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The Application of Tangram Media in Developing the Cognitive Skills of 4-5 Year Old Children at RA Takrimah

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Abstract
Early childhood cognitive development encompasses thinking, remembering, imagining, and problem-solving, which require stimulation through learning media. This study aims to assess the effectiveness of tangram media in developing the cognitive abilities of children aged 4–5 years through exercises that involve identifying and arranging tangram shapes from basic geometric blocks to form new shapes. The observational results revealed that children aged 4-5 years have difficulties; their cognitive development remains limited. 16 of 22 children have not demonstrated the ability to arrange and name geometric blocks and to compare their similarities and differences. This study was conducted at RA Takrimah Banda Aceh. This study employed a quantitative pre-experimental design with a one-group pretest-posttest format. Purposive sampling was used, and of the 43 students in the population, 22 from class A2 were selected as the sample. Data collection methods include observation and documentation. Based on the results of the Normality Test, after ensuring that the data is normally distributed, the t-count value (19.439) > t-table (1.721) and sig (2-tailed) 0.001 < 0.05 obtained from the data analysis process indicate that the null hypothesis (Ho) is rejected and the hypothesis (Ha) is accepted. Based on the research findings, Tangram Media is a viable alternative to traditional methods for developing early childhood cognitive abilities.

Keywords: Tangram Media, Cognitive Development, Young Children.

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INTRODUCTION

Cognitive development refers to changes in cognitive structures that encompass mental processes such as thinking, remembering, imagining, problem solving, creativity, language, intelligence, and reasoning. Children's functions improve, and their cognitive structures become more sophisticated and mature as a result of mental activity. Over time, children's cognitive skills develop across various areas, including memory, attention, reasoning, problem-solving, abstraction,

language, and understanding of increasingly complex ideas (Eka Daryati & Sadiana, 2025; Jhoni Warmansyah, 2023).

The cognitive development of a growing individual is active, implying that a person actively participates in their own mental development. Children experience various phases of cognitive development, according to Piaget's theory, each with unique characteristics; however, these stages are interconnected and continuous in a developmental sequence. Piaget explains this as the fundamental mental order and structure by which individuals adapt to their environment. Piaget defined cognitive development as the evolution of logical reasoning from childhood to adulthood. Piaget emphasized that from an early age, mental development is greatly influenced by the sensorimotor period and the preoperational stage (Daryati, 2025; Fatimah, 2021).

According to Vygotsky, cognitive development underscores the role of social and cultural interactions in the early development of logical reasoning. According to Vygotsky, children learn through interaction with more expert individuals, such as parents, teachers, and older peers, as well as through cultural means, one of which is language. For example, breaking geometric shapes into smaller pieces requires children to solve problems and collaborate simultaneously (Suriah, 2019).

According to Colvin, cognitive growth is the capacity to adapt to the environment. Thus, a child's ability to understand various concepts constitutes their mental growth. Henman describes cognition as intelligence and knowledge, whereas Hunt views cognition as the processing of information from the senses, which further supports this view. Furthermore, symbolic thinking includes the capacity to understand numerical concepts, call, read, and visualize ideas through visuals (Hery Setyani & Dwijayanti, Ida, 2023). Early childhood educators can support and optimize children's cognitive development by designing a variety of learning activities that enhance their thinking skills. Of course, these educational tasks can be achieved through play, as learning for children of this age essentially means learning through play (Fadillah & Suryadi, 2025).

The primary cognitive development of concern is logical thinking, a thought process that emphasizes reasoning. This ability is evident in activities that involve comparing and connecting various pieces of information. Therefore, to help children develop this logical thinking ability, it is essential to consider how information should be presented so that they can absorb and understand it. Playing, question and answer sessions, and the use of real objects and simple visual displays can also help develop children's logical thinking skills (Chandratika, 2025; Fitria, 2023). Children's logical thinking skills can be fully developed through age-appropriate play activities, fundamental skills, and the use of appropriate learning strategies (Febby Ristyadewi1, 2023).

