DEVELOPING CHILDREN'S CREATIVITY THROUGH MURAL ARTS

BY

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Abstract

When it comes to color theory or color psychology, both small graphic design shops and big architectural industries tend to create various color palettes that support the aesthetics of a product which is a collective presumption of how colors affect the looks expressed or the emotions perceived. Despite the market growth, this research aims to use the power of color as an advantage to benefit people (Birren, 1961). Another study shows that early childhood before age 6 is the most creative age to achieve anything. (Land, 1968). A mixed-method approach is conducted based on qualitative, quantitative, and case studies by (1) testing color-emotion combinations in early childhood, (2) surveying creativity-boosting toys in the international market, (3) and conducting case studies on children in differently colored rooms to compare results. It is to enhance both emotional intelligence and creativity during the coloring process. It is designed for one or more children to let them interact and play with colors. Schools and parents can install this in a space where children can play to improve creativity in the early childhood stage, contributing to children's toy industries through solid market research and creating a product design that is effective and affordable products for potential customers.

(Total 79 pages)

Keywords: Mural Arts, Emotion, Color Therapy, Creativity, Educational, Psychology

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Chapter 1

Introduction

1.1 Background of the study

The background of this research centers on exploring the psychological effects of color and creativity in early childhood. Through centuries of research, from Isaac Newton's groundbreaking findings to the present, color theory has clarified the significant impact of colors on human emotions and behaviors. However, empirical research on color's psychological effects is still scarce, indicating a gap in our knowledge of this phenomenon despite color's pervasiveness. Simultaneously, the discussion surrounding creativity in education—especially considering East-West dynamics—highlights the need to accept a variety of viewpoints and approaches to successfully foster creativity. Since a lack of creativity makes it difficult for more than half of Thai students to apply basic concepts to real-life situations, it is critical to address this problem. Through the integration of these two fields, this study seeks to advance our understanding of color psychology while also suggesting creative pedagogical approaches to improve creativity and rectify Thailand's educational deficiencies, opening the door for extensive educational reforms.

1.1.1 The Study of Color

As it exists today, color theory is the result of concepts that numerous scientists and artists have been working on for centuries. Isaac Newton, who discovered the color spectrum in 1666 by passing sunlight through a prism, is a significant figure in its development, though. The first color wheel was then made by

him by arranging these colors in a closed loop. This was subsequently developed by Johann Wolfgang von Goethe, who examined the psychological effects of color in his book "Theory of Colors" published in 1810. On the other hand, color psychology is the study of how distinct colors affect human mood and behavior. However, color psychology is the study of how distinct colors affect human mood and behavior. Researchers Andrew Elliot and Markus Maier found that even though colors are everywhere, there's not much scientific study on how they affect our minds. They discovered that most of the research done on color psychology is driven by practical needs rather than thorough scientific investigation. This highlights a gap in our understanding of how colors influence our thoughts and feelings.

In a study from 2020, researchers discovered that people often link specific emotions to certain colors. The study involved 4,598 participants from 30 different countries. Warm colors like red, orange, and yellow, found in the red part of the color spectrum, are associated with feelings of coziness and warmth, as well as enmity and rage. On the other hand, cool colors like blue, purple, and green, found on the blue end of the spectrum, are linked to calmness, but they can also be connected to feelings of sadness or apathy. The researchers suggested that these color-emotion connections might have universal traits, which could help communication by sharing common meanings.

1.1.2 The Study of Creative Education

A lot of research has investigated the differences in creative education between the East and the West. Some studies compare creativity education features from a Western perspective, while others identify an Asian concept of creativity that is similar to the Western one. Yet, interpretations of the concept of creativity education may differ depending on the social painting setting (Reilly, 2011). While the widely acknowledged interpretation of creativity is rooted in Western values and concepts, it

can undergo modification or constraints within distinct cultural contexts (Cheng, 2011; Craft, 2003; Niu & Kaufman, 2013). In Asian countries, which exhibit cultural distinctions from the West, creativity is likely to be comprehended and applied in ways that deviate from Western perspectives (Kwang, 2004; Wu, 2010). However, these studies often view the East and West as opposing extremes and do not fully show the diverse and complex ways the Western idea of creativity has been integrated into Asian culture. As a result of globalization, many countries are coming to share a common language for articulating educational perspectives, problems, and solutions through international discourses (Hartley, 2003). In line with this trend, education reforms aimed at fostering creativity prevail globally; cultivating creativity has become a dominant discourse for education reforms in many countries. As a result, creativity can be perceived as a universally applicable concept, regardless of diverse social and cultural backgrounds.

However, educators in the East are not able to provide enough opportunities for those students in need of developing abilities in creativity since they are not exposed to new methodologies.

1.2 Significance of the Problem

More than half of 15-year-olds in Thailand faced challenges applying math and science concepts to daily situations due to low levels of creativity. The deficiency in Thailand's education system, particularly in the application of knowledge to real-life scenarios, stemmed from an outdated curriculum that had seen minimal changes over the past two decades. To enhance students' capabilities and nurture comprehensive competencies, the education system should have prioritized the development of a well-rounded combination of knowledge, skills, attitudes, and values, rather than solely focusing on one aspect. (Permjit, 2023). Additionally, the introduction of new laws, according to a Chula academic, might have inadvertently constrained children's

curiosity and freedom. The legislation mandated that students aged 6 to 12 learned about their rights and duties, national pride, religion, monarchy, constitutional monarchy, the Sufficiency Economy Philosophy, future planning, and proficiency in various subjects including math, science, technology, computers, languages, culture, and history. It also expected them to start exploring career choices at this early age. This issue suggested a critical gap in the current educational approach, emphasizing the need to explore innovative teaching strategies and interventions that foster creativity. (Blauw, 2021)

This issue suggests a critical gap in the current educational approach, emphasizing the need to explore innovative teaching strategies and interventions that foster creativity.

1.3 Research Objectives

1.3.1 Objective 1

To study color therapy & mural art properties to enhance and develop creative expressions for young children aged 3 to 5.

1.3.2 Objective 2

To develop a mural painting set using therapeutic colors that help boost creativity in kids.

1.4 Research Questions/ Assumptions

1.4.1 Can therapeutic colors be used for enhancing creativity through mural arts?

1.4.2 What are the ways of fostering creativity and learning to be developed in early childhood?

1.4.3 Can a conceptual mural painting set be designed that helps children develop creativity before the age of 6?

1.5 Research Framework

Table 1.1 Research framework

Research objectives	Research questions	Research methodologies	Research outcomes
To study color therapy & mural art properties to enhance and develop creative expressions for young children aged 3 to 5	What are the main ways of fostering creativity and learning in early childhood?	Literature Reviews	Painting activity with colors can develop creativity for early childhood with accurate guidelines for kid safety, eco-friendly, educational toy for creativity
To develop a mural painting set using therapeutic colors that help boost creativity in kids	Can a conceptual mural painting set be designed to help children develop their creativity before the age of 6?	Qualitative Pre and Post Assessments	A research-based design of conceptual mural painting set for 2 children to play together.

Source: Researcher

According to Table 1.1, exploring color therapy, the qualities of mural art, and the best ways to encourage creativity in young children (ages 3 to 5) are all part of this research project. A thorough literature review is also included. The foundation of this synthesis of knowledge is the creation of a novel educational tool, a creative kit based on color therapy that consists of two essential parts. First, there is a carefully selected painting set with a color palette that has been chosen to elicit feelings and meanings that correspond with the developmental stages and cognitive capacities of the children.

This color scheme, which is based on case studies and empirical research, aims to build children's emotional and cognitive capacities while also boosting their expressive and creative abilities. The second part is an open-play collaborative mural painting set that correlates with age-appropriate literature and customized features to foster reasoning, creativity, and imagination. After conducting a pre-and post-survey of the prototype, a product design is created that serves as a model for developing entertaining and engaging products that foster creativity in the global children's industry.

Thus, these products will be integrated into children's environments to support creativity and holistic development during the critical early childhood years.

1.6 Definition of Terms

Early Childhood The term is used to describe the stage of human development that begins at birth and ends around the age of eight. Significant development and growth in many areas, such as the physical, cognitive, emotional, and social domains, characterize this stage. It is a crucial period for the establishment of fundamental knowledge, abilities, and attitudes that painting set the stage for later learning and well-being.

Creative Expression The process of communicating ideas, feelings, thoughts, or experiences through a variety of imaginative or artistic mediums. It includes a broad range of pursuits and formats including literature (such as writing and poetry), performing arts (such as dance, music, and theater), visual arts (such as painting, drawing, and sculpture), and multimedia (such as digital media, film, and photography). Originality, inventiveness, and individuality are all components of creative expression, which enables people to express themselves honestly, explore their creativity, and interact with others in fresh and meaningful ways.

Chapter 2

Literature Review

This chapter considers the concepts for a fundamental research project framework and compiles several recent case studies of project-based methodologies, early childhood color associations, toys for creativity, and creative activities.

2.1 Color Psychology Theory

Color is psychologically and physiologically beneficial and may be put to effective human service. (Birren, 1961).

According to this theory, color can be used to enhance human well-being in a physiologically and psychologically beneficial way. In Zachary Gray's Industrial design thesis book, she explains about how each color has its emotional effect on individuals. Some colors are thought to cause physical effects as well (Gray, 2010). For instance, red has been shown to raise blood pressure, speed, respiration, and increase heart rate. "Color is physiologically and psychologically beneficial and may be put to effective human service" (Birren, 1961). Yellow communicates happiness, but people are more likely to lose their temper in a yellow room. Crimson can make some people feel irritable whereas blue brings down blood pressure. Blue is calming, relaxing and serene. Green is the most restful color for the eyes. It's considered a balanced color, neither causing anxiety nor overly depressing (Gray, 2010).

Every culture in the world has a significant influence on how people view color in day-to-day life. (Gray, 2010). For example, red is associated by Americans

with anger, danger, and love. Red is a color of celebration and good fortune in China and purity in India. White is associated with purity and calm, but in Japan, white carnations are symbolic of death. Red, blue, and yellow are the three primary colors; no other color can be made by combining them. However, with the right use of hue, saturation chroma, and value, they can create any other color in the visible spectrum.

2.1.1 Color Properties

Numerous studies have indicated that the mood-altering properties of color may be transient. According to Birren (1961), "to state a principle, it seems that the immediate action of any color stimulation is followed in time by a reverse effect." In general, the warm half of the color spectrum—yellow, orange, and red—has an aggressive quality to it and elevates people's emotions nearly to an unstable, uncomfortable level. Cool hues like violet, blue, and indigo have a calming, almost melancholy quality. Faber Birren describes contemporary American color associations in his book 'Color Psychology and Color Therapy'. From the general appearance of each color and its direct associations to the impartial perceptions one has of a single color.

Table 2.1 Modern American Color Associations

Color	General Appearances	Mental Associations	Direct Associations	Objective Impressions	Subjective Impressions
Red	Brillant, intense, opaque, dry	Hot, fire, heat, blood	Danger, Christmas, Fourth of July, Valentine's Day, Mother's Day, Flag	Passionate, exciting, fervid, active	Intensity, rage, rapacity, fierceness

Table 2.1 Modern American Color Associations (continued)

Orange	Bright, luminous, glowing	Warm, metallic, autumnal	Halloween, Thanksgiving	Jovial, lively, energetic, forceful	Hilarity, exuberance, satiety
Yellow	Sunny, incandescent, radiant	Sunlight	Caution	Cheerful, inspiring, vital, celestial	High Spirit, health
Green	Clear, moist	Cool, nature, water,	Clear, St. Patrick's Day	Quieting, refreshing, peaceful, nascent	Ghastliness, disease, terror, guilt
Blue	Transparent, wet	Cold, sky, water, ice	Service, flag	Subduing, melancholy, contemplative, sober	Gloom, fearfulness, furtiveness
Purple	Deep, soft, atmospheric	Cool, mist, darkness, shadow	Mourning, Easter	Dignified, pompous, mournful, mystic	Loneliness, desperation
White	Spatial light	Cool, snow	Cleanliness, Mother's Day, flag	Pure, clean, frank, youthful	Brightness of spirit, normality
Black	Spatial darkness	Neutral, night, emptiness	Mourning	Funeral, ominous, deadly, depressing	Negation of spirit, death

Source: Birren, 1961

2.1.2 Color as Therapy

Based on the theory of how colors can be used for people's benefit, color therapy must be included. Color therapy is based on the idea that colors create an electrical impulse in our brain, which stimulates hormonal and biochemical processes in our body. These processes either stimulate or calm us (Azeemi, 2005). Color and the sensitivities of sensible designs are closely related; this is supported by color manifestations in a wide range of fields, including image consulting, color therapy, and color meditation, in addition to product, interior, and marketing design. Due to each color's distinct wavelength, it not only highlights the appearance's psychological attractiveness but also stimulates the body and mind. As a result, human emotions are highly sensitive and respond most strongly to color variations.

