that is to design as a toy set. Because the creation of various textures on the fabric causing different kinds of touch by that touch it is very important for the development of children between the ages of 2-4 years, so it is very suitable to be designed and developed as a toy for children. Can summarize important aspects of design into topics as follows.

1. Local material and techniques The spinning of the fibers in an extra large size suitable to be produced as a large piece rather than a small piece due to the tightness of the fabric. Makes the fabric easily fuzzy the structure is not tight enough but will have a strange and different texture makes it more interesting.

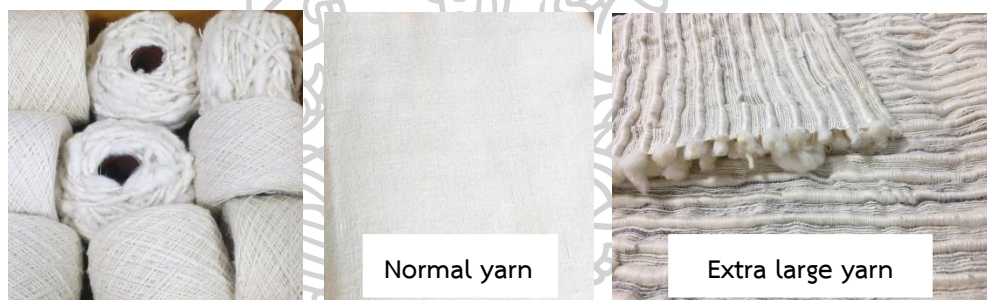


Figure 103 Normal yarn and Extra large yarn

The techniques for sewing there are observations from the experiment and the production process found that after successfully creating a textile surface in order to obtain beauty and durability before placing the pattern to cut on the fabric, place another piece of fabric on the fabric that created the surface first then laying out the drawings and drawings to sew and sew together the edges, uncover another layer for the strength of the structure, the pattern created on that fabric



Figure 104 The techniques for sewing

2. The development of children between the ages of 2-4 years from all experiments found that having a good playing style has a profound effect on the appeal of toys including how to take care of a parent, guardian or teacher involved in bringing children to play with each toy set size and color also influence your interest but depending on the style of play some forms do not have to be large toys that can be fun while play together with many people such as experiment 5th "Dino quest and Dino land" but some forms of play the size also affects the child's attention such as the 4th experiment "Music book" with a limited size resulting in limited access to the product as well and the method of playing is limited to those who have experience know those stories before you can understand and play. Application to other stories or other activities is limited with the initial elements based on the story content that inspired the story, so choosing concepts, how to play, size affects children's interests.

5.1.4 Conclusion of research

From all the previous experiments above until observing the feedback from the final work, it can be summarized as the introduction of local materials craft production process and the playing style of the toy set designed can affect the development of children as follows;

1 Local materials is suitable to be produced as a toy of some kind depends on the size the production process that is chosen to be suitable for the design but how to play as well.

2 Dyeing with natural colors has a soft tone which is suitable for Waldorf education methods that focus on children learning from playing using natural materials using natural color tones

3 Exploring when a child has been found a new surface that is different from before or never seen before children will learn from exploration which will start from observing with the eye using a hand grip and learning to remember, because when children have become familiar with toys with different textures found that children are more matching items with similar surfaces together

4 Style of play although construction play will make playing a clear step there is a systematic thinking and children will have a goal of playing each time. But playing with free style is also important with this free play children will be able to continuously expand their ideas from playing to unlimited, resulting in new creativity and can change can change the style of play in the future.

5 Regarding to the duration of play, the attention span continues from free style play referring to the 3rd experiment "Sensory Craft Ball" although it is just a simple knitting ball without any additional functions only the style of play can be adjusted continuously according to the situation and have different textures makes the imagination of players and the game leader continuously playing resulting in longer playing time increase interest in toys allowing children to focus on playing doing activities for longer than before.

6 Connection to previous experience refer to the 4th experiment "Dino Land" that uses simple truncated shapes used in production but has added differences in texture and color, allowing players to imagine themselves as what that toy is. Some of the shapes are reduced to not be similar to the images of dinosaurs that children know but because of the color, texture, combined with the previous experience that has been seen learning various things, causing the child to expand on the idea that the pink doll is a pig, the yellow doll is duck or even dinosaurs with long mouth shapes and triangular surfaces have to be ferocious, using their mouths as weapon such as knife, sword or dinosaur with blue color must live by the lake.

7 Playing the role play by observing the playing behavior, this set of toys has been passed down to participate in creating a variety of blocks and imagine

to be like their house, ride dinosaurs while they are here as their own or as their own dinosaurs. In the past, for example, boys would like to fight with each other. Girls would like to play with them more like dressing up for dinosaurs.

5.2 Recommendation

For suggestions the development of experimental results from this research continued in the future. The researcher has recommendations from analyzing all experimental results and recommendations from research experts in various processes, the issues can be summarized as follow.

5.2.1 Natural materials of course, nature is good and environmentally friendly, especially dyeing with natural color that do not use chemicals but there are recommendations dyeing with natural colors must have well study in each type of natural fiber because some fibers like certain plants and dyeing with that natural color often cause color fouling while washing or even while in use especially in dark tone therefore, should be washed many times before using for the color that doesn't penetrate into the fibers as much as possible will wash out.

5.2.2 Although toys made from fabric are safe And the surface is different from other materials applying various surface building methods can be done by just changing the pattern choose to suit various shapes will make the work consistent with the shape, color, and texture details.

5.2.3 Maintenance because most soft toys are easily stained if used as a public toy may cause the toys to stain easily Therefore, should pay attention in terms of maintenance during use.

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VITA

NAME Nantiya Na nongkai

DATE OF BIRTH 01 May 1983

PLACE OF BIRTH Bangkok

HOME ADDRESS 264/112 Grand miracle Tambon Chaimongkol 304 rd.
Mueng Nakornratchasima 30000

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