Media in learning activities are the means and tools that help educators carry out the learning process in accordance with established plans. Media can be people, objects, or events that serve as intermediaries in creating conditions that support learners' learning. The presence of learning media also plays a role in increasing children's participation and motivation during the learning process (Shofia & Dadan, 2021). Tangram is a medium that can be utilized: a traditional Chinese puzzle game known to stimulate children's creativity and understanding of geometric concepts. Tangram consists of seven geometric shapes that can be arranged and combined to form various patterns and designs, thereby sharpening problem-solving skills and encouraging children to think creatively (Zunita, 2024).

Simple materials such as paper, wood, or plywood can be used to make educational toys called tangrams. The seven pieces of this Chinese puzzle are a square, a rectangle, a medium-sized triangle, two small triangles, and two large triangles (Mega Faniya et al., 2023). The tangram media used in this study were made from plywood. Children can learn various basic geometric shapes using tangram media, as well as compare the similarities and differences between various basic geometric shapes, and be able to combine and separate these shapes into various objects, such as rockets, animals, houses, and others (Humaira et al., 2024). Children's interest in tangram media stems from its colors and shapes, which allow children to explore, dismantle, form, and group (Amelia et al., 2022).

Cognitive development refers to a child's capacity for broad or intellectual thinking, memory, imagination, problem-solving, and creativity (Fauzia, 2022). In this study, cognitive development is defined as a child's ability to think, remember, and develop creativity through their ideas. The focus of enhanced cognitive development is the ability to think logically, a mode of thinking that relies on reasoning. This ability can be observed through activities of comparing and connecting (Harini et al., 2025).

Based on observations conducted at RA Takrimah in October 2024, researchers identified problems among children aged 4-5 years, particularly related to cognitive development, of the 22 children, only six were able to arrange geometric blocks, name the geometric blocks, and compare their similarities and differences. This indicates that 16 children were still unable to demonstrate these skills. Thus, only 33.33% of the children recognized and understood geometric blocks, whereas 66.67% were unable to do so.

Meanwhile, Indonesian Education Regulation Number 5 of 2022 on Culture, Research, and Technology states that children aged 4 to 6 years should develop cognitive skills within the independent early childhood education curriculum, which includes the basic components of STEAM, literacy, science, mathematics, technology, engineering, and art. This is indicated by children's ability

to recognize simple geometric shapes, compare similarities and differences among basic geometric shapes, combine and decompose geometric shapes into new forms, and group and compare simple geometric shapes (Kemendikbudristek, 2022).

Based on several previous studies, one of which is a study by Putri Rahmi entitled "The Application of Tangram Educational Games to Improve Children's Creativity in Recognizing Geometric Shapes at TKN Pembina Lawe Alas" in 2020. The classroom action research (CAR) methodology was used in this study. The research findings showed that children's development increased from 68.07% in Cycle I, which was categorized as Developing as Expected (BSH), to 84.37% in Cycle II, which was classified as Very Good Development (BSB) (Rahmi et al., 2020).

Further research was conducted by Giodya Reza Bintari in 2021, titled "The Effect of Tangram Media on the Ability to Recognize Geometric Shapes for Early Childhood," which employed a quantitative regression approach. Based on the results of phase I of the study, children's number recognition ability was only 51.493 when the tangram medium was not used, compared with a constant of 57.725. In the second phase of the study, children's recognition of geometric shapes was the dependent variable, and the tangram medium accounted for 0.585 (58.5%). However, the magnitude of this relationship also depends on additional variables beyond the scope of this study. Therefore, it can be said that children's geometric shape recognition ability increases by 58.5% as a result of using the tangram media (Daryati, 2025; Giodya, 2021).

Nur Zunita conducted a study titled "The Use of Tangram Media in Introducing Geometric Shapes to Group A at Wildani Integrated Islamic Kindergarten (Case Study)" in 2024. This research employed a qualitative methodological approach to data collection: the research design combined observation techniques, in-depth interviews, and the examination of relevant documents. Empirical findings from this study indicate that integrating tangram-based media into a pedagogical context significantly improves students' understanding of various geometric shapes. In addition to performing tasks such as grouping, tracing, and assembling tangram puzzles, the research volunteers were also able to identify colors and shapes. The results of interviews with three research subjects and classroom teachers support this conclusion, showing how Tangram media can improve the learning process for recognizing geometric shapes (Zunita, 2024).

