SCIENCE CART GAMES TO IMPROVE PROBLEM SOLVING ABILITY IN CHILDREN (SSR)

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ABSTRACT

Problem solving is a skill that everyone must have and must be introduced early on. The ability to solve problems is very useful in daily activities in exploring both within the school environment and in the community environment. Through this STEAM-based science Gerobal game, it can be used as a learning medium for young children to be able to improve problem-solving skills and explore science activities. This study uses the experimental method A-B-A design pattern (single subject research) to determine the causes and effects of the research variables. The results showed that the intervention in the form of a magic flashlight game had an impact on students' problem-solving abilities. At baseline 1, the 1st and 2nd study subjects obtained a percentage of 42% and the 3rd subject obtained a percentage of 40%. While the conditions at baseline 2 of the three subjects experienced increase with increasing percentages to 90%, 94% and 94%. This is in line with the results of the low percentage of overlap. Therefore, the use of magic flashlight games can affect children's problem solving abilities.

Keywords: *STEAM, cognitive, science cart game*

1. INTRODUCTION

Children are born with the talent to be scientists. Children are born with something magical that is the urge to curiosity or find out about what he saw, heard and felt in the surrounding environment. Adults who are around children such as parents at home, or teachers at school play an important role in helping children to develop their curiosity. By having some stimulation, children will begin to understand and understand the world around them. Based on UU RI number.20 of 2003 on the national education system Chapter 1, Article 1, Item 14 stated that Early Childhood Education is a coaching effort aimed at children from birth until the age of 6 years. One form of education in early childhood that supports cognitive development is through playing Science. Cognitive development of childhood is a period of play so that the things that are taught to them are easier to understand and realized by playing.

Cognitive development is one of several aspects of development that is stimulated in AUD. Cognitive is the process of thinking, that is, the ability of individuals to relate, assess and consider an event or events throughout life, starting from infancy, childhood, adolescence and adulthood. Cognitive development is very important to improve children's thinking power. Gardner called cognitive as a thought that is used very quickly precisely in overcoming situations and solving a problem both simple problems and complex problems that occur in everyday life (A. Susanto, 2011). Children may often feel uncomfortable or difficult when they encounter a problem. In the face of a problem a child will be more anxious and worried, because the child is learning to overcome the problem (problem solving). In learning, stimulation is needed so that children are more skilled (Fahyuni et al., 2016). Problem solving is the first step towards a successful life in the future. Parenting parents are sometimes the problem, such as when children play with friends or when seeing objects and events that make children feel curious. Wrong behaviour is that some parents tend to be impatient and always help children when faced with problems. So, the child cannot solve his problems independently. Every child has to learn to deal with problems.

Teachers have a very dominant role in developing children's abilities in all aspects of development including cognitive aspects. As an educator, a teacher is expected to play an active role in stimulating the learning process of learners. In the cognitive activity of children, on some occasions teachers often find children have above average ability, relatively moderate or low ability. Children with good problem solving skills tend to grow into more independent, creative, and mentally healthy children. That way, when they grow up they will be able to face life's challenges well. Some important things done by parents and teachers apply to train and develop children's abilities in problem solving, such as (1) teach children to identify problems, (2) teach children to manage feelings of discomfort, (3) teach children to focus on self-ability, that is, children learn to solve problems with solutions that he found himself. (4) teach children to discuss, pour out ideas and solutions based on the child's version, (5) apply the solution that has been chosen by the child and give praise /achievement for the slightest results. In the age range of 3-6 years is a good time to teach early childhood. Regarding measures and strategies for problem solving has actions in the form of identifying problems and solving problems (Muhibin, 2011).

In STPPA has been established indicators of what should be done in the cognitive development of children aged 5-6 years, such as in general knowledge and science, or science, namely (1) classifying objects based on the function of showing activities that are explorative and probing (cause and effect), planning activities to be carried out, initiative in choosing the theme of the game, and solving simple problems. (2). The concept of shape, size and pattern, such as knowing the differences classify, recognize patterns, sort objects by size, and (3) is the concept of numbers, symbols of numbers and letters related to cognitive according to (Abdurrahman, 2012). So it takes time to maximize aspects of Student Development. Cognitive abilities develop gradually, in parallel with physical and nervous development located in the centre of the nervous system.

