

# THE EFFECTS OF PLAYDOUGH GAMES IN LEARNING (STEAM) TO IMPROVE CREATIVITY AND SYMBOLIC THINKING IN CHILDREN 5-6 YEARS

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## ABSTRACT

This study aimed to determine the effects of playdough games on steam learning for early childhood at RA Al Mujahidin Babakan Cikao Purwakarta and the influence it has on children's creativity and symbolic thinking. The type of research used was quantitative research using the ssr research method with a single subject experiment and the A-B-A (single subject research) design pattern to find out the causes and effects of the research variables. The results showed that the intervention in the form of playdough games had an impact on the ability of creativity and symbolic thinking in children. At baseline 1, the 1<sup>st</sup> and 2<sup>nd</sup> study subjects obtained a percentage of 39.57%. and the 3rd subject obtained a percentage of 37.25%. While the conditions at baseline 2 of the three subjects experienced an increase with an increase in percentage to 66.96%, 74.27% and 87.39%. This is in line with the results of the low overlap percentage of 0%. The location of this research was carried out at RA Al Mujahidin Babakan Ciako Purwakarta. The subject of this study was group B, which consisted of 3 children, 1 boy and 2 girls. The results of the study showed that there is an influence of the use of playdough media on creativity and symbolic thinking of early childhood at RA Al Mujahidin Babakan Cikao and can be viewed with quite influential interpretations.

Keywords: *early childhood, STEAM, playdough*

## 1. INTRODUCTIONS

Early childhood is a phase where children will continue to develop, and this period is called the golden age for children, because at an early age, children are very unique individuals and have their own characteristics that are different from adults. At an early age, children have many abilities that can be developed, we must support the skills they have so that they can develop properly (Sari, Suryana & Zulminiati, 2020).

Early age is a long and important life journey in human life. Because the formation of the foundation and basis of personality is formed at an early age, so that children get a lot of experience. At this time the process of growth and development is formed quickly. Therefore, it is at that time that children get the right stimulus so that children can develop optimally (Putri & Eliza, 2019).

Early childhood is an individual who is experiencing a very rapid process of growth and development, even said to be a developmental leap. Early childhood has a very valuable age range compared to later ages because their intelligence development is extraordinary (Mulyasa, 2014). So, this period is a unique period, different from other periods and is said to be a golden age where

children are able to quickly absorb various information given to them. Therefore, it is said that early childhood intelligence develops very extraordinary.

During this early childhood, stimulation of all aspects of development has an important role for further developmental tasks. Early childhood development is a very important period and needs to be treated as early as possible (Mulyasa 2014, p. 20). And as already said, physical and spiritual growth and development in early childhood develop so very rapidly. Therefore, we must make the best use of this period, children are only given the right, optimal and effective education so that their growth and development can develop properly.

Entering the industrial revolution 4.0 changed the learning targets which initially focused on learning outcomes to focus on the learning process. The industrial revolution 4.0 demands human resources who have the ability for 4C, namely Communication, Collaboration, Creativity, and Critical thinking. Apart from being creative, thinking critically, communicating and collaborating, people are also required to be able to search, process and convey information through technology (Risdiyanto, 2019). This demand certainly makes a revolution in learning. Various models, methods and learning strategies have developed following the dynamics of the industrial revolution, this is because education is the spearhead of preparing the human resources needed.

The results of collaboration and creative thinking can produce innovative products. The STEAM learning model (Science, Technology, Engineering, Art and Math) is a development of the STEM model by adding Art or arts. STEM was designed by the National Science Foundation (DeCoito, 2014), which is a combination of: Science (study of the natural world), Technology (study of products made to fulfill human wants or needs), Engineering/Engineering (design processes used to solve problems), and Mathematics (the language of shapes, numbers, and numbers).

Judging from the characteristics of STEAM that have been stated, the STEAM model can be applied in PAUD as stated by Hope 2021, STEAM in PAUD is defined as follows: (1) Science is an activity related to investigation and experimentation. Using the question "how can 6175ndust blow?", why can the ice melt?" make children curious about life and the environment around them. (2) Technology (technology) is commonly used as a tool, technology is not just a machine or smartphone, but paper, pencil, pen, scope,

scales as well as technology. (3) Engineering (technique) is an activity of identifying problems in an effort to create something usable. In their activities, children will think and solve the problem of how to make houses made with Lego stand upright, and so on. (4) Art (art) is related to how children can put ideas into something according to their imagination. Like making pictures, graphics, and so on. (5) Mathematics (mathematics) related to children's activities to count, group, make patterns or make shapes.