This study is comparable to prior studies on the use of tangram media. However, this study is unique because it focuses on efforts to improve the logical reasoning abilities of four- to five-year-old children as a component of cognitive development. No previous studies have been found that specifically improve children's logical thinking skills through tangram media by presenting simple geometric shapes such as triangles, squares, and parallelograms, in this context, tangram media is

used to facilitate children in comparing, connecting, combining, and decomposing basic geometric shapes into new shapes, such as rockets, animals, houses, and others.

This study focuses on the use of tangram media at RA Takrimah Upaya to help children aged four to five years develop their logical thinking skills. Initial observations indicated that the children's cognitive abilities remained relatively weak, prompting the initiation of this study. Thus, the researcher proposed to conduct a study titled "The Application of Tangram Media to Develop the Cognitive Skills of 4-5 Year Old Children at RA Takrimah." The purpose of this study was to assess the effectiveness of using tangram media in developing the cognitive abilities of 4-5-year-old children at RA Takrimah, and to examine the skills and processes of these children in recognizing and arranging tangram pieces into basic geometric shapes to form new shapes, such as geometric blocks.

METHODOLOGY

Types of research

A quantitative approach with a pre-experimental design was adopted for this investigation. This quantitative method utilizes data that has been measured or expressed as numbers and is objective, scientific, and inductive, which is then analyzed using statistical techniques (Hermawan, 2019). This study employed an experimental design to assess the treatment's effectiveness in the subjects studied. One experimental group was included in the One-Group Pretest-Posttest Design. The test is conducted twice in this design: once before the treatment (pretest) and once after the treatment (posttest). With the pretest, the results of the treatment can be evaluated more accurately because it allows for a comparison of the conditions before and after the treatment is applied (Sugiyono, 2013). The research design is described as follows

Table 1: Research Design

Class	Pre-Test	Treatment	Post Test
Experimental	O_1	X	O_2

Description:

O_1: Experimental class pretest

X: The application of tangram media to improve children's cognitive skills was the treatment given to the experimental group aged 4 to 5 years at RA Takrimah.

O_2: Posttest of the experimental class

Time and Place of Research

The research was conducted at RA Takrimah in Tungkop Village, Darussalam District, Aceh Besar Regency. This research was conducted from August 1 to August 6, 2025. Before conducting the study, the researcher made preliminary observations during an initial internship at RA Takrimah, lasting approximately six days. Additionally, the researcher taught and engaged in direct classroom interactions for 45 days of Field Practice Training (PPL). Rather than conducting a brief series of preliminary observations, this research employed in-depth observations to gain a comprehensive understanding of field conditions.

Research Objectives

The research population comprised 43 students in class A at RA Takrimah, aged 4-5 years. There were 22 students in class A2 (11 girls and 11 boys) and 21 children in class A1 (10 girls and 11 boys). Class A1 had a relatively broad age range and therefore did not fully meet the study's age criteria. Therefore, Class A2 was selected as the sample because it met the research requirements, including a relatively homogeneous level of cognitive development, a structured learning schedule aligned with the research focus, and a class teacher who had implemented game-based learning. These conditions facilitated the researcher's observations and the measurement of the effectiveness of learning media use.

Based on these considerations, the researcher did not involve both classes simultaneously to ensure that the research results would be more focused, in-depth, and free from bias arising from differences in treatment between classes. Thus, the children in class A2 were the subjects of this study. Purposive sampling was used in the selection process because participants were selected according to predetermined criteria deemed appropriate and aligned with the research objectives.