In teaching and learning activities, it is natural to encounter various obstacles. Problems that occur in teaching and learning activities can come from environmental factors, teachers, learning media or even in the child himself. This is based on observations made in the field, namely in RA Royhan Purwakarta children have difficulty understanding the delivery made by teachers, children are less interested in ongoing activities, or teachers are less interested in learning activities. Based on existing data, the researchers felt the need to conduct research on problem solving in RA ROYHAN Purwakarta. As presented by Majid, 2013, problem solving is a way of providing understanding by stimulating children to pay attention, study, and think about a problem and then analyze the problem as an effort to solve the problem.

2. LITERATURE REVIEW

2.1 Theory of Science

Science for early childhood is not just a collection of facts, but involves observing activities about what is happening, classifying information, predicting what will happen, testing predictions through guided activities and formulating conclusions (Putri, 2019). While based on the book basic concepts of Science 1 writing. (Septantiningtyas et al., 2020), Science is a science that specifically studies a natural occurrence. Primarily, science aims to uncover the events behind an event using the scientific method. These aspects include curiosity, the value of honesty, openness, and problem solving. The definition of science according is a collection of theories that have been tested for truth, which explain the patterns, order, and irregularity of the observed phenomena. According to law No. 2 of 2003 law No. 2 year 2003 which discusses the National Education System states that science is a branch of subjects that have an important role and cannot be separated from human life. The law explains that science or science is included in various levels of education in Indonesia.

In the narrow sense of science is a discipline consisting of Physical Sciences (physical sciences) and Life Sciences (biological sciences). The physical sciences include astronomy, chemistry, geology, Mineralogy, Meteorology, and physics, while the life sciences include biology. The physical sciences include astronomy, chemistry, geology, Mineralogy, Meteorology, and physics, while the life sciences include biology (anatomy, physiology, Zoology, cytology, Embryology, microbiology). In this book the term of science is defined specifically as the Natural Sciences. The understanding of the term science specifically is as a science.

2.2 Cognitive Theory

One of the areas of development that must be mastered by a teacher or parent is the cognitive development of children. Gardner (2000) called cognitive as a thought that is used very quickly precisely in overcoming situations and solving a problem both simple problems and very complex problems that occur in everyday life (A. Susanto, 2011). Through cognitive development is very useful for children in teaching get as well as implement a form of representation that represents the object it faces. According to Winkel (2010), there are two activities in cognitive learning, namely remembering and thinking, which with these two activities is the beginning of the child in learning, remembering and thinking to get a concept.

2.3. Problem Solving

Problem solving comes from two words: problems and solves. The meaning of the language of the problem is "a thing that is difficult to deal with or understand" (a thing that is difficult to do or understand), can be interpreted as "a question to be answered or solved " or a question that needs an answer or a way out), while solve can be interpreted as "to find an answer to a problem" (Hornby, 1995). According to (Mulyasa, 2004), problem solving is a teaching approach that exposes students to problems as a context for students to learn about critical thinking and problem skills, as well as to acquire knowledge and essential concepts from learning materials (Mulyasa, 2004). There is one concept of learning that can improve the level of cognitive ability of children, namely learning on the basis of problem solving (problem solving). Problem solving learning method comes from Dewey (2023) the purpose of this method is to give exercise to children to think. This method can prevent children from making hasty conclusions, considering the possibility of various solutions, and suspending decision - making until there is sufficient evidence (Musyik, 1981). From what has been described, it can be concluded that problem solving is a way of solving a problem which in its completion of course in different ways and tricks.