Children have various stages that must be passed, and naturally the development of children is different, one of which is the development of creativity and symbolic thinking. Creativity is a general ability to create something new, either in the form of new products or ideas that can be applied in solving problems, or as the ability to see elements that already existed before (Achmad Susanto, 2012). So, it can be concluded that creativity is a person's ability to produce something new, both the ability to produce real products/work or ideas from something that already existed before.

Playing can be used by children to explore their world, develop competence in an effort to overcome their world and develop children's creativity (Suryana, 2016). Playing is a fun and spontaneous activity so that it gives a psychological sense of security to children. Feeling psychologically safe and free is an important condition for the growth of creativity. Children are accepted as they are, valued for their uniqueness, and not evaluated too quickly, will feel psychologically safe.

Play provides opportunities for children to express their creative impulses as opportunities to experience objects and challenges to find things in new ways, to find uses for things differently, to find new relationships between things and things, and to interpret them in many alternative ways. In addition, playing provides an opportunity for individuals to think and act imaginatively, as well as full of imagination which is closely related to the development of children's creativity (Wiyana & Barnawi, 2014).

Playdough media is a material used for playing by children in class. Playdough provides a fun and fulfilling experience for children, but it's not just a fun activity. Through this media, teachers can use it as a way to observe children's development in various areas of development (Sari, 2013)

The development of children's creativity must be given stimulation from an early age, so that children will feel creative thinking, because creativity allows humans to become qualified and survive in their lives. Children will see problems from various points of view, be able to produce works that are different from those that existed before (Susanto, 2012). As has been said, the development of children's creativity must be stimulated from an early age and early childhood education is the most appropriate time to develop creativity.

Therefore, it is necessary to have game and learning programs that can maintain and develop children's creative potential. Children's creativity can also be honed or trained by the teacher using or applying game media. Because through playing children can learn many things, without realizing it and without feeling burdened (Mulyasa, 2014). So, by playing children can also learn, therefore playing while learning is very appropriate for the child. Playing can make children learn with pleasure, and by learning through play children can master more challenging subjects.

From the explanation above, it can be concluded that developing creativity and symbolic thinking in children can be done by implementing games. Games are learning media that can increase creativity and all the potential that children have are also very liked by children because they reduce boredom when children learn. As well as learning media have a very important role in developing creativity and symbolic thinking of early childhood, especially the game media.

Therefore, a teacher must be more creative in preparing learning media for children because sometimes a teacher only always prepares learning media in the form of student worksheets, that makes children get bored quickly and the learning process will look monotonous. It is necessary to prepare well the media that can facilitate the development of children's creativity. Playdough is one of the educational play media. Playdough has a soft texture, so it is easy to shape it into the desired shape. Children like playdough because with playdough children can knead, press, form playdough into symbols, objects, letters, numbers, animals, people and so on, according to the child's creations and imagination.

In using this playdough media, teachers at RA Al Mujahidin invite children to play by exploring using the media and making children actively use their imagination. Because the teacher there provides opportunities or scope for children to form playdough according to their own imagination. Therefore, researchers are interested in conducting research with the title "The Effect of Playdough Games in Learning (STEAM) to Increase Creativity and Symbolic Thinking in Children Aged 5-6 Years"

## **2. LITERATURE REVIEW**

### **2.1 Cognitive Theory of Science and Mathematics for Early Childhood**

Science Technology Engineering Art Mathematics (STEAM) is an approach to the learning process that combines science, technology, engineering, mathematics, and art in the learning process. Learning can be defined as the abilities possessed by students after gaining experience in carrying out activities (Hamalik, 2007). Learning with the STEM approach aims to make students more easily understand the concepts that will be conveyed and can apply them in everyday life and can explore the potential that exists within them. The next development is by adding "Art" to STEAM to further explore children's creativity and art.