Similar studies on the connections between color and other elements and human emotions have been conducted extensively. Human emotions are more subjective, according to the findings, and Cacioppo and Gardner state that "the measurement of emotions is a very bustling research field." (Wills, 2013). Nonetheless, this is a complementary therapy that dates back a few years and is practiced in China, Egypt, and India. The therapy specifically uses different wavelengths and energies to treat different parts of the body, including any abnormalities. In addition to correcting bodily part imbalances, the therapy aids in the rebalancing of the seven chakras (Gupta, 2021).

Table 2.2 Physiological Benefits of Color Therapy

Color	Benefit
Red	Activates the circulatory and nervous systems.
Strong Pink	Acts as a cleanser, strengthening the veins and arteries.
Pink	Activate and eliminate impurities from the bloodstream.
Orange	Energizes and eliminates localized fat. Helps address asthma and bronchitis.

Table 2.2 Physiological Benefits of Color Therapy (continued)

Strong Yellow	Strengthens the body and acts on internal tissues.
Yellow	Reactivates and Purifies the Skin Helps with indigestion and bodily distress.
Green	Acts as a nerve relaxant.
Strong Green	Provide the infectious antiseptic and regenerative stimulation.
Strong Blue	Lubricates joints. Helps address infections, stress and nervous tension.
Blue	Stimulates muscle and skin cells, nerves and the circulatory system.
Indigo	Helps address eye inflammation cataracts. Glaucoma and ocular fatigue.
Violet	Relaxes the nerves and lymphatic system. Addresses inflammation and urinary illness.

Source: Gupta, 2010

Peterson has quoted “Color has a great impact on us. Color plays a major role in setting up a particular mode of mind. Colors are wavelengths of electromagnetic energy, are part of the visible spectrum, and are reflected by or from a certain object. Color is a part of our everyday life. The color is everywhere around us. If everything is there on the earth, there must be some reasons. So, color is no exception” (Peterson, 2006).

2.1.3 Walls with Colors

A large space lets the mind expand and allows building more creative fluency (Fischer et al., 2005; Katja, 2017). In terms of huge spaces filled with colors, the concept and category of murals are also known as decorative wall paintings. It is a circle formed on the natural or artificial wall surface by color painting, sculpture, and other modeling techniques, focusing on the decorative building's interior surface.

Murals often cover large surfaces, providing artists with an expansive canvas to express their ideas. The scale allows for impactful visuals that can transform and energize public spaces. Traditionally murals were intended primarily to beautify public or private spaces.

However, murals have also become a medium to express themselves freely and to paint out their imaginations as a community. Large-scale artworks are created directly on walls or other permanent surfaces as a form of visual expression is also known as mural art. (Sahabuddin, 2024) Large murals that frequently cover entire walls or building facades are what define them and because of their large size, artists can produce visually striking and immersive experiences that are impossible with smaller canvases (Sahabuddin, 2024).

Murals are frequently used as public art forms for both pragmatic and strategic reasons, but the main draw for doing so is that the art not only gets displayed in the city but also becomes an integral part of the city (Gillette, 2010). They can be found everywhere, including multi-story buildings, subways, and under bridges. These are all places that are already a part of the city's identity, but now they are distinguished by their artistic beauty. (Gillette, 2010) According to Michael Benson, effective community-based art never stops developing in the mind because it gives real voices a platform, makes real communities' struggles and dignity palpable, and fosters genuine conversations across racial and class divides. Mural art is one of the uncommon types of art that can be incorporated into practically any structure or space that can be used as a canvas. (Benson, 1995)

By utilizing the characteristics of murals, a combination of research-based therapeutic colors to enhance creativity will be more productive compared to normal painting processes.

2.1.4 Color-Emotion Case Study

In Zentner (2001) research, in kindergartens and early elementary classrooms, manipulative materials (such as Cuisenaire Rods and Pattern Blocks) play a significant role in children's learning, enabling children to explore mathematical and scientific concepts (such as numbers, shapes, and sizes) through direct manipulation of physical objects.

Human color vision is essential for more than just differentiating objects; it permits the perception of fine details and gives chromatic stimuli significance and importance. Although the main purpose of this sensory ability may be to differentiate between various objects, it also allows us to attach emotional meaning to colors. (Zentner, 2001) The fact that people consistently assign emotional qualities to colors in addition to exhibiting particular color preferences is a prime example. school age onwards (Boyatzis 1975; Guilford, 1959; Karp, 1988; Meerum, 1995; Valdez, 1994; Whitfield, 1990) Remarkably little is known, nevertheless, regarding the early formation of perceptual attractiveness and the emotional meanings associated with colors, apart from research on color discrimination in infancy (Adams, 1987; Bornstein, 1975; Werner, 1979).

Research on young children's comprehension of metaphors provides more proof. Since "anger is like red" and "sadness is like blue" share the characteristic of a metaphor, which is a "similarity between objects and events that violate children's conventional categories," one could classify analogies like these as metaphors (Vosniadou, 1987). That being said, it is widely accepted that young children can understand metaphors (Gardner, 1986; Vosniadou, 1987). Additionally, it has been discovered that this capacity is brittle, particularly regarding metaphors that explain psychological concepts like emotions. (Winner, 1976).

But more research indicates that even young toddlers may have a basic intuitive understanding of emotional metaphors (Waggoner, 1989). Finally, studies have demonstrated that preschoolers are quite skilled at accurately and consistently

projecting their emotions onto inanimate stimuli like music (Zentner, 1999) or museum art (Callaghan, 1997). Long acknowledged (Werner, 1967), that children's comparisons of psychological traits to inanimate objects were frequently explained away as unintentional classification errors or the product of their imagination. A preoperational child's animosity in thought (Chukovsky,1968; Piaget, 1962) Still, animism and magical thinking do not account for the consistency of the results, even though they may make it easier to extract emotional information from inanimate stimuli.

People arranged their sensory information according to certain fundamental dimensions starting in their early years (Osgood, 1957). In more detail, both modality-specific processing would be part of the perception of an event. as well as on a more fundamental amodal dimension (like possessing a specific color or emotion). (For example, varying in intensity or pleasantness). The key to understanding why, even in the case of very young children, analogies between perceptually and/or categorically dissimilar phenomena can occasionally be drawn with a striking degree of consistency lies in this view, which proposes that some translation of modality-specific input into an amodal code is occurring (Collier, 1996; Gardner, 1974; Gardner, 1986; Marks, 1987; Smith, 1992;).

Since colors can be described using a set of similar abstract dimensions, they make an interesting variable for the investigation of this hypothesis. To the fundamental characteristics that characterize emotions (Osgood, 1957; Russell, 1980). Parallel to this explanatory framework (Meerum, 1995), a hypothesis was subsequently put forth and partially supported: color and emotions could be related to one another because of the preference (valence) each is accorded within its own domain.

Apart from theoretical concerns, there is also a practical interest in how young children respond emotionally to different colors. Gender stereotypes, like 'pink is for girls, blue is for boys,' are commonly used by advisors and parents. Clinicians claim to understand the emotional importance of colors for young children, but there is limited

knowledge of how they feel about them. Additionally, experimental studies with toddlers and preschoolers often use color stimuli such as toys and animals, without considering the potential impact of different colors on young children's attention and behavior.

Table 2.3 Color-Emotion Combinations in Early childhood

	Red	Yellow	Blue	Brown	Green	Black
Happiness	30	24	16	9	12	12
Sadness	19	9	30	17	12	16
Anger	19	19	23	14	13	15

Source: Zentner, 2001

In this experiment, they conducted a case study on kindergarten with a color-emotion test that resulted in 68.1% manifested in bright preference according to table 2.3. In contrast to the developmental consistencies in the emotional connotations of blue and yellow, differences emerge for black and red. Having demonstrated that young children can detect consistent relationships between colors and facial expressions of emotions.

This determines how we can survey kindergartens' color-emotion preferences to develop a color palette that can not only be therapeutic but can develop creativity by using these colors.

2.1.5 Facts of Emotion

It is implied that creativity is domain specific in the previous section. This suggests that people in a variety of professions possess the capacity to apply creative thinking in a special way to their work. There may be a connection between an employee's increased creativity and improved job performance and the success of the business. As such, it would be in the best interests of managers and business owners to uphold a morale-boosting work environment (Gray, 2010).

Robert. Lord Richard J. The book Emotions in the Workplace was edited by Ruth Kanfer and Klimoski. This book describes various emotional models. When a psychologist is interested in comprehending a particular behavior or group of behaviors, the primary emotion's view can serve as a useful theoretical basis. However, another perspective contends that "all emotional experiences are combinations of a few dimensional ingredients" (Lord, 2002). Valence and arousal are used as the longitudinal and latitudinal dimensions of the so-called "dimensional view".

Anger, for instance, is regarded as a negatively valenced, high arousal emotion, much like anxiety, fear, disgust, or distress. Individuals who encounter a single high-arousal negative emotion are frequently prone to experiencing additional ones. According to Lord, Klimoski, and Kanfer (2002), the Dimensional view is based on the idea that most processes that affect or are affected by emotions are "sensitive to broad classes of emotion, such as the high-arousal negative emotions, and are not diagnostic of specific emotions.". A model of the circumplex has been made within the dimensional view to show its properties.

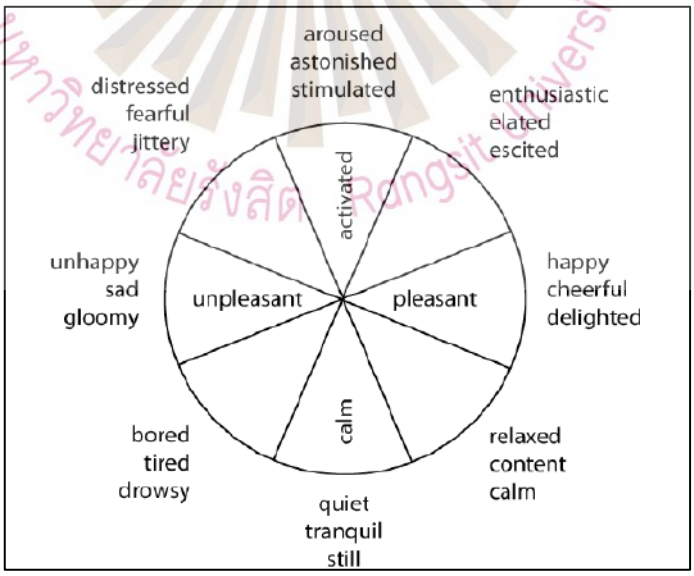

Figure 2.1 The Affect Circumplex Model

Source: Lord et al., 2002

According to figure 2.1, four dimensions are described as unpleasant, activated, pleasant, calm. To encourage children's emotions, circumference between activated and pleasant includes aroused, astonished, stimulated, enthusiastic, elated, excited, happy, cheerful and delighted that are the most suitable selections to further develop a design as an outcome from this research.

2.2 Creativity Theory

When people engage in creative activity, their thoughts and actions are guided by the personal definitions of creativity. (Plucker & Runco, 1998).

According to this theory, when people engage in creative endeavors, their unique interpretations of creativity influence their thoughts and behaviors. Those with creative minds might intentionally use color to guide and inspire their work in this environment. It seems from this that color therapy can help create an environment that inspires creativity and expression. Creativity has been hailed as a critical 21st-century talent and an important part of student achievement. Due to the impact of perceived artistic abilities on economic innovation, creativity has been aggressively encouraged in Western and Asian countries over the last two decades (Craft, 2005).

Supporting innovative thought in early education, on the other hand, can be a difficult challenge for the classroom teacher. Although it is true that children use imaginative thinking when they paint, design, or produce artworks, it is also true that creative thinking should be fostered in all realms (Eckhoff, 2011). To make matters worse, the push-down school environment in early childhood classrooms (Copple & Bredekamp, 2009) creates yet another barrier to the incorporation of classroom learning opportunities that foster children's use of critical thinking skills. Early childhood teachers struggle to strike a balance between the advancement of material awareness, child-centered learning environments, and engaging and play-based learning, which presents a pedagogical challenge.