Data Collection Techniques and Instrument Development

Observation and documentation were employed to collect data for this study. This study tool was created to evaluate the cognitive development of children aged four to five years using various indicators such as the ability to recognize simple geometric shapes, compare similarities and differences, combine and break down geometric shapes into new shapes, group geometric shapes that have similarities, and compare simple geometric shapes (Kemendikbud, 2022). Data collection instruments use observation sheets, the accuracy of which has been verified.

Table 2. Cognitive Development Achievements of Children Aged 4-5 Years

ELEMENT	CP	TP	CONTEXT
Literacy and STEAM	Children recognize and use pre-mathematical concepts to solve problems in everyday life.	Name	Children can name simple geometric shapes (triangle, square, parallelogram).
		Comparing similarities and differences	Children can compare the similarities and differences between basic shapes. geometric
		Combining and decomposing	Children can combine and decompose geometric shapes into new shapes.
		Grouping.	Children can group geometric shapes by size.
		Comparing simple geometric shapes	Children can compare simple geometric shapes such as triangles, squares, and parallelograms.

Source: Learning and Assessment Guide for Early Childhood, Elementary School, and Middle School Education, 2022:36.

Data Analysis Techniques

The Shapiro-Wilk normality test and statistical software version 27 were used to examine the research data. Furthermore, a paired-samples t-test was used to test the hypothesis, using the same software at a 5% significance level, to detect differences between pretest and posttest results. The pretest was administered on Friday, August 1, 2025, using geometric blocks to assess children's cognitive abilities prior to tangram treatment. After obtaining the pretest data, the treatment was carried out three times, namely on August 2-5, 2025. Subsequently, the posttest was administered on August 6, 2025, to assess changes in children's cognitive abilities following the treatment.

RESULTS AND DISCUSSION

RESULTS

From August 1–6, 2025, this study was conducted in three phases: pretest, treatment, and posttest. The pretest served as the first assessment of the research sample, measuring children's cognitive abilities in using tangram media in class A, RA Takrimah, before the treatment was implemented (Mukhid, 2021). After the pretest was conducted, the next stage was to administer the treatment to the research sample. Using the same indicators as in the pretest phase, the treatment was administered three times. After all treatments were completed, the final stage was the posttest. The posttest was the final assessment used to measure changes in ability following treatment (Wicaksono, 2022). The use of pretest and posttest produced the following data based on the research findings:

Table 3: Pretest and Posttest Results

No	Name	Pretest Score		Posttest Score	
		Total	Average	Total	Average
1	QR	11	2.2	19	3.8
2	ZAM	10	2	19	3.8
3	AH	12	2.4	20	4
4	RMA	11	2.2	19	3.8
5	SK	10	2	19	3.8
6	MS	11	2.2	20	4
7	A A	10	2	20	4
8	MNF	12	2.4	19	3.8
9	HKM	11	2.2	19	3.8
10	NSA	9	1.8	20	4
11	MFA	10	2	20	4
12	ML	9	1.8	20	4
13	MFA	12	2.4	20	4
14	SA	14	2.8	18	3.6
15	MRM	13	2.6	18	3.6
16	YB	13	2.6	19	3.8
17	A A	12	2.4	20	4
18	AM	12	2.4	19	3.8
19	Mrs.	13	2.6	20	4
20	EAA	13	2.6	19	3.8
21	A A	13	2.6	20	4
22	CZA	14	2.8	19	3.8
Total		255	51	426	85.2
Average		11.59091	2.318182	19.36364	3.872727

Based on the table above, all children obtained a total score of 51 on the initial test, with an average score of 2.3. Based on this score, the children's abilities were classified as adequate. Furthermore, the total score of all children on the final test reached 85.2, with an average of 3.8. Based on this average, the children's abilities were classified as "good".

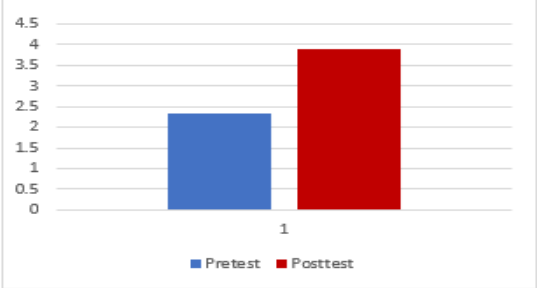

Figure 1. Comparison diagram of pretest and posttest scores

Showing an average score of 3.8 on the post-test evaluation and 2.3 on the pre-test assessment. The pretest and posttest graphs above show an increase in scores. After obtaining the pretest and posttest results, a normality test was conducted.

