THE EFFECT OF MAGIC PLATE GAMES ON STEAM LEARNING TO IMPROVE PROBLEM SOLVING ABILITY IN CHILDREN

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ABSTRACT

STEAM is a learning strategy that can be applied at the level of early childhood education to the higher education level. The STEAM (Science, Technology, Engineering, Art, and Matchematics) approach encourages students to learn to explore all of their abilities in their own way. This STEAM-based Magic Plate game teaches children to improve their ability to solve problems in everyday life. This study aims to determine the effect of the magic plat game in improving problem solving skills. The method used in this study is the Single Subject Research method with an A-B-A design pattern experiment to find out the cause and effect of the research variables. At baseline 1 the 1st research subject obtained a percentage of 42.5%, the 2nd research subject obtained a 35% percentage and the 3rd subject obtained a percentage of 32.5%. In baseline condition 2 there was an increase in each subject with increasing percentages to 95%, 92.5% and 87.5%. So the results of this study indicate that the Magic Plate game can affect symbolic thinking skills and problem solving in early childhood.

Keywords: Magic Hand, Problem Solving, Early Childhood

1.   INTRODUCTION

2.   STEAM learning is project-centered and student-centered where children are more active in carrying out the activities they want, where the teacher is only a facilitator. From this lesson the teacher is also required to be more creative in presenting various play activities so that children do not get bored quickly. Development of STEM (Science, Technology, Engineering, and Mathematics) with art (Art). The integration of art into STEM learning produces a new acronym, namely STEAM (Science (about curiosity and curiosity), Technology (tools or media used in learning), Engineering (a technique that starts from identifying a problem then thinking of a solution and trying it), Art (adding art provides opportunities for children to hone their creativity and imagination), and Mathematics (training children to have mathematical thinking including comparing, sorting, working with patterns and identifying shapes)). Through STEAM learning, children are trained in their ability to think critically, solve a simple problem so they can hone their creativity (Roshayanti et al., 2022). Methods on learning STEAM. 1) Science, which becomes a process for children to understand and also find out about various things. Children can explore various things by searching for appropriate data and then finding relationships and patterns from existing events. This method can make children more sensitive to events that are happening around them. In addition, this can also form children to be more critical in thinking. 2) Technology, can be introduced to children starting from the simple first. This is done so that children can use and also develop what they use. This method can help children find out what interests and talents they have. 3) Engineering, can be done by making a simulation to solve a

problem from the smallest first. This method can be done by assembling to become a car or other shapes. 4) Art, done to train children in experimenting with the imagination they have. Children can explore their thoughts and creativity. Children can carry out various kinds of wishes without having to follow the existing structure so that they can be free. 5) Mathematics, to find out the basic concepts in mathematics. Children can be invited to make predictions or look at numbers to tell which ones are more or less. The STEAM approach encourages students to learn to explore all the abilities they have, in their own way. STEAM will also bring out different and unexpected works from each individual or group. In addition, collaboration, collaboration and communication will emerge in the learning process because this approach is carried out in groups.

A further goal of STEAM education is to develop STEM literacy. This definition of STEAM refers individually to: 1) knowledge, attitudes and skills to identify questions and problems in life, explain naturally and artificially, and draw conclusions about STEM-related issues; 2) Understanding the special characteristics of STEM as a form of human knowledge, inquiry and design; 3) The introduction of STEM shapes the material, intellectual, and cultural environment; 4) Willingness to relate STEM to issues and ideas about science, technology, engineering, mathematics as a constructive approach. The introduction of STEAM for early childhood can be done by creating a safe and fun learning environment. Providing opportunities for children to explore, discover, build, experiment, predict, seek temporary answers and relate knowledge to real life are key activities that can be carried out in STEAM implementation. These key activities can be designed through play activities so that children feel comfortable and enthusiastic about being involved in them (Putri, 2019). STEAM learning happens naturally every day as kids explore, play, and try new things. When young children have the opportunity to investigate the world around them, they learn and experiment with new STEAM skills and theories. In Ministerial Regulation No. 137 of 2014 concerning Standards for Levels of Achievement The development of the cognitive aspects of symbolic thinking that must be achieved in children 4-5 years old is to recognize number symbols 1-10, recognize number symbols 1-10, recognize the concept of numbers and recognize letter symbols. The ability to think symbolically is one aspect that is included in cognitive development and is a very important aspect that must be achieved by children. To improve the ability of symbolic thinking in early childhood certainly cannot be separated from the role of educators or parents in stimulating it. The stimulation carried out must of course be fun for children, therefore every learning activity on the

role of the media is so important for conveying material that will be taught to early childhood (Bodedarsyah & Yulianti, 2019).