Research indicates that obstacles to fostering children's creativity in the formal classroom include the tension between scholastic and recreational activities (Cheung, 2012), the divide between knowledge- and creativity-centered learning (Cheng, 2010), and the transition from well-known teacher-centered pedagogy to unfamiliar child-centered pedagogy (Hui et al., 2015). When it comes to encouraging imagination for creativity, there is a disconnect in the beliefs and practices of Chinese instructors in Hong Kong. Teachers cannot apply successful creative growth practices in the classroom, even though their beliefs about them are similar to those found in Western literature. Most of the artistic activities in the report were part of teacher-directed learning, in which the instructor asked questions, provided examples and guidance, and had students produce answers. Youngsters are used to following their teachers' directions without question (Cheung, 2012).

2.2.1 Creativity in Early Childhood

Most children are born creative geniuses, but our education system often contributes to suppressing that genius with time. NASA worked with Dr. George Land to develop a test that could measure the creative potential of NASA's scientists and engineers. The test focused on identifying divergent thinking capabilities—in other words, the ability to look at a particular problem and suggest multiple solutions. The test required participants to come up with as many ideas as possible to solve a problem, and it was remarkably effective for NASA's purposes.

The same researchers then decided to give the same test to 1600 children between the ages of 4 and 5. What emerged is quite interesting: 98% of the children fell into the genius category of imagination! This led to a longitudinal study that followed the same children years later to redo the same test. When those same kids turned 10, only 30% were considered creative geniuses. When they turned 15, that number dropped to 12%. When the same test was conducted for adults, it showed that only 2% qualified as geniuses. This study proves that the most creative age is at kindergarten where the brain is fresh and full of ideas. Also, if we have a way to use this as an opportunity, any kid can be trained as geniuses.

In creativity analysis, the term creativity is primarily examined from three angles: person-oriented, process-oriented, and product-oriented. The product-oriented approach defines innovation as a special product that needs to be timely, connected to a social context. Process-oriented researchers view innovation as a sequence of discrete actions or mental processes (Pürgstaller, 2021). Person-centered approach proponents object to restricting imagination to a material or to just divergent reasoning. They contend that the ability to imagine is a special gift that every child has and that both internal and external factors can foster or inhibit the development of imagination (Steinberg, 2016).

Given the conversations surrounding the growth of children's imaginations, it is especially critical to raise awareness of children's creativity. There are primarily two topics covered. First, the authors assert that, especially in the domains of sport, dance, and creative movement education, children express their ideas and thoughts in a kinesthetic rather than a cognitive way. According to Cleland and Gallahue (1993), creativity can therefore be understood as a particular type of creativity that is body-bound and movement-based, known as motor creativity, rather than just cognitive ability.

Similar to how imagination is recognized as a domain-general cognitive skill (Kuhn & Holling, 2009), motor creativity is viewed as a collection of skills and features as opposed to a singular skill. Studies have discovered a strong correlation between fluency (number of responses), versatility (number of theme changes), and originality (uniqueness of response), even though facets hypotheses differ (Runco & Acar, 2012). Artists can communicate in many ways, such as through language, music, and painting (Saracho, 2002). In a sample of three to five-year-olds, innovation is defined as a method, substance, or personal attributes in an individual's interpersonal and intrapersonal process where the generated goods have originality, high quality, and intrinsic value.

Young children ought to be inspired to use their imaginations persistently (i.e. generating and generating original ideas), as this forms the basis of their creative

capacity. The children are inspired to make new suggestions when their suggestions are accepted (Saracho, 2002). In the context of evaluating creativity, Runco (2003) makes a distinction between subjective and analytical creativity and implies that a child's imagination can be personal. Four levels of creativity are distinguished by Kaufman and Beghetto (2009): mini-c creativity, which is creativity that is subjectively recognized; little-c creativity, which is creativity that is recognized as such by another person; and pro-c creativity, which is creativity that is classified as a new a by an expert in the field.

2.2.2 Characteristics and Process of Creativity

There are four primary areas of study in 'creativity' research: the creative individual, the creative environment, the creative process, and the creative object. After synthesizing the research, Craft (2000) put together a list of the most frequently mentioned creative traits. These characteristics include intense passion, a lot of questions, a wide range of desires, a desire for sophistication, a high regard for artistic values in experience, judgment freedom, high energy, originality, and intuition. Hong Kong teachers scored highly on the characteristics of being "innovative, observant, artistic, changeable, curious, and agile," according to Rudowicz and Hui's (2000) investigation into the characteristics of a creative person.

Many reports state that teachers can help foster young children's imagination by providing open-ended answers, exhibiting critical thinking and behavior, encouraging experimentation, and rewarding students for unexpected answers (Craft, 2005). In ten European nations, Jeffrey (2006) conducted a survey and found a few key elements that supported students' ability to think creatively. Examples of this included situations where: 1) students worked in groups; 2) they were challenged and enjoyed learning; and 3) students were given some prior knowledge before being asked to finish the creative tasks. According to (Lucas, 2001), some strategies for stimulating a person's imagination include encouraging social learning as opposed to private learning, placing more emphasis on active learning than passive learning, focusing on the needs of the individual rather than the curriculum, engaging multiple

learning types, asking open-ended questions, and presenting a variety of patterns as opposed to a standardized format.

According to figure 2.2, Resnick (2007) synthesizes a creative process for learning called Creative Learning Spiral, which in this process consists of Imagine, Create, Play, Share, Reflect, then back to Imagine. The creative process or creative process also occurs naturally during children's play.

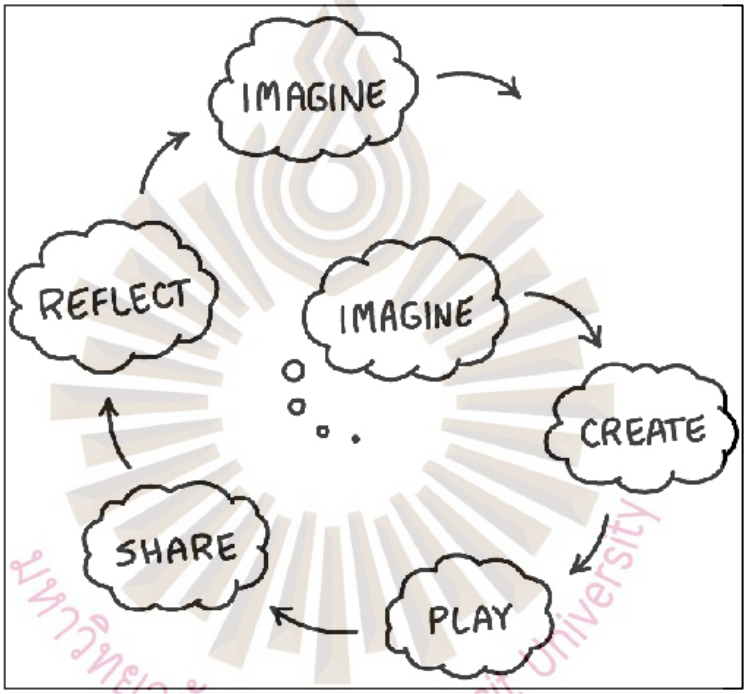

Figure 2.2 Creative Learning Spiral Process of Creativity in Kindergartens
Source: Resnick, 2007

Whether attempting to create a more elaborate castle, narrate original tales, or design exquisitely. Next, illustrate the people inside the castle. The inside and outside of the castle are decorated with various details. With oil, powder, blocks, wood, paper, and other materials they find nearby, kids will construct a castle. Kids will engage in play, exploration, and testing of variously constructed objects. Attempting to construct a taller castle, narrating fresh tales, or creating exquisite décor. When kids come over to play together, share. The modernization and stories are even more varied. Consider the time the castle was constructed and its collapse. If your parents, teachers, or other

family members assisted you, consider the idea and determine the cause of the collapse. Imagine from experience how a new building could increase the stability of the castle and enable kids to attempt to construct a stronger castle than ever before using their solutions. Youngsters will begin to use their imagination in new ways.

2.2.3 Creative Play-Based Activities

In the Western view, play is essential to children's learning because it helps them use their imaginations to their fullest potential. Craft (2007) argues that a playful approach in the early years is more conducive to innovation because of its creative and flexible aspect. In Western societies, a great deal of research has been done to examine the connection and creativity. Results show that play fosters creativity and that kids who play freely think more creatively than kids who play in a lot of structured activities (Russ, 2012).

The problems facing today's culture demand original and creative solutions, which come from careful consideration and problem-solving. Theorists and researchers have attempted to define imagination, contending that it is a skill that can be learned. Creativity research supports the development of instructional creativity training programs. By fostering an environment that encourages children to think creatively, teachers can help them develop their creative thinking skills, which may or may not lead to the children's creative development (Saracho, 2002).

Children's social skills are formed through play, which is essential in the development of qualities like acceptance, friendliness, competitiveness, and inclusion (Leff, 2004). Negative peer relationships may worsen dysfunctional situations, whereas positive peer relationships have been shown to lessen a range of social issues like violence and intimidation (Schwartz, 2000). Therefore, it's critical to observe how kids interact with their peers to determine whether these experiences are reflected in their play-related attitudes, which can either be constructive or destructive. Playing is one of the best ways for kids to express themselves. Children use a range of communication techniques, such as sounds, voices, symbols, gestures, actions, and

mimics, to convey their feelings and ideas when they play. Among these strategies is motor creativity.

Within those processes, the development of children's artistic output is a persistent concern, and the phenomenon of children's spontaneous play is effective in guaranteeing and fostering consistency in creativity. Additionally, he said that play can be an indication of imagination because it can be a springboard for engaging in cognitive or physical activity and in the creation of socially beneficial and interactive activities. It follows that kids who play with their peers gain from using their motor imagination to increase their success (Karaca, 2020).

The purpose of the study, according to Garaigordobil and Berrueco (2011), was to determine how preschoolers' imaginations were impacted by a cooperative-creative play program. First, the results show that in the three measures of verbal imagination that were examined (flexibility, fluency, and originality), the curriculum significantly increased verbal imagination. It enhances linguistic versatility, or the capacity to shift from one area to another; a high degree of adaptability enables individuals to view situations from various angles. The study supports the curriculum, offers a means of fostering preschoolers' verbal and graphic-figurative imaginations, and emphasizes the significance of low-systemic cooperative-creative practices for the development of kids' creativity.

Play is intertwined with the term creativity. This is because imagination can create new connections between seemingly unrelated objects, phrases, symbols, or experiences (Hoffmann, 2016). The study's findings about the connection between play and motor creativity showed that play engagement—a sub dimension of play skills—and imagination—a sub dimension of motor creativity skills—had a negative relationship, while play interruption and disconnection—a sub dimension of motor creativity skills—had a positive relationship (Karaca, 2020). Accordingly, play engagement increases correlate with a decrease in creativity, and a rise in imagination corresponds with an increase in the sub-dimensions of play interruption and play disconnection.

Children naturally express themselves through play. Children play with animate and inanimate objects, participate in team sports, and engage in physical activity. They frequently employ their imagination in those activities, which is one of the most important aspects of creativity. The way that kids play, and their attitudes are important factors in determining how well they do. Playtime allows children to use their imaginations, which frequently fosters the development of their creativity (Karaca, 2020). According to this study, kids who interact with their friends during playtime tend to be less imaginative, but they also tend to stop themselves from disrupting the game by continuing.

Both adults and children can foster their imaginations through players. Imagination, on the other hand, is the most important factor in sports. Play and imagination are therefore two interrelated dynamics. The child's imagination is needed for the game, and creativity is fostered by imagination. For instance, pretend games are fantasy games. A child's ability to be creatively stimulated depends critically on their freedom. On the other hand, giving the child a reference model to follow during the game can limit their creativity and have a negative effect on their peer interaction with other players (Karaca, 2020).

Youngsters who have received criticism and reprimands during a game may want to stop playing or the play environment altogether. Children's play engagement decreases, but their imaginations expand, and they become more adept at disconnecting from games and disrupting them. Because of the research, educators are urged to implement strategies that foster and support kids' motor creativity abilities—particularly their fluency and originality—through play. In addition, parents are urged to participate in educational events like workshops and conventions to gain knowledge about the appropriate duration and activities for parents to play with their children (Karaca, 2020).

It's been said that when a child plays at being a particular species, like a leopard, he or she makes up what they don't know and depends on what they already know (Dewi, 2021). A child's attempt to be both creative and imitative always results

in a blend of imagination and realism. Youngsters who use their imaginations acquire knowledge, grow in self-awareness, and hone their creative abilities (Keun, 2006). Children who use their imaginations are free from the limitations of judgment and are more likely to generate original ideas. Craft asserts that children who play imaginatively by nature are more likely to be creative in their professional settings. Thus, a child's inclination toward imagination may contribute to their creative abilities. (Craft, 2000).