Normality tests can be used to determine whether a sample or a data distribution follows a typical distribution. The primary purpose of normality tests is to determine whether data are regularly distributed (Zulkifli et al., 2025). In this study, software Statistik was used to perform the Shapiro-Wilk normality test. This test was chosen because it can be applied to data with a sample size of fewer than 50.(Henry Kurniawan, 2024). The normality test is as follows:

a. Ho is rejected, or the data is not normally distributed if Sig or significance < 0.05.
b. The data shows a normal distribution if Sig > 0.05. In this case, Ha is accepted (Feky Reken, 2024).

Table 4. Normality Test

Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pretest	.153	22	.198	.938	22	.179
posttest	.111	22	.200*	.957	22	.430

Based on the previous normality test table, the Shapiro-Wilk method was used for evaluation. Therefore, if the p-value exceeds 0.05, the data are considered normally distributed. The significance values for the pretest and posttest are 0.179 > 0.05 and 0.430 > 0.05, respectively. Therefore, the pretest and posttest distributions are considered normal based on the significance criterion (p-value).

Table 5. t-test/Hypothesis

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Standard Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Pretest - Posttest	-7,773	1,875	.400	-8,604	-6,941	-19,439	21	.000

The p-value (2-tailed) in the t-test results table is 0.001, which is less than 0.05, indicating that the pretest and posttest data differ significantly. The research hypothesis is assessed using the following standard: when the two-tailed p-value is below 0.05, the pretest and posttest data are significantly different; if the p-value is greater than 0.05, the difference is not significant.

The t-table value and the calculated t-value of 19.439 are compared. The formula df = n-1 is used to determine the t-value from the t-table at the 0.05 significance level. The t-statistic is 1.721 with df = 21. Based on the comparison results, t-calculated (19.439) > t-table (1.721). As a result, Ha

is accepted while Ho is rejected. These findings indicate that children aged 4–5 years at RA Takrimah can develop their cognitive abilities through the use of tangram materials.

DISCUSSION

The use of tangrams significantly improves children's cognitive abilities, according to the study mentioned earlier. The average pre-test score of 2.3 is considered adequate, while the average post-test score of 3.8 is considered good. This improvement is evident in the comparison of average pretest and posttest scores. The average increase of 1.5 points demonstrates the effectiveness of tangrams in stimulating children's cognitive abilities, particularly logical thinking skills, including comparing, connecting, combining, and decomposing geometric shapes into various forms, such as rockets, animals, houses, and other figures. This effectiveness is reinforced by the results of the Hypothesis Test (t-test) supporting this efficacy: The t-table value (1.721) is smaller than the t-count value (19.439). 0.000 < 0.05 is the significance value (2-tailed). This statistical criterion provides the basis for rejecting H0 and accepting H1. Quantitatively, this demonstrates that the use of tangram media at RA Takrimah can improve the cognitive development of children aged 4-5 years.

Pre-test, treatment, and post-test are the three steps researchers use to process data. Geometric blocks were used in the pre-test on Friday, August 1, 2025, to assess children's cognitive abilities prior to the tangram media treatment. The average pre-test score was 2.3. In addition, from August 2 to 5, 2025, three treatment sessions were conducted. Using Tangram media, the researchers explained the stages of the tasks the children were required to complete during the first session and introduced and demonstrated the media. The children showed great enthusiasm and interest in the tangram introduced to them.

Treatment I activity: After introducing the names of geometric shapes in the tangram media, the researcher asked the children to group similar geometric shapes. In treatment II, the children were asked to name and compare simple geometric shapes in tangram media, then to describe these shapes as new shapes with the teacher's help. Next, in treatment III, the children assembled and glued HVS paper tangram pieces to form an object, such as a house. After the three treatment stages were completed, the activity continued with a posttest on Wednesday, August 6, 2025.