Mathematics as one of the lessons that hones students' concepts and mindsets is expected to no longer be frightening for children. For this reason, a fun, innovative and applicable mathematics learning process is needed in life so that students' motivation and interest in learning mathematics can increase.

### **2.2 Creativity and Symbolic Thinking**

Creativity is a person's ability which in everyday life is associated with special achievements in creating new things or something that already exists into new concepts, finding ways to solve problems that most people cannot find, generating ideas. something new that has never existed, and sees various possibilities that will occur (Fakhriyani, 2016).

When children aged 5-6 years is a period of cognitive development of children in the preoperational phase in Piaget's cognitive stage

theory, which is characterized by the ability to present objects, objects, people mentally. This means that the child already has the ability to imagine things, objects, people and events in his mind even though all of them are not present empirically or physically in front of the child. This ability is also called the ability to think symbolically. Where the forms of thinking are shown in the various activities they do, such as when playing. At play time children operate the ability to think symbolically

### 3. METHODS

The method used in this research is using single subject research experiment (single subject research design). Experimental research designs can be broadly divided into two groups, namely (1) group design and (2) single subject design (Yuwano, 2019). The group design focuses on data from individual groups, while the single subject design focuses on individual data as research samples. The research method is subject single research developed by Juang Sunanto namely, the theory of modification of a person's behavior where the measurement of variables is carried out by the same object but with different conditions. What is meant by conditions here are baseline conditions and experimental conditions (intervention). Baseline is a condition in which the target behavior measurement is carried out in a natural state before any intervention is given. Experimental conditions are conditions where an intervention has been given and the target behavior is measured under these conditions.

The design used in this study is the A-B-A reversal design. This A-B-A design is one of the developments of the basic AB design. This A-B-A design has shown that there is a causal relationship between the dependent variable and the independent variable. The basic procedure is not much different from the A-B design, except that there has been a repetition of the baseline phase. At first, the target behavior was measured continuously at the baseline condition (A1) for a certain period of time then at the intervention condition (B). In contrast to the A-B design, in the A-B-A design after measurements in the intervention condition (B) measurements in the second baseline condition (A2) are given. The addition of the second baseline condition (A2) is intended as a control for the intervention phase so that it is possible to draw conclusions that there is a functional relationship between the independent variable and the dependent variable.

In this study, researchers determined 3 students of RA Almujaahidin as research subjects. Data collection activities are carried out using tools in the form of instruments. The stages of using SSR research are: (1) Determining Titles and Identifying Problems in the Field (2) Determining research instruments. (3) Calculating research results. (4) Making conclusions. In order to carry out the trial steps on the development research model, this research will conduct a limited trial on RA Al Mujaahidin. The population in the research group B or children aged 5-6 years is 3 people. The type of data in this study is primary data, where data is taken from children directly as research subjects. The data collection technique in this study as a whole was a questionnaire on the effectiveness of using

Playdough for group B children, namely looking at the feasibility of playdough in STEAM learning. the method.

### 4. RESULTS & DISCUSSION

After the researchers conducted research on students in group B Ra Al Mujaahidin using a questionnaire and test instruments. In the first stage, at this stage the researcher analyzes based on the learning needs of the 21st century. In line with the industrial revolution 4.0 where human resources are expected to have the ability to think critically, creatively, innovatively, be able to collaborate and communicate well. For this reason, educational institutions as human resources must provide learning that supports the abilities of 21st century children where we must be able to change the learning paradigm of the 21st century, where teachers, parents and students can use technology to be able to think critically, collaborate, be creative, solve problems. One type of learning that can facilitate is STEAM-based learning, as expressed by (Zubaidah, 2019) that STEAM-based learning is designed to teach various skills in the 21<sup>st</sup> century, thus developing media that assists teachers in carrying out STEAM-based learning is very important. In addition, based on the results of previous studies, there are still many children who have low 4 C abilities, one of which is research conducted by Yunita et al. (2019) which examines the improvement of children's critical thinking skills through a scientific approach, where prior to the scientific application, children's critical thinking abilities were low. another study by Reswari (2021) examined the effect of STEAM on HOTS thinking skills, where students who were given STEAM-based learning had higher HOTS abilities.