Children can use their fingertips to play with color and pattern in the Finger-Painting exercise. A good way for them to express their emotions and create art is through their sensory play, where they draw with color at their fingertips. To clarify, Arlow (1946) suggests that finger painting can elicit feelings in psychotherapy contexts, particularly for kids who struggle with behavior issues. With the help of this exercise, kids can learn about the idea of art as well as the qualities of creativity, such as originality, fluency, and flexibility (Mayar, 2022). Children learn about different colors, lines, areas, and textures visually through finger painting (Suryawan, 2022). Youngsters use paint to decorate a variety of objects, including cars, houses, flowers, fruits, and vegetables.

Educators, who serve as examples for their students, must receive training in creativity to prepare them for the shift from science to finger painting (Sundari, 2021). In this scenario, children are expected to identify and retain the fundamental ideas of the subject matter, the colors, and the painting technique as a competency of their understanding. After that, kids practice finger painting to solve problems as teachers instruct them to, applying the knowledge they have learned. Children can then submit their works of art for critique.

2.3 Techniques and Methods of Stimulating Creativity

The Brainstorming technique finds ways to group ideas together so that none are rejected as unsuitable. The approach is based on the idea that every suggestion has the potential to inspire someone else to consider an even better solution, ensuring that

every input is treated with decency and candor. SWOT analysis can be used to generate ideas, and they can also be approached in reverse, whereby participants consider potential causes of problems rather than solving them. In doing so, they attempt to address questions like who, what, where, when, why, and how, while also encouraging participation from all participants. (Bucur, 2023)

The Delphi method offers a novel approach to forecast future events. Using lists of carefully considered questions, the method makes it easier to access alternative viewpoints on topics like how science will advance, how technology will affect the next several years, or how certain changes will be received by society. With this method, the participants don't communicate with one another; instead, they only learn about each other's perspectives after they have all finished and responded to the questions. (Bucur, 2023)

A synoptic approach to the creative idea is presented by the Philips method. This approach essentially sets up a mental sprint for the participants, who will work hard and try to come up with the best ideas in the minute allotted, instead of wasting time on idle chatter. The duration is just right for everyone to feel inspired, and there is just the right number of people involved to make it seem unprofessional. (Bucur, 2023).

The approach of these methods presented through play allows the socialization of children at different ages, at the same time it develops creativity, and the generation of ideas for a rigorous analysis of the proposed concept (Beghetto, 2017; Zenden, 2020). Obviously, by going through the transitional stages, also through play, the practical skills are fixed and with the advancement in age of the youngest children, in time they will succeed in associating ideas, and creative solutions intended for new projects that require such a creative, innovative structure (Plucker, 2020; Plucker, 2018).

Stimulating children’s interest through play also defines solving through exploration regarding the accumulation of new essential information for knowing

values and other useful information, by stimulating curiosity, creativity as well as discovering new resources that generate creative ideas, allowing the acquisition of practical skills (Bucur, 2022; Plucker, 2017). All these aspects orient and define the premises for the harmonious development of children towards a new existential stage (Sternburg, 1996).

Thus, considering these aspects will have future effects on self-confidence, work strategies, school results, as well as the desire to study and store and organize the information received.

2.4 Related Studies of Designing for Children

Catherine Fishel, a design-focused editor, wrote her own book about designing for kids and solicited advice from other designers. According to Fishel, design respects and educates children while also going beyond traditional educational goals by assisting them in determining their place in the wider world. Good design doesn't have to be cute because kids want to appear older than they are, and it can't be based only on the experiences of the designers' own or other people's kids (Fishel, 2001).

Though these observations may not apply to every culture, children in Japan, for example, find "cute" to be appealing. Both adults and children adore products that are made to look cute, like those from the Hello Kitty brand. Thus, it could be referred to as a cross-generational product line. Japan has a cutesy culture known as "Kawaii.". One well-known company that makes goods for the Hello Kitty brand is Sannio. Girls and women in Japan are fond of this. Masubuchi (1994) identified seven essential elements of Kawaii, which are: small, innocent, impressionable, reliant, round, pastel-colored, and possessing animal characteristics (Goldstein, 1994). Given the longevity of the Hello Kitty brand, it is hypothesized that adult consumers continue to enjoy kawaii products due to nostalgia (Goldstein, 2004).

Parham Santana oversaw reinventing the Barbie brand for Mattel; to do this, they needed to have a solid grasp of what the $16 billion (about $49 per person in the US) (about $49 per person in the US) product line's customers (parents and kids)

enjoyed about it and what they could do to increase its popularity. By speaking with parents in focus groups, they were able to identify design opportunities for kids. They learned about this by interacting with the parents while presenting the product and its packaging. Focus groups allowed the designers to see that while Barbie pink was popular with kids, it was less popular with parents.

Rather than just listening to the kids, the designers made the decision to make concessions for the parents and reduce the amount of pink in favor of complementary colors. The parents were now drawn to the brand. The project's designer, Santan, believed that through talking to the customers, they could see that the kids were far more intelligent than some designers gave them credit for. The project's designers, Marchi and John, inform Fishel that they believe the brand's emotional connection to be essentially significant. These are items that enable children to act out adult lives (Fishel, 2001).

Because the Barbie dolls did not appeal to all girls, Mattel's former senior designer decided to start a new business and create the "Get Real Girl," a competitor to Barbie that celebrated the uniqueness of the girl. The designer discovered a market niche and inspiration by speaking with her friends. All her friends were passionate about sports as kids, and they remained so as adults. Their lives as adults were significantly impacted by the things they did as children. The Get Real Doll's inventor, Chavez, saw that not all girls were represented by the dolls that were on the market. Their origins were not genuinely distinct cultures or ways of life. She persisted with her idea and made the dolls despite encountering opposition from industry. The designer was inspired by her adult friends at the time, and this gave her the opportunity to pursue the product line (Fishel, 2001).

Swearinger, the art director for C3 designers, had to carefully examine children's dreams when developing a new Sonic toy for a children's meal program because the toy was free, and the child alone could decide whether it was successful. According to him, children always aspire to emulate the lifestyle of an older child, which is why the Sonic toys were designed with that in mind. According to

Swearinger, Sonic is designed for children aged 3 to 8, but only for the 8-year-old because younger children constantly aspire to be like their older peers.

Fishel and Rynolds, the creative director, discuss the shortcomings of design in the field. The child gains a sense of ownership when they are empowered and involved. Youngsters want a sense of ownership, empowerment from a product, and involvement in everything that is going on around them. Although the Sonic Meal toy was inexpensive, the designer insisted that it had a high-quality design since, in contrast to adults, kids will not tolerate subpar design, even if it is given to them for free (Fishel, 2001).

Aibo is among the best-selling toys that Sony has produced. One instance of clever technology being used to create a clever toy is Aibo. Aibo is a robotic dog designed to mimic a real dog's movements, behaviors, and emotions as closely as possible. The motivation behind developing a much more realistic product came from the emotional responses that earlier electronic pets, like the Tamagotchi, provided. For Aibo to succeed, the designers were primarily concerned with the emotional bond that formed between the product and the user. This was the beginning for the designers of Aibo, but as the product progressed through a series of prototypes, the designers were able to refine the design and produce a product that was as nearly as possible a replica of a real dog.

The designer seemed to find inspiration in the technology. The designers of this toy studied pets to create something they knew kids would love, but parents are hesitant to purchase. This was the ideal pairing for these two buyers. The designers didn't try to give the robot a more endearing appearance; instead, they trusted the toy's features to capture the buyer's interest. Aibo has advanced to the point where it now has a built-in camera for taking pictures (Gringer, 2001). It seems they imbued the robot with a memory to facilitate the emotional bond between the consumer and the toy. One toy that spans generations is Aibo.

According to MacPherson's (2000) report, children were involved in the design process when new concepts were coming from a combination of engineers, scientists, and university lectures at the University of Maryland in America. Together, they produced extremely engaging toys enabled by technology. In contrast to the limited speech preprogrammed toys that the talking Arthur had, these toys include soft toy robots that can mimic emotions and read the stories that children have created. MacPherson claims that because the kids didn't fear failing, they were able to challenge adults' beliefs and inspire the development of more original ideas. As a result of this project, toys have been created that empower kids to master the toy and take charge of it, rather than letting the limitations imposed by the designer (MacPherson, 2000).

Tveskov started working as a designer at Lego at 17, not too far from when he was a child. Throughout his career, Tveskov was constrained by a budget of Lego bricks, each of which had a unique price, and he was given briefs centered around titles. Lego's designers used parent focus groups to evaluate the suitability of the models they produced. Rather than the companies consulting the children, the parents were the ones who brought up the concerns about the suitability of the suggested product models. Through market research, they also knew that as they evolved as designers and produced more intricate designs, they needed to make sure that the designs were appropriate for a wider age range than what was indicated on the packaging (Johnson, 2008). New Lego models seem inspired by the designers' own childhood and their observation of children of different ages playing together and wanting to build the same Lego models.

Hasbro is another big player in the toy industry. In February of this year, I conducted an online interview with Bradley, a freelance designer who worked full-time on Hasbro's Transformer lines. Bradley gave me insight into the strategies used by a profitable toy company. Bradley believes that creating toys should be enjoyable, and his passion for Hasbro stemmed from his admiration for their boy's action figures. His fondness was sparked by his early favorites, Mason, and his five-year-old love of dinosaurs, which filled him with enthusiasm and inspiration.

"Perfecting the bodily skills of manipulation, muscle coordination, balance, strength, and endurance" is what children do when they play (Newson, 1979). It appears that by making toys that promote the growth of these important abilities, the designer can have a significant impact. Our childhood toys can impact the skills we carry into adulthood as we age. People's memories of "their childhood toys" can help to paint a more accurate and convincing picture of the issues with the toy. The respondent's response is more animated and detailed when the toys are simpler. The childhood desire to be the master of their own play was the primary motivator behind Lego bricks' enormous popularity. They wanted to be the creators of anything they wanted, and they weren't so concerned with making the toy that was conventionally suggested. The toy wasn't there to dictate to them.

The study has shown how important it is for designers to learn about child development to guarantee that further developments in toy design are headed in a fruitful and fulfilling direction.

Chapter 3

Research Methodology

3.1 Introduction

The last research question formulated is (1) Can a conceptual mural set be designed to help children develop their creativity before the age of 6? This question connects children's emotional involvement and growth needs by focusing on two separate but related goals. By examining the color-emotion preferences of young children in Thailand and studying the worldwide market for innovative toys, this study is intended to guide the development of tools and products that not only encourage imagination and creativity but also closely match the developmental stages of early childhood. Through qualitative approaches, this research hopes to offer practical advice for educators, toy makers, and policymakers, enhancing the overall well-being and development of young students worldwide. The study is conducted as follows.

3.2 Case Study of Color-Emotion Association Survey (CEAS)

3.2.1 Scope of Research

To conduct the Color-Emotion Association Survey (CEAS), formerly conducted by Zenter (2001), the first objective of CEAS is to: investigate the color-emotion preferences of children aged 3 to 5 years in central Thailand to create a unique color palette that filters positive emotional responses. By using qualitative research methods, subjects consisting of 3 to 5 age groups of children will be engaged.

3.2.2 Population and Sampling

Convenience sampling will be used as the strategy, prioritizing the children's convenience during the selection process. The sampling includes 60 students from two kindergarten schools which are Mueang-Ake Kindergarten School and Satit-Bilingual International School located in Central Thailand. Participants of 10 kindergarten children from each age group of 3, 4 and 5 are selected from each school by their teachers in conducting this survey.

3.2.3 Research Instruments

For CEAS, two types of research instruments are used. Both instruments are given to individual participants to use during this test. 1) A 2-sided test paper printed with drawings of a character with 8 figures of different facial expressions. Each figure is labeled by its emotions, written in both Thai and English languages and, 2) a 24-color set of coloring pencils for coloring on given test paper.

3.2.4 Data Collection

To collect quantitative information on children's emotional associations with colors, the open-ended questioning method is the most necessary method to conduct in a classroom. To fully understand children's color-emotion preferences, this structured approach makes it possible to record and analyze the highest and lowest frequency of which emotions react to various colors among the participants. Therefore, participants are instructed to observe each figure’s emotion printed on the paper test. Then open-ended questioning follows as, “What color makes him happy? What color makes him sad?” Depending on how participants feel or react to the figures, they selected 8 colors out of 24 given colors which their emotions have associated with.

3.2.5 Data Analysis

Emotion frequency analysis is the method used for analyzing the frequency of each emotion selected for various colors. It looks for the most often associated emotions with each of the 24 colors to provide preferences for developing an emotion-based color palette. Based on the outcome of this CEAS, it identifies the 8 most positively perceived colors chosen by participants. Through this analysis, the highest frequency of collected data is applied to create an emotion-based color palette by installing its color paint codes in the mural painting set development to enhance emotional engagement and creativity in young children through therapeutic painting activity.