Refraction of light is the event of deflection of the direction of propagation of light that occurs when light passes through the boundary between two different mediums. Refraction occurs when the incident ray forms a certain angle the incident light is not perpendicular to the boundary (angle of incidence smaller than 90 degrees) to the boundary. Light is very important in this life. Without light we cannot see everything around us. Light has several properties, namely, light can propagate straight, light can be reflected, light can penetrate clear objects, light can be refracted, and light can be described. From the properties of light above, we will conduct a simple experiment on light refraction. So light refraction or refraction is an event where the direction of light travels is deflected due to a difference in medium, that is, the difference in the density of objects from air and water, from water to air or from water to glass and from glass to water.

One of the learning media that can stimulate children's ability to think symbolically and solve problems is through STEAM-based magic plate media. This magic plate is a game with the main ingredients being 1 plastic plate colored with a picture of a tree trunk and on top of it a scissor to resemble a leaf and 1 plastic plate with green leaves drawn and fruits in different shapes or sizes, plastic ziplock and plastic cup filled with water. The way to play this magic plate game is to put the two plastic plates together and then rotate them according to the wishes of the child, then when the desired tree shape is obtained, the child can choose a plastic ziplock which contains geometric shapes and numbers according to those on the plastic plate. Next, the child puts the plastic ziplock into a glass filled with water and the child will see a refraction of light by dipping the plastic ziplock into the water. In addition to introducing children to the refraction of light, children will be stimulated with questions and answers such as what shape and number the child gets in the tree, counting how many fruits are on the tree, knowing various basic colors and knowing the concepts of many and few.

From the beginning of the research that researchers did in KB. Raudhatul Jannah found various problems in the learning process and had not carried out STEAM-based learning and the learning methods that educators provided were still teacher-oriented, resulting in children being less enthusiastic about learning and less optimal cognitive development in early childhood. Therefore, the research conducted by the researchers this time was to find out how the effect of playing magic plate in learning (STEAM) is to improve symbolic thinking skills and problem solving in children aged 4-5 years in KB. Raudhatul Jannah.

3. LITERATURE REVIEW
3.1 Cognitive Theory
According to Piaget, cognitive ability can be understood as a child's ability to think more complexly as well as the ability to reason and solve problems. In developing cognitive abilities, it will make it easier for children to master broader general knowledge, so that children are able to continue their functions naturally in their interactions with society and the environment. According to Khadijah, cognitive development is an ability to learn and think with intelligence that is able to learn new skills and concepts (Khadijah & Amelia, 2020). Skilled at understanding what is going on around him and skilled at using memory and solving simple problems. Meanwhile, comes from the word cognition which means knowing which means knowing, another meaning of cognition is acquisition, arrangement and knowledge (Daulay, 2019)

3.2 Mathematical Theory
3.3 Mathematics is a pattern of thinking, a pattern of organizing logical evidence, language that uses terms that are carefully defined, clear and accurate, representation with symbols and solid, more in the form of language. symbols about ideas or ideas rather than about sounds, knowledge of organized structures, the properties/theories are made deductively based on defined or undefined elements, axioms, properties/theories that have been proven in fact, an art whose beauty lies in its order and harmony. Meanwhile, mathematics is a deductive science which does not accept generalizations based on observation or observation (inductive) but these generalizations must be based on deductive proofs; mathematics as a language, art and the queen of science, the science of well-organized structures, the science of patterns and relationships (Sriningsih, 2009).

3.4 Science Theory
Science or also known as Natural Science according to (Fowler & Fowler, 1951) can be defined as a systematic science that is formulated in accordance with natural phenomena and is based on observation and induction. Meanwhile, Langford (2010) views science or natural science as knowledge obtained through a series of systematic processes to reveal everything related to the universe. Science for early childhood is not just a collection of facts, but involves observing what is happening, classifying or organizing information, predicting what will happen, testing predictions through guided activities and formulating conclusions. This is also in line with the opinion expressed by Wong (2007) which mentions several activities in the scientific process in the context of science learning for early childhood, such as observation, prediction, conducting experiments, and interpreting.