In the second stage the researcher made the playdough media, the steps taken were to make the playdough itself, prepare the tools and materials first. (1) 10 tablespoons of flour (2) 2 tablespoons of fine salt (3) 60 ml of warm water (4) water and pandan leaves (5) 1 tablespoon of vegetable oil (6) Scissors (7) Bowl (8) Blender. Then Mix flour and salt in a large bowl. Cut the pandan leaves then add a little water and then blend. After blending pandan leaves in a separate bowl, mix water and oil. Pour the colored water into the flour mixture and mix well with a spoon. Lightly sprinkle a table or flat surface with flour and roll out the dough. Knead for a few minutes to form a smooth, pliable dough. The science in this playdough is the color obtained for making this playdough from natural ingredients, namely pandan leaves. The technology in playdough is scissors, blender, spoon. Engineering occurs when the child pours all the ingredients. Art in playdough is found when children make playdough. Math in playdough is when the child has made playdough and then creates numbers and symbols.

#### 4.1 Data Description

The results of calculating creativity and symbolic thinking in children aged 5-6 years were viewed from the research instrument (result score: maximum score x 100%) for the three subjects.

**Table 1. Baseline 1 (Session 1-3)**

Name	Session to Test Achievement (%)		
	1	2	3

ATR	35%	37,5%	42,25%
WE	32,5%	35%	37,5%
RR	27,5%	30%	32,5%

Table 1 shows that the child's acquisition score in learning STEAM media playdough for ATR children is the highest 42.25% WE 37.5% RR 32.5%. The results of this study were then processed using the following formula.

Mean level baseline 1 (A) Total Multiple  
 Session Score

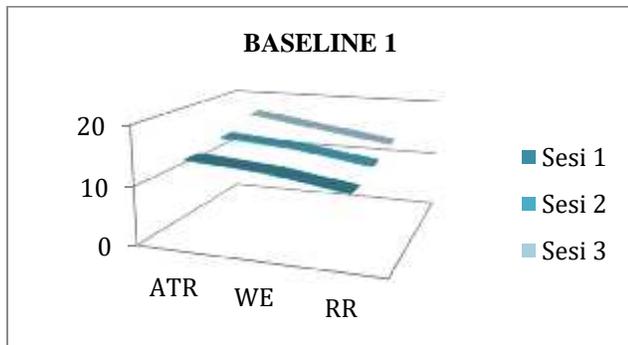


Figure 1. Baseline 1

Figure 1 shows that the mean level baseline1 (A) for children with ATR is 38%, WE is 35%, and RR is 30%.

Table 2. Intervention Gain (Session 1-3)

Name	Session to Test Achievement (%)		
	1	2	3
ATR	50%	55%	60%
WE	42,5%	47,5%	52,5%
RR	37,5%	42,5%	47,5%

Table 2 shows that the child's acquisition score in learning STEAM media playdough for ATR children is the highest at 60%, WE is 52.5%, RR is 47.5%. The results of this study are then processed using the following formula:

Mean level baseline 1 (A) Total Multiple  
 Session Score

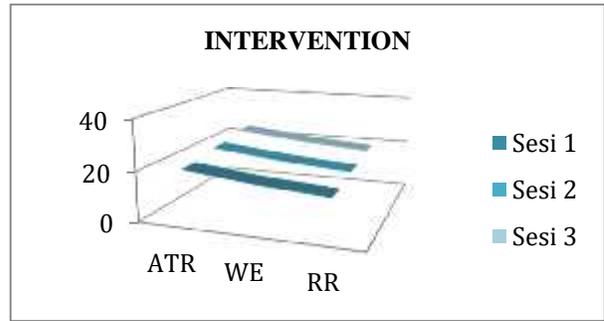


Figure 2. Intervention

Figure 2 shows that the mean level of intervention (B) for children with ATR is 55%, WE is 47.5%, and RR is 37.5%.