2.4 Cognitive STEAM theory of Science and Mathematics for Early Childhood

STEAM stands for science, technology, engineering, art, and mathematics. STEAM is a learning method that emphasizes the relationship of knowledge and skills of science, technology, engineering, art, and mathematics (STEAM) to overcome the problems encountered. Refers to kemdikbud.go.id STAM is a learning approach that emphasizes the relationship of knowledge and skills of science, technology, engineering, art, and mathematics to solve problems. The purposes of STEAM itself are to (1) teach critical thinking, (2) develop innovation, grow ideas, (3) develop skills and (4) answer the challenges of the Times. From Abdillah (2019), there are 5 components of STEAM learners, namely: involvement (engage) IE parents or teachers invite children to look further in play activities that contain STEAM content based on experience, STEM education is defined as the integration of at least two of the STEM disciplines, usually mathematics and science. Building connections across curriculum areas is considered important by professional educational organizations in early childhood (Copple and Bredekamp, 2009), mathematics (National Council of Teachers of Mathematics 2000), and Science (National Research Council 1996). By implementing STEM learning in the classroom, teachers can ensure that children have ample opportunities to investigate concepts in science and mathematics and to learn to connect the two disciplines (Moomaw & Davis, 2010). The elements in STEM or STEAM are not a stage that must be done sequentially, the most important thing is that in a series of learning activities must include these elements (Putri, 2019). STEAM nuanced teaching materials that will be developed is also expected of the abilities that are emphasized to be developed (Wibowo et al., 2019)

One of the learning media used is a scientific cart, which is a cart used as a learning media created to attract children's learning interests. The science cart itself is designed to accommodate all

children's scientific activities, which include a series of data collection activities through observation, questioning, experimentation, processing information or data, and communicating. How to use this scientific cart is that the child plays all the activities that have been provided in the cart that are tailored to the needs and themes that take place. Kids can practice/operate how to use the science cart and explore all the learning activities that have been prepared inside the science cart.

What is also important to note in providing learning to early childhood is to create a learning experience that is fun and enjoyable, so that it is more inherent because the child experiences it himself. According to The Theory of behaviouristic Learning contains changes in behaviour that occur due to learning experiences. In its development, this theory becomes a stream of learning psychology that has an effect on the purpose of increasing learning theory and practice in the world of education and learning. Learning by using Learning media will form a mastery process because of the interaction in learning (Fahyuni et.al 2013).

3. RESEARCH METHODS

This research was conducted in RA Royhan located in Suluh Kuning Village, Jatiluhur Purwakarta. The research time was conducted from January 16, 2023 to January 25, 2023. The time of the study began on January 16, 17, 18, 2023 implementation of baseline phase -1, before intervention was given. Then continued on January 19th, 20th, 21st, 2023 in the form of implementation of interventions to provide stimulation by providing a STEAM learning model. To improve children's cognitive abilities in the form of problem solving and experiments on January 23rd, 24th, 25th, 2023, the implementation of Baseline-2 phase. After receiving intervention(Suryani & Hendrayadi, 2015). Researcher see the development of children's cognitive abilities. The method used in this study is to use experimental research Single Subject Research (Single Subject Design Research), which is research that focuses on data from groups of individuals as a research sample (Yuwano, 2019).

The Single Subject Research method developed by (J. Susanto et al., 2005) is a theory of modification of a person's behaviour in which the measurement of variables is carried out by the same object but under different conditions. Baseline - 1 conditions and experimental or intervention conditions. Baseline is a condition in which the measurement of target behaviour is carried out under natural or improvised conditions, before any intervention is carried out. While the experimental condition is a condition where the intervention has been given and the target behaviour is measured in these conditions. The design used in this study is the design of setback A-B-A. This A-B-A design is one of the developments of the previous design, namely A-B. This A-B-A Design has shown a causal relationship between the dependent variable and the independent variable. The basic procedure is actually not much different from the A-B design, it's just that there is already a repetition in the baseline phase. At first, the target behaviour is measured continuously at baseline-1 (A1) in a certain period of time, then given an intervention (B), after measuring the intervention condition (B), then measured at baseline-2. The addition of baseline-2 conditions is intended to control the intervention phase so that it is possible to draw conclusions. There

is a functional relationship between the independent variable and the dependent variable.