4. METHODS
This research uses the SSR research method (Single subject research), which is research that examines or observes the same object continuously (Maturidi & Djohar, 2014). Single subject research is experimental research to look at behavior and evaluate certain interventions or treatments for the behavior of a single subject with repeated assessments at a certain time. Because single subject research is quantitative research by providing intervention or treatment to research subjects within a certain period of time. The term single subject does not mean that only one research subject is studied, but it is more typical to be somewhere between one to five participants, which is why the single subject research design is sometimes called the small-n design, where n is statistical symbol for sample size. Single Subject Research (SSR) research, namely subject research with research procedures using an experimental design to see the effect of treatment on changes in behavior. The data was analyzed using graphical visual analysis techniques, namely by plotting the data onto a graph, then the data was analyzed based on the components in each baseline condition (A1), intervention (B), baseline (A2) (Yuwano, 2019).

In this study, the subjects were 3 children aged 4-5 years in family planning. Raudhatul Jannah, with the initials DS, AA, RA. The three subjects were given a magic plate game treatment/intervention in learning (STEAM) to improve their symbolic thinking skills and problem solving. The data collection technique is through discussion with the subject, field observations to observe the subject directly using research instruments that match the criteria set by the researcher, as well as documentation when the child is playing the magic plate game.

5.   RESULTS & DISCUSSION

The concept of learning in early childhood is learning while playing (learning by playing), learning by doing (learning by doing), and learning by stimulating (learning by stimulating), so that the learning process of early childhood is carried out through fun activities, doing experiments simple experiments or real activities, and educators must be active in stimulating the learning process. Thus, educators will be able to help children to develop every aspect of their growth and development optimally. Regulation of the Minister of Education and Culture of the Republic of Indonesia as stated in Permendiknas number 5 of 2020 regarding PAUD National Standards article 10 explains that "Aspects of child development according to their level of development include religious and moral, physical-motor, cognitive, language, social-emotional, and artistic aspects". The six aspects of development are a unity that cannot be separated and are interconnected with one another. If one aspect of a child's development is problematic, it will have an impact on other aspects of development. Aspects of child development are also a determinant or foundation for children in carrying out activities of daily life, both in interacting, communicating, learning, playing and others. Children in their daily lives are faced with various kinds of problems so that children really need knowledge as a solution to solve every problem. Therefore, in addition to developing other aspects of children's development, it is very important to develop and improve their cognitive aspects. The scope of cognitive development is divided into three, one of which is problem solving ability.

The STEM approach is based on the development of learning on the existence and relationship between science, technology, engineering and math, while STEAM has the addition of an "art" component in it. Many people think that the application of STEM or STEAM to early childhood education is difficult and not entirely true, because early childhood can be said to be natural scientists because they have high curiosity which is often marked by the emergence of many questions. STEAM children are invited to create something based on their own thinking and imagination so that it is possible for children to form a good mindset. The introduction of STEAM for early childhood can be done by creating a safe and fun learning environment. Providing opportunities for children to explore, discover, build, conduct experiments, predict, seek temporary answers and relate knowledge to real life are key activities that can be carried out in implementing STEAM. These activities can be designed through play activities so that children feel comfortable and enthusiastic about being involved in them (Novitasari, 2022).

5.1   From the results of the initial observations made by the researcher, the condition score obtained was that there were 10 children aged 4-5 years (Group A) in KB. Raudhatul Jannah, but researchers conducted research on 3 children only. In the initial

conditions of the study, the researcher found that the three subjects had low knowledge in symbolic thinking and problem solving. From the beginning of the study until treatment was given to the 3 subjects, this will be explained below.

5.2   Data Description

The results of calculating the scores of the three subjects in problem solving abilities in children aged 4-5 years in terms of research instruments (result score: maximum score x 100%).