Table 3. Baseline 2 (Session 1-3)

Name	Session to Test Achievement (%)		
	1	2	3
ATR	75%	80%	87,5%
WE	62,5%	75%	82,5%
RR	62,5%	70%	80%

Table 3 shows that the child's acquisition score in learning STEAM media playdough for ATR children is the highest at 87.5%, WE is 82.5%, RR is 80%. The results of this study were then processed using the following formula:

Mean level baseline 1 (A) Total Multiple  
 Session Score

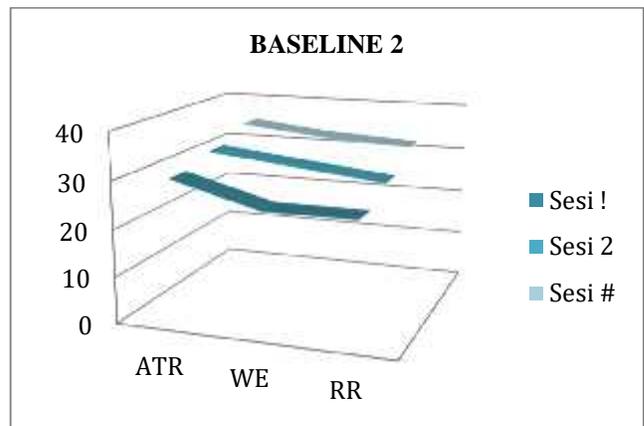


Figure 3. Baseline 2

So that in Figure 3, the mean level Baseline 2 (A) for children with ATR is 80.8%, WE is 73%, and RR is 70.3%.

**Table 4. Under Condition Analysis**

Condition Analysis	Baseline 1	Intervention	Baseline 2
<b>1. Condition Length</b>			
ATR	3 sessions	3 sessions	3 sessions
WE	3 sessions	3 sessions	3 sessions
RR	3 sessions	3 sessions	3 sessions
<b>2. Directional trend</b>			
ATR			
WE			
RR			
<b>3. Stability Trends</b>			
ATR	33,3%	66,6%	100%
WE	33,3%	66,6%	100%
RR	33,3%	66,6%	100%
<b>4. Data trail</b>			
ATR	(+)	(+)	(+)
WE	(+)	(+)	(+)

RR	(+)	(+)	(+)
<b>5. Stability Level and Range</b>			
ATR	33,3% (37,25-39,57)	66,6% (52,16-61,16)	100% (74,27-87,39)
WE	(32,19-37,81)	(43,6-51,9)	(66,96-79,7)
RR	(27,57-32,43)	(38,94-46,06)	(64,83-76,83)
<b>6. Level change</b>			
ATR	(39,57-37,25) (+2,32)	(61,16-52,16) (+ 9)	(87,39-74,27) (+13,1)
WE	(37,81-32,19) (+5,6)	(51,9-43,6) (+8,3)	(79,7-66,96) (+12,1)
RR	(32,43-27,57) (+4,8)	(46,06-38,94) (+7,1)	(76,83-64,83) (+12)

From Table 4 about the results of the visual analysis above, it can be concluded that playdog games are effective in increasing creativity and symbolic thinking for ages 5-6 years.

**Table 5. Inter-Condition Analysis**

Condition Analysis	Baseline 1 (A1)/ Intervention (A)	Intervention (B)/ Baseline 2 (A2)
<b>Number of Variables</b>		
ATR	1	1
WE	1	1
RR	1	1
<b>Directional Trends and Effects</b>		
ATR	(+)	(+)
WE	(+)	(+)
RR	(+)	(+)

Stability Change		
ATR	Unstable/unstable	Unstable/unstable
WE	Unstable/unstable	Unstable/unstable
RR	Unstable/unstable	Unstable/unstable
Level Change		
ATR	39,57-52,16	61,16-74,27
WE	(-12,59)	(+13,11)
RR	37,81-43,6	51,9-66,96
	(-5,79)	(+15,06)
	32,43-38,94	46,06-64,83
	(-6,51)	(+18,77)

Based on the results of data analysis within conditions and the results of analysis between conditions, there were nine conditions, namely three baseline sessions before the intervention (A1), three intervention sessions (B) and three sessions after the intervention (A2). It was explained that before being given an intervention using playdough media in the baseline condition (A1) the tendency towards creativity and symbolic thinking in ATR, WE and RR tended to be flat (=) and still low which lies in the range of 37.25% to 39.57 %. When given treatment in the intervention conditions, the tendency towards creativity and symbolic thinking abilities in children who previously had difficulty having creativity and



symbolic thinking continued to increase (+), which lies in the range of 52.16% to 61.16%, and you can see the child's ability to solve problems in learning without using playdough media the tendency towards the ability of children with learning difficulties remains and increases (+), which lies in the range of 74.27% to 87.39%. This proves that playdough media is effective in creativity and symbolic thinking in children aged 5-6 years at RA Al Mujahidin.