3.3 Case Study of Torrance Tests of Creative Thinking (TTCT)

3.3.1 Scope of Research

To conduct pre- and post-assessments, the objective for both is to: validate the development of creativity in early childhood by comparing before-and-after conducting user-testing with developed conceptual mural painting set. Both research methods use qualitative approaches. Through a qualitative approach, the method of Torrance Tests of Creative Thinking (TTCT) by Torrance (1966) is selected to conduct creativity development tests. Among the two tests of Verbal and Figural of TTCT, The TTCT Figural provides 3 parts: separate assessments of creativity, criterion-referenced assessments of creativity and composite assessment of creativity.

3.3.2 Separate Assessments of Creativity

Separate Assessments of Creativity consist of 5 measures.

Fluency: The total number of pertinent responses is the basis for this score. As such, it could be considered among the test's most important components.

Since no additional points can be awarded in other dimensions until a response is deemed relevant, all other scores are partially dependent on the fluency score.

Originality: This score is determined by how uncommon and statistically rare the response is. This means that it shows whether a student generated a lot of generic, common responses (low originality) or unique, highly imaginative responses (high originality). More weight is assigned when two or more figures are combined into a single image.

Abstractness of Titles: this score pertains to the subject's organizing and synthesizing cognitive processes. At the highest level, one can effectively convey the essential details of the scene, identify the key elements, and help the viewer see the image more fully and richly.

Elaboration: Two underlying assumptions form the basis is that the minimum primary response to the stimulus figure is a single response; and second, that the elaboration score is a function of creative ability, appropriately labeled as elaboration.

Resistant to Premature Closure: This score is based on an individual's capacity to remain open-minded and postpone making decisions long enough to make the mental leap that enables novel ideas. People who are less creative often make snap judgments and act without thinking them through.

3.3.3 Composite Assessments of Creativity

Some uses of the TTCT require an overall assessment of creativity. The TTCT Figural provides two such measures: the Average Standard Score and Creativity Index. Among the two assessments, the average standard score is collected from the participants through the former assessment of 5 measures.

Average Standard Score: each of the five norm-referenced assessments is reported as a standard score. This enables the averaging of these standard scores to obtain a score reflecting the assessment based on the norm-referenced assessments' pooling.

3.3.4 Population and Sampling

There are two tests under TTCT which are Verbal tests designed for students six years of age and older, and Figural tests designed for kindergarteners. Thus, based on the research participants, the Figural test was chosen. 6 participants from each age group who have been performing well in terms of creativity in class and are comfortable with such activities recommended by their teachers are selected for this test. The same sampling will also be tested for post-assessment of TTCT as well.

3.3.5 Participants

Table 3.1 Participants for TTCT Pre-Assessment and Post-Assessment

	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6
Gender	M	F	M	F	M	F
Age	3	4	5	3	4	5

Source: Researcher

3.3.6 Research Instruments

The three subtests under the Figural Test are Picture Construction, Picture Completion, and Parallel Lines.

In the Picture Construction (from a marked cue) subtest, the test taker is given a small shape or cue (like an abstract mark or squiggle) and asked to incorporate it into a more complicated, larger picture. The objective is to evaluate an individual's ability to develop a basic visual stimulus into something more intricate and imaginative.

Based on the Constructed Picture's uniqueness, intricacy, and narrative value, the participant's creativity is assessed. This subtest aims to elicit a person's creative visual imagination, inventive storytelling, and divergent thinking.

Once more using cues, in Picture Completion is a subtest in which the examinee is given multiple incomplete pictures or cues and asked to fill them in as creatively as they can. The objective is to finish the images in a way that adds meaning, originality, and creativity. It is the individual's responsibility for these cues, which could be abstract lines or shapes. The ability to think divergently is assessed by this subtest.

Parallel Lines is a subtest required to use a page containing multiple pairs of parallel lines as a starting point to create original images or pictures in this activity. This task encourages creative, divergent thinking by testing the participant's capacity to view a well-known shape (parallel lines) in fresh ways. This subtest evaluates a person's capacity to produce novel, distinctive, and complex ideas from straightforward visual cues.

3.3.7 Data Collection

Data is collected through TTCT itself, which is developed for accessing creative mindset and creative thinking by evaluating various problem-solving abilities throughout the subtests. (Torrance, 1966). Key elements of creative thinking are measured by the Torrance Test: fluency, flexibility, originality, and elaboration.

The TTCT Figural provides five Separate Assessments of Creativity. After making these assessments, the scorer looks for the “average” from the 5 separate assessments, along with a scoring system of raw score (actual score) with Mean (average) 100 and standard deviation of 20. For instance, if a participant scores 130 on the standardized test, she is 1.5 standard deviations above the mean, indicating she performed significantly better than the average student.

3.3.8 Data Analysis

These Figural test subtests are scored on originality and elaboration for the first one, and on fluency, flexibility, originality, and elaboration for the latter ones. Figural fluency, flexibility, originality, and elaboration overall scores are then calculated by adding up the totals from all subtests. These results can be translated into a standard T score.

After calculating pre-assessment and post-assessment results, both scores will be compared to analyze the value of improvement or difference before and after using the prototype. This will validate the second objective of this research.

3.4 Prototype User-Testing

3.4.1 Scope of Research

After developing the Initial Design based on CEAS (Color Emotion Association Survey) and pre-assessment of TTCT (Torrance Tests of Creative Thinking), the children will be involved in painting activity using the developed conceptual mural painting set prototype. This research uses observation methods with a qualitative approach. This user-testing activity observes prototype design flaws, benefits, convenience and flexibility.

3.4.2 Population and Sampling

The same 6 participants from pre-assessment of TTCT (Torrance Tests of Creative Thinking); those who have been performing well in terms of creativity in class and are comfortable with such activities recommended by their teachers are selected for this user-testing case study.

3.4.3 Participant Table

The same participants described in table 3 are conducted for this user-testing survey.

3.4.4 Research Instruments

Evaluation form is used to measure the observations on children's activity with the prototype. Teachers from the kindergarten who were involved in guiding the whole painting activity and other teachers who observe from after will give scores upon their performance, engagement, teamwork and ability to follow instructions.

3.4.5 Data Collection

Data will be collected with the scoring system, 25 points for each skill and in total 100 points for each kid. A total score equal to or above 75 is considered as a good activity among children using the prototype to develop skills of performance, engagement, teamwork and ability to follow instructions.

3.4.6 Data Analysis

The data is analyzed as follows: a total of 25 is low, 50 is fair, 75 is good and 100 is excellent. The target margin of the test is to reach 75 points minimum to validate the activity is effective for children of 3 to 5 years old.

3.5 Design Process

3.5.1 Conceptual Design

The conceptual design concept aims to improve five key cognitive abilities: fine motor skills, gross motor skills, spatial skills, cognitive skills, and communication skills. Children can enhance their fine motor skills in activities such as grasping

objects, writing, and engaging in sensory tasks to strengthen hand-eye coordination. Mastering gross motor skills like grabbing, holding, lifting, and moving objects is necessary for building the physical power and coordination required for daily tasks and leisure pursuits. Possessing spatial abilities is essential for comprehending and moving through the tangible environment as it requires the capacity to gauge distances, spaces, elevations, and items. Comprehension skills in reading, math and other cognitive abilities are important for academic success and critical thinking. Ability to have communication skills, including verbal and non-verbal communication, is important for engaging with others and expressing feelings. Developing these skills in kindergarten is vital as it enhances children's overall development and fosters creativity, enabling them to better understand and interact with their environment. This thorough approach to education ensures that children are given the necessary tools for their future academic growth and individual advancement.

3.5.2 Design Development

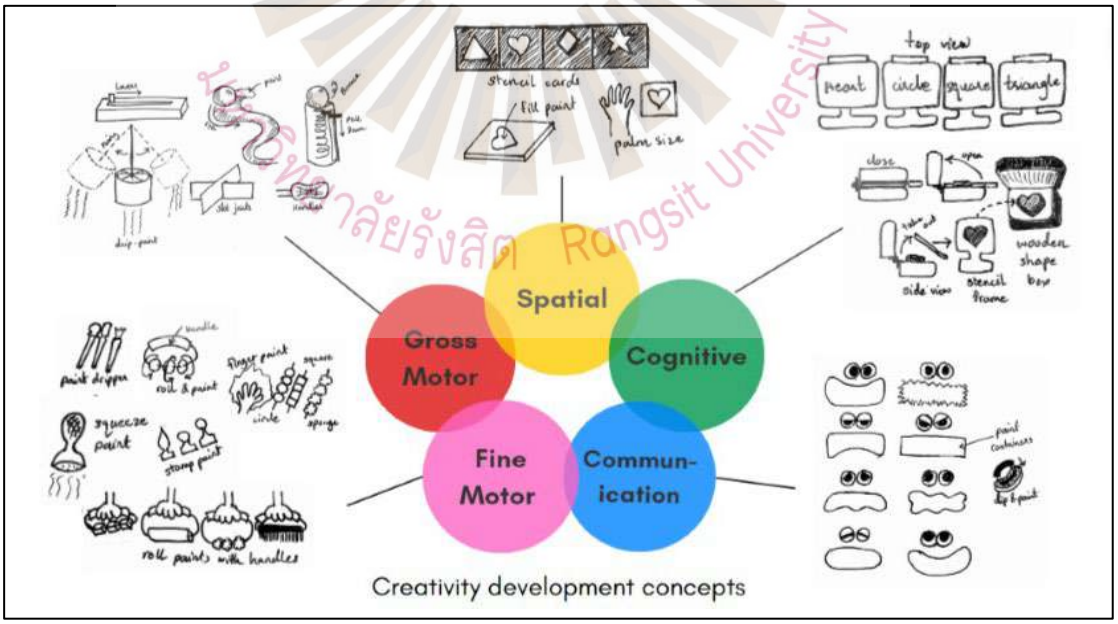

Figure 3.1 Creativity Development Design Concepts

Source: Researcher

According to the needs of conceptual design as shown in figure 3.1, therefore, from these concepts, materials are chosen appropriately.

3.5.3 Materials Selection

The design has 6 components which are ink pad, roller, wall mount, stencil, paper sheet and paper towels. Ink pad is designed to have 5 layers which mainly functions as an airtight paint container where children can stamp the rollers. The paint is a water-based gouache paint chosen as child-friendly material. The container is made of pinewood which is the most common and lightest material for wooden toys for children. Rollers and wall mounts are also made from the same material whereas the latter ones have magnets inside so that paintings can be held to mount on the wall. Stencils are made from filtered color films as they are thin enough for rollers to roll on and transparent enough to see the painting underneath. Paper sheets are made from watercolor paper in fine texture with A3 sizes which is big enough for one or two children to paint. Paper towels are wet cloths to roll off excessive paints left on used rollers so that the paints will not be messy through usage.