Table 1. Obtaining a Baseline Score of 1

Name	Session Test Achievability to (%)		
	1	2	3
DS	25%	35%	42,5%
AA	30%	32,5%	35%
RA	25%	27,5%	32,5%

Table 2. Obtaining The Intervention Score

Name	Session Test Achievability to (%)		
	1	2	3
DS	25%	35%	42,5%
AA	30%	32,5%	35%
RA	25%	27,5%	32,5%

Table 3. Obtaining a Baseline Score of 2

Name	Session Test Achievability to (%)		
	1	2	3
DS	25%	35%	42,5%
AA	30%	32,5%	35%
RA	25%	27,5%	32,5%

5.3   Data Analysis

Analysis Under Condition

Analysis of the conditions according to the data reviewed by the researchers on the three subjects, namely DS, AA, and RA, showed that the length of the conditions from baseline 1, intervention and baseline 2 all had 3 sessions. The trend towards the three subjects (DS, AA and RA) which each had 3 sessions, all showed an increasing graph. The stability trend of the three subjects (DA, AA and RA) has the same stability trend, namely at baseline 1 as much as 33.3%, at intervention as much as 66.6% and at baseline 2 as much as 100%. The three subjects (DS, AA and RA) on the results of the data trail for all sessions showed positive results (+). The level of stability in the first subject (DA) baseline 1 was 33.3% with a range (25-42.5), at intervention the stability level was 66.6% with a range (30-35), then in baseline 2 with a stability level of 100 % and range (82.5-95). In the second subject (AA) baseline 1 was 33.3% with a range (30-35), at intervention 66.6% with a range (37.5-47.5) and in baseline 2 was 100% with a range (62, 5-92.5). Whereas in the third subject (RA) it was 33.3% with the range (25-

32.5), in the intervention it was 66.6% with the range (40-72.5), and in baseline 2 it was 100% with the range (75 -87.5).

Analysis Between Condition

Analysis between baseline 1 – intervention – baseline 2 conditions in the three subjects (DS, AA and RA) the number of variables was 1, the direction trend and the effect of the three subjects (DS, AA and RA) showed positive (+). The three subjects (DS, AA and RA) have changes in stability that are unstable - unstable - stable, and the data overlap is 0%. From the results of the initial observations made by the researcher, the condition score obtained was that there were 10 children aged 4-5 years (Group A) in KB. Raudhatul Jannah, but researchers conducted research on 3 children only. In the initial conditions of the study, the researcher found that the three subjects had low knowledge in symbolic thinking and problem solving. From the beginning of the research, based on the results of the data from the above conditions, it can be proven that by using the magic plate learning media carried out at the Raudhatul Jannah KB, it can improve problem solving abilities, because using learning media can attract attention and interest in children's learning, making the learning process interactive. and helps children to gain knowledge in a more interesting and clear way. Research until treatment has been given to these 3 subjects will be explained below.

From the results of the data above, it can be seen that the results of data analysis under conditions and the results of analysis between conditions were contained in nine sessions, namely three sessions before the intervention (A1), three intervention sessions (B), and three sessions after the intervention was given (A2). . It can be concluded that before the intervention (A1) was given to the 3 subjects by using the magic plate game, the ability to think symbolic and problem solving was still low, which was in the range of 32.5% to 42.5%. When given treatment in the intervention conditions, the tendency for the ability to think symbolically and problem solving to increase (+) is in the range of 47.5% to 72%, and after being given treatment the tendency for the child's abilities to continue to increase (+) is located in the range of 87.5% to 95%. So this proves that the magic plate game media is effective in increasing the ability to think symbolically and to solve problems in children aged 4-5 years in family planning.

Figure 1. Magic Plate Game

6. CONCLUSION

Conclusively, STEAM is able to increase children's curiosity and stimulate children's ability to ask questions, so that children can build their knowledge, are able to explore, and are able to show an inquiring attitude. In STEAM learning, it can be applied directly in class by training children to learn science which includes learning about the environment, oneself and natural phenomena. By using the magic plate game media, the ability to think symbolically and

solve problems in children aged 4-5 years at KB.Raudhatul Jannah has increased, as shown in the results of the analysis above, it shows that before the initial ability of children was only 32.5% - 42.5% . After being given treatment using the median magic plate game, the children's ability to think symbolically and solve problems increased to 47.5% - 72%. And after the treatment was stopped, the child's ability continued to increase to 87.5% - 95%, where the child was able to recognize symbols and the concept of numbers 1-10, know the concept of many and few, recognize geometric shapes, group objects by color, size and so on. other.

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