**Figure 4. Playdough Making**

This research was carried out in schools for 9 times and the observations were made in three conditions: three times in the baseline condition before the intervention was given (A1), three times in the intervention condition (B), and three times in the baseline condition (A2) after the intervention was no longer given. The first observation to the third meeting of the child's abilities tended to be flat and still low with a range of 37.25% -39.57%, so the researchers stopped observing this condition.



Whereas in the intervention condition (B) the observation was stopped on the third day because the data showed a steady increase in data, the percentage of children's abilities rose from 52.16% to 61.16%. Day six the percentage of children's abilities was quite stable at 61.61%, the observation was stopped because the children were able to solve the problems in the playdough game correctly.

In the baseline session (A2) three observations were made, the first observation was the ability to think creatively and symbolically. in the second to third observations the ability of these 3 children continued to increase with a percentage of 64.83%, 76.83%, 79.7%, 66.96% 74.27%, and 87.39%. Variable measurements in this study are percentages. In SSR research as a percentage is intended to show the number of occurrences of a behavior or event compared to the overall probability of the occurrence of the event multiplied by 100.

Based on the analysis above, it indicates that there is an effect of using playdough media on STEAM learning to increase children's creativity and symbolic thinking. In playing playdough children can also find new ideas when playing this playdough, thus training children to be creative. When the researchers conducted research and instructed children to make geometric shapes and figures from playdough, the children enthusiastically explored how to make geometric shapes and numbers so that they came up with creative ideas that made their work unique and interesting. Children can also build and explore all knowledge through their own experiences and all of this can train and develop creativity in these children.

It is important for teachers to use media in the teaching and learning process, especially playdough media so that children become productive and creative. This plasticine/playdough has a soft texture, so it is easy to shape it into the shape of the desired object. Children like playdough because with plasticine children can knead, press, form playdough into geometric shapes, figures, animals, people and so on, according to the child's creations and imagination. Therefore, playing with playdough media is able to hone and develop children's creativity and symbolic thinking. And creativity is very important to be developed from an early age because creativity is very influential in the development of aspects of early childhood development, if a child's creativity is not developed from an early age then the ability of intelligence and fluency in thinking children does not develop because to create a

product and creative talent that requires a high level of intelligence as well.

Currently, there are still quite a number of early childhood education institutions that place more emphasis on knowledge in terms of writing and reading, even though it is undeniable that the development of creativity is also very important to be honed from an early age, therefore researchers are trying to make a contribution in the world of early childhood education. so that children's creativity is well honed by using playdough learning media. As for the findings of further research, namely the use of playdough media has a significant effect on STEAM learning.

## 5. CONCLUSION

The influence of playdough games on learning (steam) is carried out by combining materials from nature and technology. Playdough media is very suitable for use in STEAM-based learning. Playdough media can make it easier for teachers to implement STEAM learning. By using this playdough, it is easier for children to understand the material provided by the researcher. This can be seen from the research data in the baseline condition before the intervention (A1) was given, indicating that the child's ability to solve problems was still low, namely in this condition the child's ability was only 37.25% -39.57%. And after being given treatment using playdough games, the child's ability to solve problems increases, the child is able to recognize concepts, know the function of an object, recognize symbols, the concept of numbers 1-10, group objects according to color, size, etc., and children are able to know the concept of a lot or a little. 64.83%, 76.83% and 79.7%. And after the treatment is stopped the child's ability is stable and continues to increase, where the child is able to recognize concepts, know the function of an object, recognize symbols, the concept of numbers 1-10, group objects according to color, size etc., and children are able to know the concept of a lot or a little as much as 66.96 % 74.27%, and 87.39%. Based on the discussion above, it can be concluded that Playdough games are effective in increasing creativity and symbolic thinking in children aged 5-6 years at RA Al Mujahidin.

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