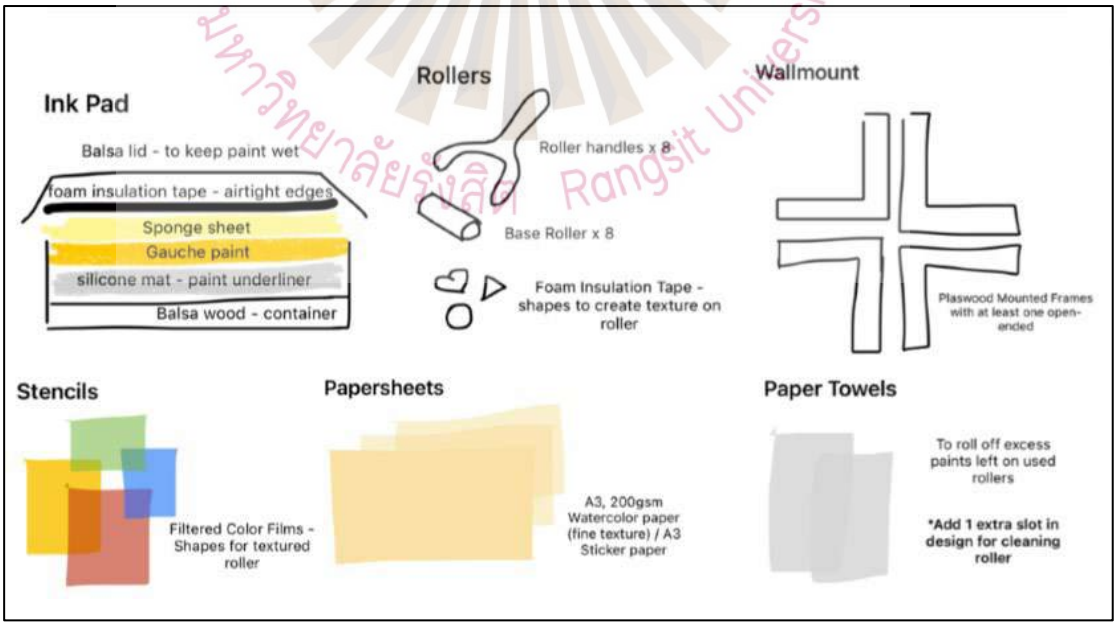

Figure 3.2 Material selections for design components

Source: Researcher

3.5.4 Design Implementation

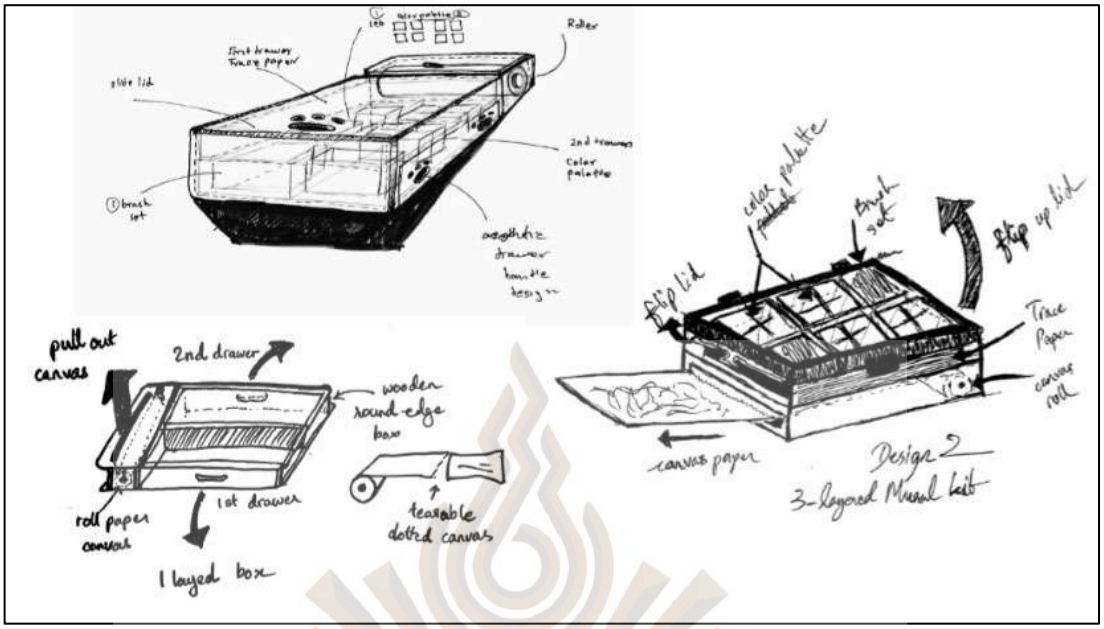

Figure 3.3 Design implementation for mural painting set

Source: Researcher

According to figure 3.3, three conceptual designs of mural art painting sets are developed to implement as a mural painting set to enhance creativity. It mainly consists of containers for papers to paint on, paints to color and tools to paint with. After various sketches and consideration for practical use, the design has flaws concerning the weight, mobility, size and materials. From various sketches and concepts, initial design is developed with careful consideration.

3.4 Conclusion

The methodology of this research is detailed, focusing on engaging students in class through a color-emotion association activity along with a creativity test that assesses creative mind, activity, thinking and problem-solving. Through proper surveys and case study, design concepts are developed which are followed by designing prototype and user-testing to make sure the design is useful and effective for creativity development.

Chapter 4

Research Results

4.1 CEAS Result

The 24 colors given to the 60 participants are red, dark orange, orange, light orange, creamy orange, yellow, light yellow, pink, light pink, dark brown, brown, dark purple, purple, violet, maroon, darker green, dark green, green, light green, dark blue, blue, gray, black and white. Among these, participants chose 8 colors as a result described in the following table.

Table 4.1 CEAS Results

	Sad	Happy	Surprised	Silly	Sleepy	Angry	Bored	Hopeful
M	Dark Blue	Blue	Green	Purple	Light Pink	Red	Black	White
F	Dark Blue	Blue	Green	Purple	Dark Orange	Maroon	Black	White

Source: Researcher

According to these results, the chosen 8 colors are the average number of most-preferred colors that pique their interest. Therefore, these most-preferred colors will be used as the colors of the ink pad in the final design of the product. These colors will give excitement and boost children during the painting activity and after the painting is mounted on the wall.

4.2 TTCT Pre-Assessment Result

The results in table 4.2 show creativity result rates from the participants. This result is calculated by the scoring system of raw score (actual score) with Mean (average) 100 and standard deviation of 20. This test is taken as a record to see the results before using the prototype of the mural painting set.

Table 4.2 TTCT Pre-Assessment Result

	Fluency	Originality	Abstract of Titles	Elaboration	Resistance to Premature Closure	Average Standard Score
Person 1	120	100	140	100	80	108
Person 2	100	80	80	120	100	96
Person 3	80	120	100	80	100	96
Person 4	60	100	80	60	80	76
Person 5	100	120	140	80	120	112
Person 6	120	100	80	100	100	100

Source: Researcher

4.3 Initial Prototype

The initial prototype is created according to figure 4.1. There are 4 components in this design. Firstly, the container for the paper roll Which has a slot for paper to come out and then to tear apart through a trace line. Secondly, The stencil holders with different shapes that fit the stencil. Thirdly, the roller containers which hold the rollers have different textures. Lastly, the paint containers which will contain paint for children to paint. According to this 3D rendering, the design was developed in prototype.

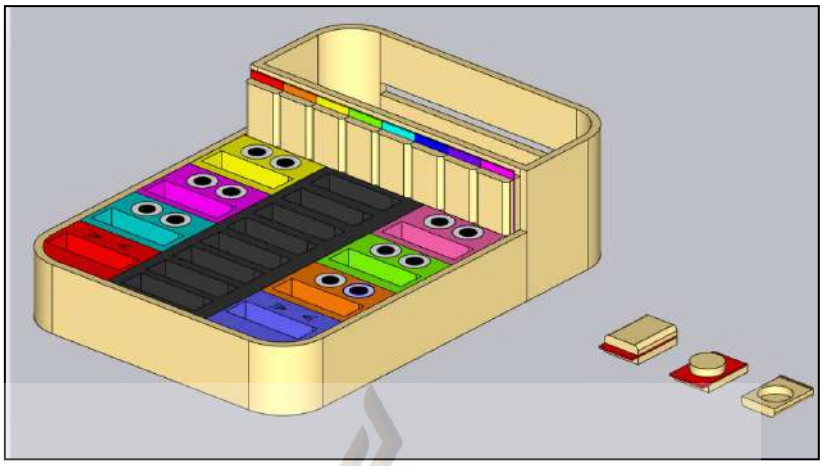

Figure 4.1 Initial Design Concept for Prototype in 3D Rendering

Source: Researcher

4.4 Design Development

Figure 4.2 Ink pad and roller development process

Source: Researcher

According to figure 4.2, both the roller and inkpad have been made and tested. During the prototype development. The initial idea was to have a paint container. But then. Figure out it is impossible for kids to not mix the paints One container and another. Therefore, the design of the container is upgraded into an inkpad that gives the same function as it is more compact and the paints will not spill or mix.

Figure 4.3 Paint-making and paint testing process

Source: Researcher

According to Figure 4.3. Paint has also been developed. With a mixture of glycerin and water. To contain consistency. After creating the pain, it is tested with the ruler. Which works well and can create a strong texture. The paint itself is used with gouge paint because it is water based which is harmless for children.

Figure 4.4 Re-development on all mural painting set components

Source: Researcher

Several important improvements are being made as shown in Figure 4.4, in the final design development phase to enhance the product's ease of use. First, a new, better material is being used for the ink pad to ensure it holds more ink and applies it more smoothly. The ink pad container is being redesigned to be easier to hold and more durable. The ink capacity is being increased to reduce the need for frequent refills. The roller width is being adjusted to achieve a more even ink distribution, and thicker foam is being used inside the roller to improve its performance. The stencils are being resized to fit different projects more accurately. Finally, the wall mount frames are being redesigned with magnets and sticker backs to allow for easier, more secure attachment and repositioning. These changes are intended to make the product more user-friendly and efficient.

4.5 Final Prototype

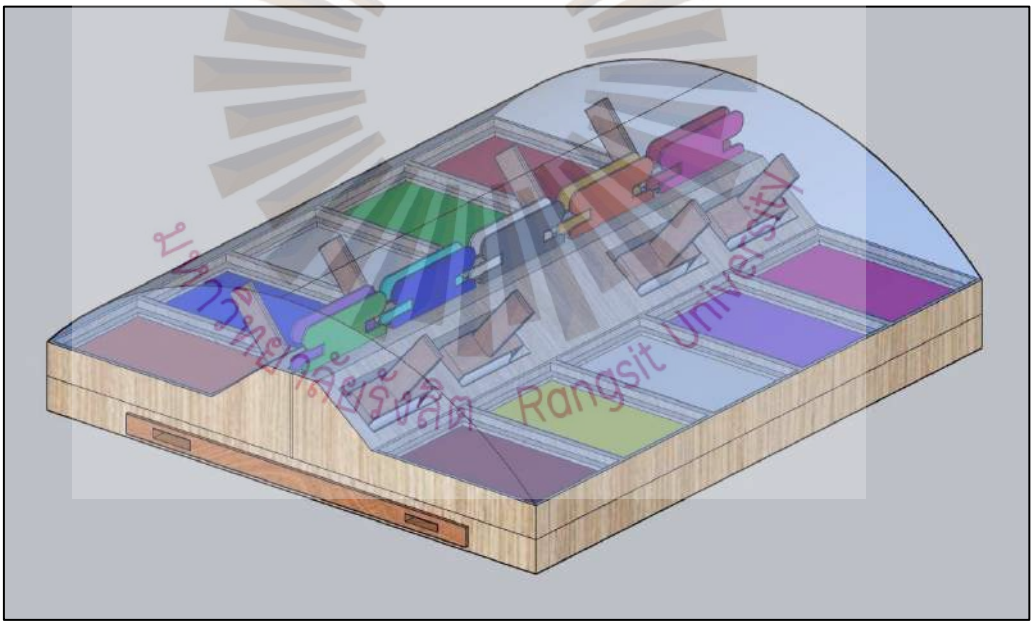

Figure 4.5 Final design in 3D rendering

Source: Researcher

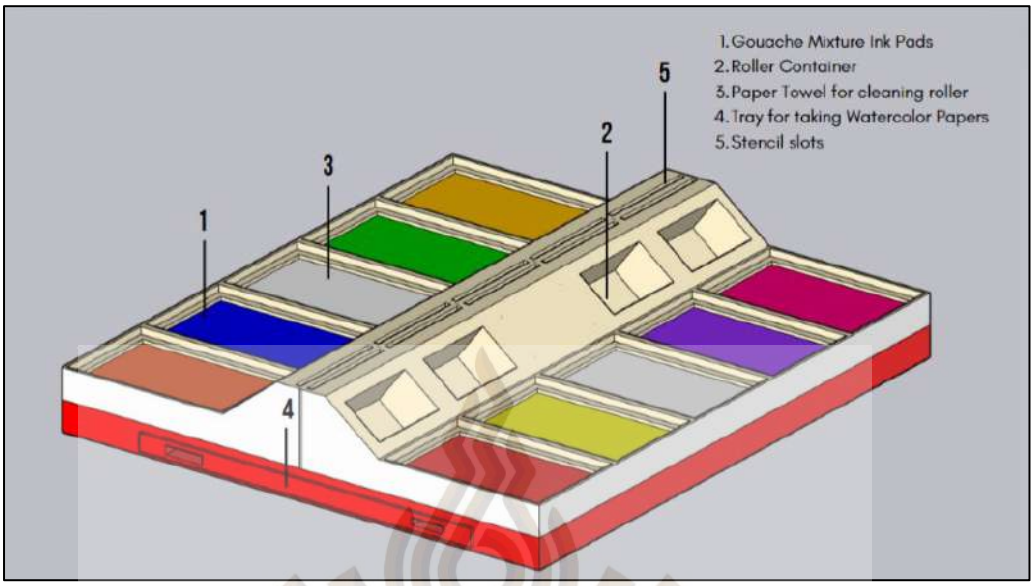

Figure 4.6 Final design in 3D rendering with component labels

Source: Researcher

After several developments of the mural painting set, the design has been finalized as shown in Figure 4.5. The product length is 1 foot 8 inches and 1 foot 5 inches wide. The components of the final design are gout mixture, ink pads, roller container, paper towel for cleaning the roller which are placed in the middle of the ink pads. Tray for taking watercolor papers and stencil slots as described in Figure 4.6.