During the posttest activity, children combined and separated geometric shapes from the tangram media, then named the shapes and compared their similarities and differences. At the post-test stage, it was evident that the children demonstrated improved performance compared with the pre-test results. With an average score of 3.8, the post-test results showed an improvement, indicating that the children's abilities were in the "good" range.

The children showed great enthusiasm when using tangrams to learn throughout the course. This was because instruction was delivered through games, which kept them engaged and motivated to learn. This signaled an improvement in their learning outcomes. Thus, existing problems can be overcome through the application of tangram media. Therefore, at RA Takrimah, Tangram media has been proven to be successful in helping children aged 4 to 5 years develop their cognitive abilities.

Study Khotimah (2022) This supports the idea that using educational tangram toys can improve children's cognitive development. The seven pieces of the tangram consist of five triangles, one quadrangle, and one parallelogram. The purpose of the tangram is to improve recognition of geometric shapes, colors, sizes, and counting skills. Playing with tangrams is very enjoyable because it helps develop children's imagination, which can trigger strong creativity. Playing with tangrams also helps them develop cognitive skills. Meanwhile, based on research Giodya (2021) Evidence indicates that tangram games are a valuable tool for promoting children's cognitive development. Children may be able to recognize various simple geometric shapes more easily through this game. Tangram provides a more enjoyable way for students in playgroups to learn about geometric shapes. The tangram puzzle holds particular appeal for children. This method, which combines learning and play, is appropriate and recommended for young children.

This was also confirmed by Khaerunnisah et al (2024) Play activities, including tangrams positively influence children's cognitive abilities. Children with stronger cognitive abilities are those who can solve tangram puzzles, particularly by identifying shapes, assembling pieces into complete forms, and creating original patterns. In addition, children's critical thinking, creativity, and problem-solving skills are all enhanced by this.

This is also supported by research Rahmi et al (2020) Because learning is fun, Tangram educational toys can inspire children and foster their creativity in identifying geometric shapes and other developmental aspects. In addition, children's cognitive abilities can be stimulated by playing with tangrams, as it requires them to think about the shapes formed from geometric pieces as they move the pieces. This proves that Tangram educational games are effective in supporting the development of children's cognitive abilities.

Tangram is a highly effective learning tool because it can serve as a primary resource for developing logical thinking skills, recognizing geometric shapes, and solving problems. Tangram helps children to be active, curious, and creative when arranging pieces to form various cognitively challenging images (Wahyu et al., 2023). Thus, teachers can utilize tangrams to create enjoyable, play-based learning, which has been proven to increase children's motivation and activity (Ano, Anestri K et al., 2023).

Tangram media offers a concrete and playful way to develop various cognitive aspects, ranging from geometric shape recognition and comparison to creativity and the ability to assemble new shapes (Hendriyadi, Linda Ayu Pertiwi, 2023). The results of this study can serve as a guide for other early childhood education institutions in developing similar educational resources. Tangram media can be used as an alternative or complement to less interactive teaching methods (Puji Indiati1, Wina Dwi Puspitasari2, 2021).

The findings of this study can serve as a basis for developing comparable learning materials for RA and other early childhood education facilities. Thus, children aged 4-5 years at RA Takrimah have benefited from the use of tangram media in terms of their cognitive development.

CONCLUSION

Research findings show that Tangram media can improve the cognitive abilities of four- to five-year-old students at RA Takrimah. The average cognitive skills of children increased significantly following therapy using Tangram media. The average pretest score increased from 2.3 (adequate) to 3.8 (good) on the posttest. The results of the t-test showed that the t-count value (19.439) was greater than the t-table value (1.721) with a significance value (2-sided) of 0.001 < 0.05. The average Pretest and Posttest scores differed significantly as a result of this criterion, leading to rejection of Ho and Ha. Thus, we conclude that children at RA Takrimah aged 4-5 years have benefited from the use of tangram media in terms of their cognitive development.

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