The basic structure of the A-B-A design can be explained as follows, in the first stage, namely baseline 1 which is still in a natural state, then the next stage is given an intervention, then at baseline 2 will be given the results of the intervention. Obtained which will then be used as a reference level of success. In this study the purpose of using the A-B-A pattern is to determine the effect of STEAM learning model media on children's ability in problem solving and exploration (science experiments) Ra Royhan students.

Here's an explanation of the A-B-A Design Pattern. The first a-1 (Baseline 1) data measurement in this phase was carried out for 3 sessions until the data was stable. The second data measurement B (intervention) at this stage the child is given treatment using STEAM learning model media to obtain stable data. The intervention is carried out in 3 sessions. And the third a-2 (Baseline) data measurement is seen from the amount of improvement in children's abilities. The research has done until the data is stable. The design of a single study of subjects A-B-A is described as follows. (1) the subject of this study is RA students. Royhan Group B age 5-6 years, taking subjects based on indicator instruments from STPPA which includes children's cognitive abilities, namely problem solving and exploration activities in the form of science experiments. The student names are MT, DW and NS.
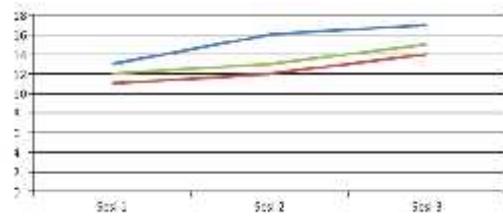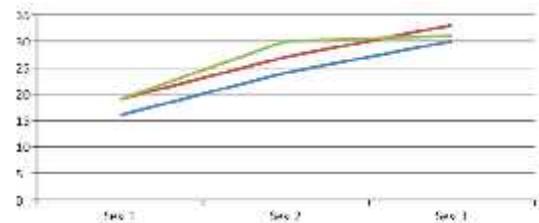

Chart. 1. Graph at baseline stage 1
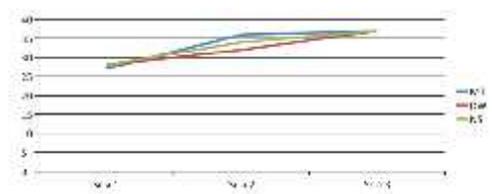

Chart 2. Graph at Intervention stage

Chart 3. Graph at baseline stage 2

3.1 Research Variables

Research variables are everything in any form determined by a researcher to be studied in order to obtain information about it, then draw conclusions (Sugiono, 2013) and the dependent variable (Y). In data collection, the technique used is a direct interview. Data were taken by 2 methods, namely test and non-test methods. Test is in the form of direct questions, while non-Test is in the form of observation. A test is a series of questions or exercises and other tools used to measure skills, knowledge intelligence, abilities or talents possessed by an individual or group (Arikkunto, 2013). The test in this study to measure students ' ability to solve problems before and after the STEAM learning model is applied whether there is an improvement or not.

The test will be given to students 2 times with different conditions, namely at baseline 1 without intervention and baseline 2 after intervention using the STEAM learning model with media Science Cart in children's cognitive development in the form of problem solving activities and science exploration.

4. RESULTS & DISCUSSION

The results of preliminary observations conducted in the field obtained 12 students aged 5-6 years in RA Royhan. It was found that under these conditions, some children RA. Royhan is still underdeveloped in problem solving and exploration activities. For more effective results, researchers conducted a study of these 3 children. The researchers made observations gave examples of similar problems related to problem solving and also carefully observed the 3 children. In the initial conditions of the study, researchers found that these three children still have low knowledge in terms of problem solving. A thorough explanation of the results of the study of 3 children will be presented below.