4.6 Application of Design

For the design to be functionable, this product design includes a manual book as shown in Figure 4.7. It is an instructional manual book for teachers and parents to help the children assemble the product and it gives guidelines on how to use the product (see figure 4.8) and how to install the painting after it's painted.

Figure 4.7 Manual book for final product

Source: Researcher

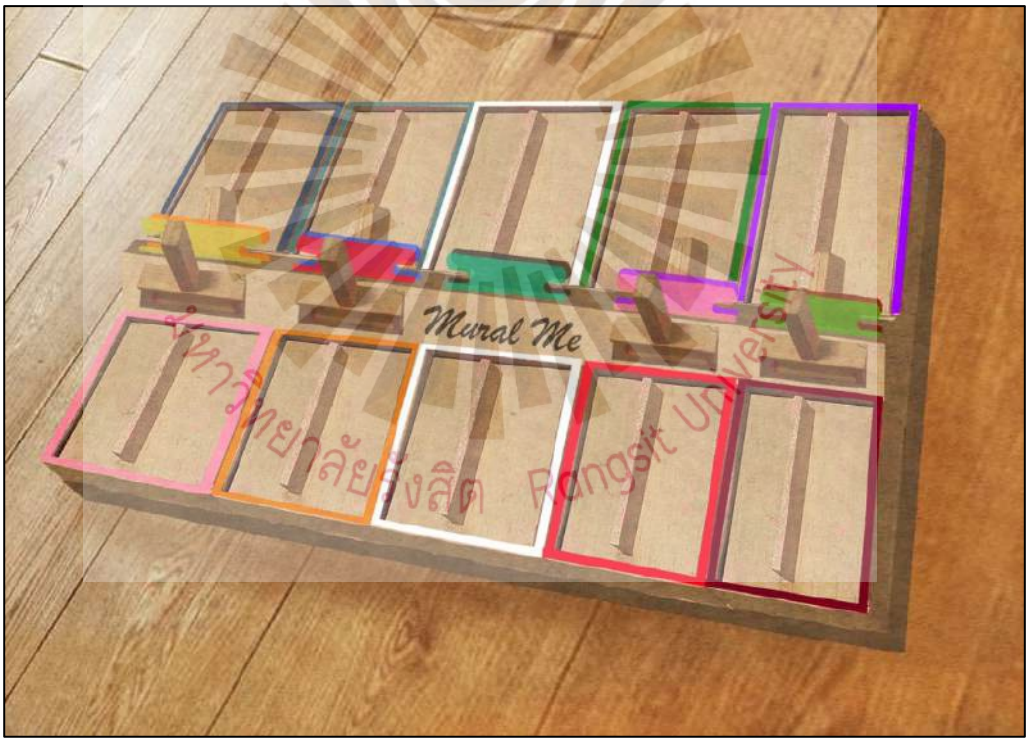

Figure 4.8 Prototype of Final Design

Source: Researcher

4.7 Prototype User-Test Result

The results shown in table 4.3 explain the user-testing of the given prototype with kindergarten children is a successful mural painting kit and is safe and compatible for early childhood. According to the evaluation scores marked by their teachers show that the children enjoy better than the average total rate of 75, proving that the prototype can help them develop performance, engagement, teamwork and ability to follow instructions.

Table 4.3 The results from teachers about children's performance during prototype testing

	Performance (25)	Engagement (25)	Teamwork (25)	Ability to follow instructions (25)	Total (100)
Person 1	22	25	22	25	94
Person 2	24	24	20	25	93
Person 3	24	20	20	22	86
Person 4	18	24	18	24	84
Person 5	22	22	24	22	90
Person 6	20	22	20	24	86

4.8 TTCT Post-Assessment Result

The results in table 4.4 show that creativity result rates from the participants. This result is calculated by the scoring system of raw score (actual score) with Mean (average) 100 and standard deviation of 20. This test is taken as a record to see the results after using the prototype of the mural painting set.

Table 4.4 TTCT Post-Assessment Result

	Fluency	Originality	Abstract of Titles	Elaboration	Resistance to Premature Closure	Average Standard Score
Person 1	140	130	110	120	100	120
Person 2	110	100	100	130	110	110
Person 3	100	120	140	140	120	124
Person 4	90	110	100	150	110	112
Person 5	100	120	140	120	130	122
Person 6	120	130	110	100	120	116

Source: Researcher

4.9 Conclusion

The comparison of before and after test of TTCT shows that the total number of the post-assessment test exceeds the number of the pre-assessment. Therefore, according to the result of the pre-assessment test and post-assessment test, the summary has been made to improve the children's creativity by using the design product of the mural painting set. As a conclusion, the objective tool of this research is to develop a mural painting set using therapeutic colors that help boost creativity in kids. This qualitative of pre and post assessments of color test, creativity tests and results of children performances has proven That this product helps develop creativity in early childhood.

Chapter 5

Conclusion and Recommendations

5.1 Conclusion

In conclusion, the results of this research demonstrate that each of the objectives has been successfully achieved and each of the research questions has been answered. For Objective 1, the study of the properties of color therapy and mural art confirmed that they significantly enhance and develop creative expressions in young children aged 3 to 5. For Objective 2, the development of a mural painting set using therapeutic colors effectively boosted creativity in kids.

Regarding the research questions/assumptions:

This research confirmed that therapeutic colors can be used to enhance creativity through mural arts.

The study identified several ways to foster creativity and learning in early childhood.

A conceptual mural painting set was designed that helps children develop creativity before the age of 6.

Therefore, the findings of this research validate the effectiveness of therapeutic colors and mural art in promoting creativity and learning in young children. The exploration of colors and creativity holds immense potential in promoting human well-being, particularly during childhood, a phase characterized by discovery and fun. However, educational challenges persist, with creativity being pivotal in applying fundamental concepts to real-world situations. To address this, user testing and research integration were employed to develop a reliable and safe mural

painting set tailored for early childhood. George Land's findings further underscore the importance of nurturing creativity during the formative years, suggesting a peak between ages three and five. By incorporating research insights, the mural painting set aims to support children's developmental education, fostering imagination and creativity. Through qualitative assessments and domain-specific functions, the design not only encourages artistic expression but also cultivates problem-solving skills through divergent thinking. By embracing play and incorporating educational objectives, this study endeavors to contribute to both the toy industry and children's developmental education, laying a foundation for future creative endeavors and holistic growth.

This study demonstrates the effective use of colors to promote human well-being by leveraging their positive physiological and psychological impacts. Creativity plays a crucial role in shaping individuals' ideas and actions during creative activities. The foundation for exploring, discovering, and enjoying creativity is established in childhood. A significant educational challenge for 15-year-olds in Thailand is their difficulty in applying fundamental science and math concepts to real-world scenarios, largely due to a lack of creativity. Many schools integrate play to address this, with toys being pivotal in activities designed to help children discover their creative voices. This research aims to offer guidelines for creating products and tools that support early childhood development while developing imagination and creativity. This was achieved through qualitative pre- and post-assessments of creativity development in two case studies: the Color-Emotion Association Survey (CEAS) and the Torrance Tests of Creative Thinking (TTCT). Research findings were integrated into the design process, resulting in the creation of a mural painting set focused on five child development objectives.

5.2 Recommendations

To finalize the product, it must be tested along with post-assessment whether the mural painting set can boost creativity after playing with it. Replacement of ink pads once the colors are out is also necessary to have the design as a dismantlable

container. Replacement of papers once is also considerable. The design can play from one child to 8 children. It is more encouraged to paint with fingers as it stimulates cognitive development in early childhood. Long-term uses will propose problems of the prototype and reveal certain things that need to be replaced or adjusted. For example, sizing, material, endurance, etc. However, it is a research-based concept design created for 3 to 5 years old to express themselves with fellow playmates in kindergarten to develop creativity is proven to be valid and therefore, these colorful mural expressions, particularly engaging for children under six, encourage creativity, teamwork, and enhanced problem-solving skills through divergent thinking.

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Appendices

Appendix A

Letters for Permission to Conduct Research

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มหาวิทยาลัยรังสิต

กอบ.3330/095

21 มีนาคม 2567

เรื่อง ขออนุเคราะห์สำรวจข้อมูลในการทำวิทยานิพนธ์

เรียน ผู้อำนวยการโรงเรียนอนุบาลเมืองเอก

ด้วย MISS THIRI MYAT NOE AUNG รหัสนักศึกษา 6508482 นักศึกษาระดับปริญญาโท ชั้นปีที่ 2 หลักสูตรศิลปมหาบัณฑิต สาขาวิชาการออกแบบ วิทยาลัยการออกแบบ มหาวิทยาลัยรังสิต กำลังทำวิทยานิพนธ์หัวข้อ 'Developing Mural Arts for Children's Creativity" การพัฒนาศิลปะจิตรกรรมฝาผนังเพื่อความคิดสร้างสรรค์ของเด็กๆ วัตถุประสงค์ของวิทยานิพนธ์ฉบับนี้คือเพื่อตรวจสอบสีใดสัมพันธ์กับอารมณ์ใดและการออกแบบต้นแบบช่วยให้ทักษะการรับรู้ทั้ง 5 ของเด็กพัฒนาความคิดสร้างสรรค์

ในการนี้ทางหลักสูตรฯขอความอนุเคราะห์ทางโรงเรียนอนุบาลเมืองเอกให้ MISS THIRI MYAT NOE AUNG สำรวจข้อมูลเด็กที่มีอายุ 3 ถึง 5 ปี โดยมีรายละเอียดดังนี้

1. แบบสำรวจสี-อารมณ์
2. การทดสอบต้นแบบราสสตัน

ทั้งนี้ เพื่อเป็นข้อมูลนำมาเพื่อนำมาประกอบการเขียนวิทยานิพนธ์ มหาวิทยาลัยรังสิต หวังเป็นอย่างยิ่งว่าจะได้รับความร่วมมือจากท่านเป็นอย่างดียิ่ง

จึงเรียนมาเพื่อโปรดพิจารณาอนุเคราะห์ และขอขอบคุณล่วงหน้ามา ณ โอกาสนี้

ขอแสดงความนับถือ

(ผศ.เรวัฒน์ ชำนาญ)
ผู้อำนวยการหลักสูตรศิลปมหาบัณฑิต
สาขาวิชาการออกแบบ วิทยาลัยการออกแบบ

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สาขาวิชาการออกแบบ
วิทยาลัยการออกแบบ
มหาวิทยาลัยรังสิต

กอบ.3330/094

21 มีนาคม 2567

เรื่อง ขออนุเคราะห์สำรวจข้อมูลในการทำวิทยานิพนธ์

เรียน ผู้อำนวยการโรงเรียนสาธิตแห่งมหาวิทยาลัยรังสิต

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ขอแสดงความนับถือ

(ผศ.เรวัฒน์ ชำนาญ)
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สาขาวิชาการออกแบบ วิทยาลัยการออกแบบ

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Appendix B

Activity Schedule and Questionnaires

Activity Schedule

14 May 2024

1. Color-Emotion Assessment Test CEAS (60 papers)

- 30 students (3,4,5 yrs old) - Mueang Ake Kindergarten
- 30 students (3,4,5 yrs old) - Satit Bilingual School

2. TTCT Pre-Assessment test (6 sets) (Selective participants for creativity test)

- 3 students (3,4,5 yrs old) - Mueang Ake Kindergarten
- 3 students (3,4,5 yrs old) - Satit Bilingual School

21 May 2024

1. Prototype User-Test (same 6 students)

- 3 students (3,4,5 yrs old) - Mueang Ake Kindergarten
- 3 students (3,4,5 yrs old) - Satit Bilingual School

28 May 2024

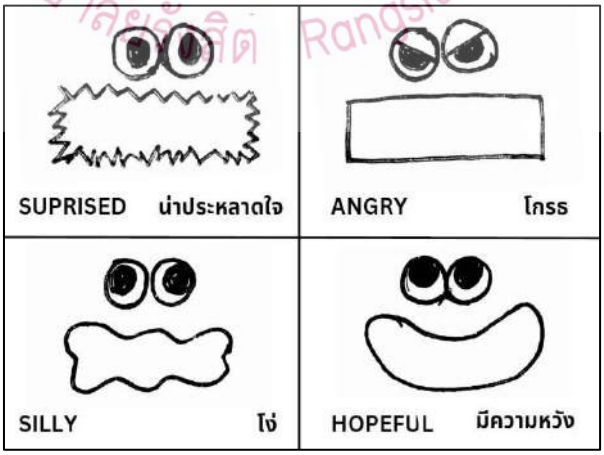
1. TTCT Post-Assessment test (same 6 students)