4.1 Data Description

Based on the results of data calculations that have been calculated by researchers, it can be concluded that the science cart game is effective in improving problem solving skills and exploration activities in early childhood 5-6 years in RA Royhan. Subject calculations

Table 1. Baseline 1 Gain Score (Session 1-3)

Name	test achievability	session to%	
session	**1**	**2**	**3**
NS	**30%**	**32%**	**37%**

Table 2. Session Intervention Gain Score (1-3)

Name	test achievability	session to%	
session	**1**	**2**	**3**

NS	47%	75%	77%

Table 3. Baseline 2 Gain Score (session 1- 3)

Name	test achievability	session to%	
session	**1**	**2**	**3**
NS	30%	32%	**37%**

MT Subject calculations

Table 4. Baseline 1 Gain Score (Session 1-3)

Name	test achievability	session to%	
session	**1**	**2**	**3**
MT	**32%**	**40%**	42%

Table 5. Session Intervention Gain Score (1-3)

Name	test achievability	session to%	
Season	**1**	**2**	**3**
MT	**40%**	**60%**	**75%**

Table 6. Baseline 2 Gain Score (session 1- 3)

Name	test achievability	session to%	
Season	**1**	**2**	**3**
MT	**67%**	**90%**	**97%**

Based on the results of data analysis in conditions and the results of inter-condition analysis, there are 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 the intervention using science cart game media in baseline condition (A1), the tendency of problem solving ability in NS, MT and DW tended to be low, ranging from 30% to

47%. When given treatment in the interventional conditions, the tendency of problem-solving ability in children who previously had difficulty solving problems continued to increase (+) ranging from 60% to 85%, and the ability of children to solve problems in learning without using science train media showed a tendency of children's ability to learn difficulties remained and increased (+) ranging from 84% to 92%.

This proves that the media of science cart game is effective in improving problem solving skills in children aged 5-6 years in RA. Royan. This study was conducted in schools for 9 observation sessions conducted in three conditions, namely three times at baseline conditions before the intervention was given (A1), three times at intervention conditions (B), and three times at baseline conditions (A2) after the intervention is no longer given. From the first observation until the third meeting, the child's ability tends to flatten and is still low, with a range of 30% - 47%, so the researchers stopped observing the condition. While in the intervention condition (B) the observation was stopped on the third day because the data showed that the data continued to increase, the percentage of children's ability rose from 66% to 85%. The sixth day the percentage of children's ability is quite stable at 92%, the observation was stopped because the child was able to solve the problem in the magic flashlight game correctly. In the baseline session (A2) three observations were made, in the first observation the problem solving ability was 71%, 80%, 90%. In the second to third observation, the ability of these 3 children continued to increase with a percentage of 86%, 88% and 92%. Measurement variable in this study is the percentage. In SSR research, in line with the opinion of Sunanto (2006:16), the percentage is intended to indicate the number of occurrences of behaviour or event compared to the overall probability of occurrence of the event multiplied by 100. Based on the data analysis described above, it can be proven that the science cart game is effective in improving problem solving skills. Problems in children aged 5-6 years in RA Royhan. In line with the above, according to Sudjana and Rivai (in Arsyad 1997:24) suggested the benefits of learning media in the learning process of students, namely by using Learning media will be more interesting, learning materials will be more clear meaning, teaching methods will be more varied, and students can do more learning activities.

5. CONCLUSION

Based on the results of the research and discussion above, it can be concluded that the use of STEAM learning model has a major effect on children's ability to solve problems (problem solving) and also explore (science experiments) Group B students aged 5-6 years in RA Royhan. This is indicated by an increase in the subject's ability to solve problems (problem solving) which is characterized by an increase in assessment results between the initial baseline (baseline 1) with the ability of the final baseline (Baseline 2), after the intervention. In the initial ability test (baseline 1), the frequency of errors S1, S2, S3 did not change, and continued to repeat the same assessment, namely undeveloped (BB) and began to develop (MB) in each session. While in the final ability test (baseline 2) S1, S2 and S3 get a score of 100% with the results develop as expected (BSH) and develop very well (SBB). From these results it can be concluded that the use of STEAM model with media Science Cart effect on children's cognitive development related to Problem Solving and Exploration (science experiments) for early childhood who previously had low ability.

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