- 3 students (3,4,5 yrs old) - Mueang Ake Kindergarten
- 3 students (3,4,5 yrs old) - Satit Bilingual School

Questionnaires

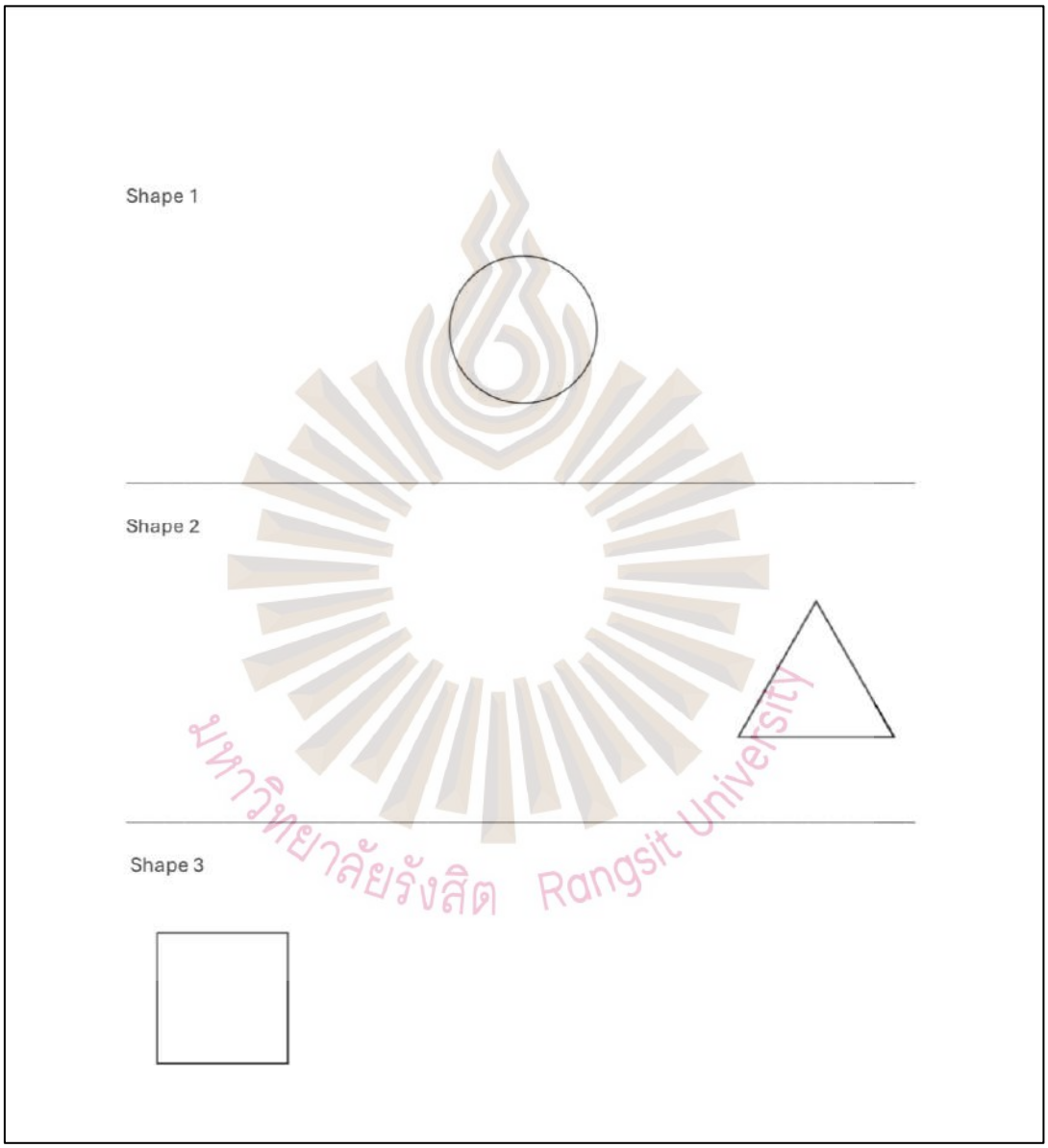
1. CEAS Color-Emotion Creativity Test

24 colors are given to fill each emotion to result in 8 colors.



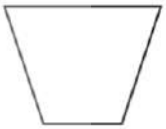
2. TTCT Torrance Tests of Creative Thinking

Activity 1: Picture Construction Test

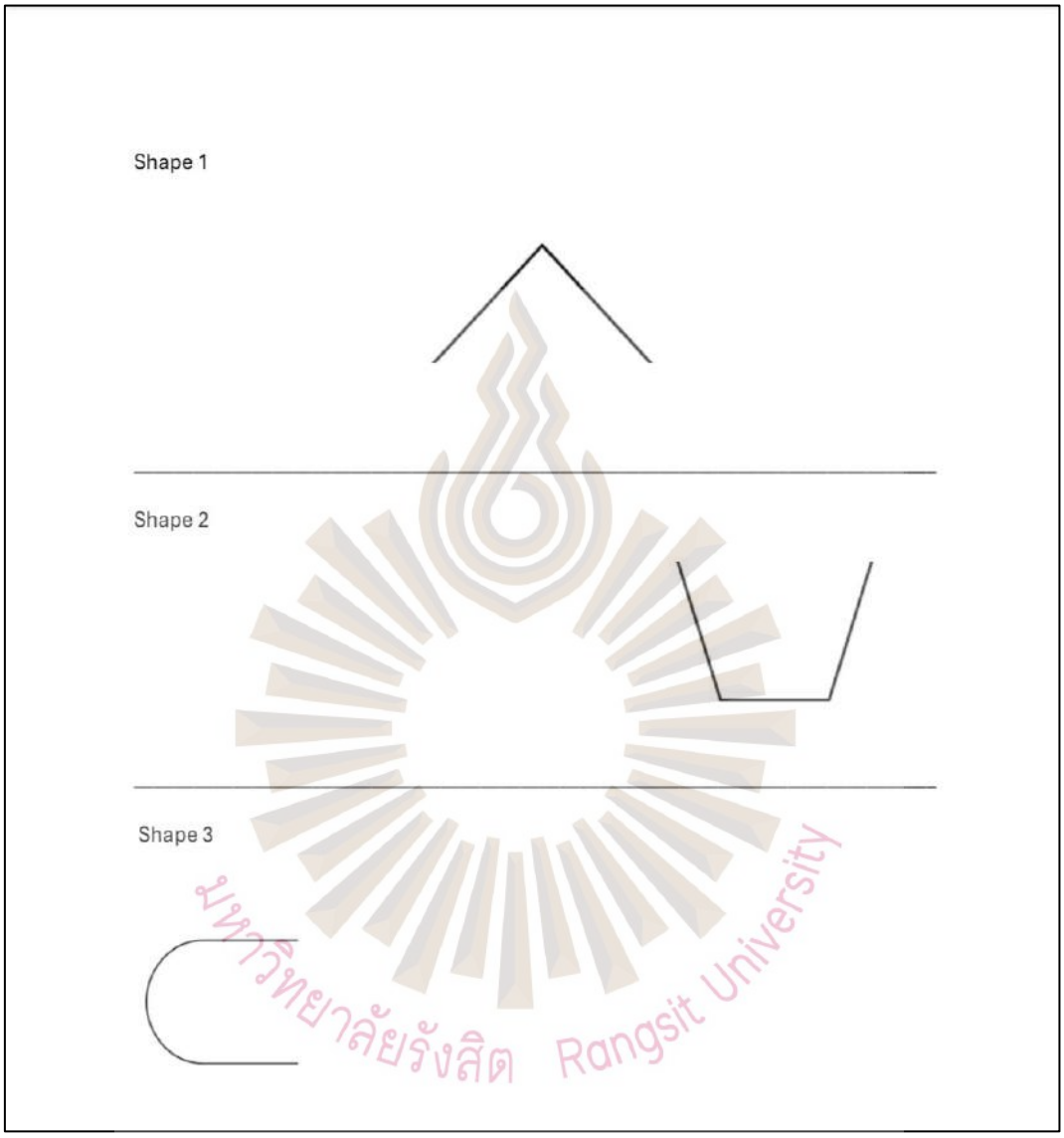


Shape 4

Shape 5



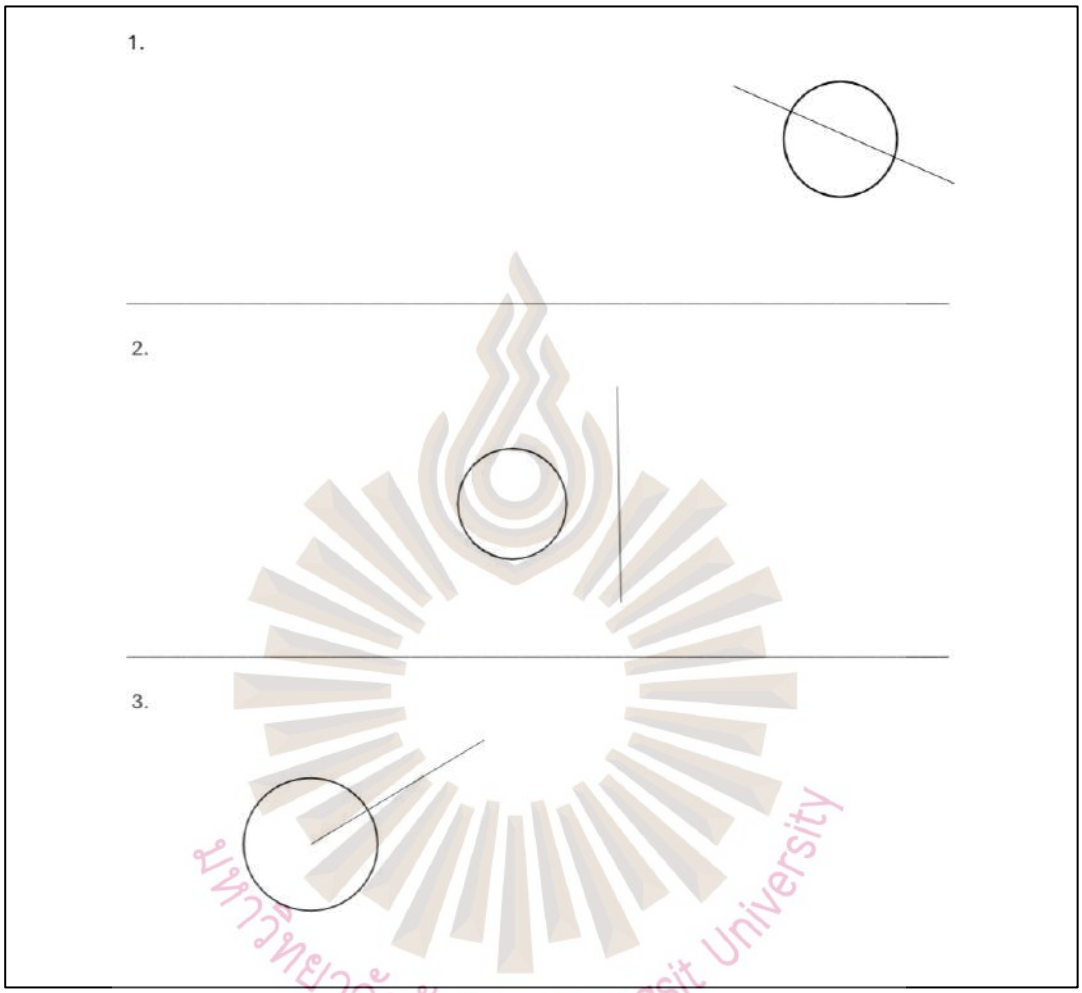
Activity 2: Picture Completion Test



Shape 4

Shape 5

Activity 3: Lines and Circles



4.

5.

3. Evaluation Form for Prototype User-Testing

No.	Performance (25)	Engagement (25)	Teamwork (25)	Ability to follow Instructions (25)	Total Score (100)
1					
2					
3					
4					
5					
6					

Appendix C

Pictures of Activity

Biography

Name	Thiri Myat Noe Aung
Date of birth	June 12, 1998
Place of birth	Yangon, Myanmar
Education background	East Yangon University Tarwa, Myanmar Bachelor of Arts in English, 2021 Rangsit University, Thailand Masters of Fine Arts in Design, 2024
Address	52/576 Ek Thaksin 5rd, Lak Hok Mueang Pathum Thani, Pathum Thani, Thailand 12000