

# THE EFFECT OF STEAM BASED MAGIC FLASHLIGHT GAMES TO IMPROVE PROBLEM-SOLVING ABILITY

Nur Aliyah<sup>1\*</sup>, Annisa Purwani<sup>2</sup>

<sup>12</sup>Pendidikan Islam Anak Usia Dini, Fakultas Tarbiyah, STAI DR KH.EZ MUTTAQIEN,  
Purwakarta, 41151, Indonesia

\*Naliyah085@gmail.com

## ABSTRACT

Problem solving is one of the aspects contained in the cognitive domain. Considering that early childhood is still in the learning stage of getting to know the conditions of the environment around them, including all existing problems, it is highly recommended that the learning activities given refer to problem solving exercises. The ability to solve problems is useful for children when exploring their world or when children are doing their assignments at school or facing problems outside of school. This STEAM-based magic flashlight game can be used as a learning medium to improve students' problem-solving skills. 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 subject in this study included 3 students who needed further intervention. Data collection was done by using instruments in the form of problem-solving test. The data was then analyzed by using visual graphic analysis. 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 an increase with increasing percentages to 90%, 94% and 94%. Therefore, the use of magic flashlight games can affect children's problem-solving abilities.

Keywords: *magic flashlight game, problem solving, children, STEAM*

## 1. INTRODUCTION

Education is the noble duty of every Indonesian citizen to make the State of Indonesia victorious. One level of education that will guarantee the quality of education in the future is early childhood education, because early childhood education is a foundation where children will be educated and assisted to develop their various potentials, both psychological and physical, so that children will be ready to continue their education to the next higher level (Utaminingsih, 2010). Law Number 20 of 2003, concerning the National Education System article 1 paragraph 14 states that Early Childhood Education (PAUD) is a coaching effort aimed at children from birth up to the age of six which is carried out through educational stimulation in order to help growth and development physically and spiritually so that children have learning readiness in entering further education.

The Regulation of the Minister of Education and Culture of the Republic of Indonesia concerning PAUD National Standards article 10 explains that aspects of children development include religious and moral, physical-motor, cognitive, language, social-emotional, as well as 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 child development, it is very important to develop and improve the ability of cognitive aspects. The scope of cognitive development is divided into three, one of which is problem solving ability.

An individual's resistance in dealing with problems can be developed from an early age. This is of course based on the view that early childhood also experiences problems in everyday life. The problems faced by children will certainly be different from adults (Taqiudin, 2022). The problems encountered usually occur when children play with friends or when they see objects and events that make children curious. Some adults will readily help children when they face a problem. This will actually limit the development of problem-solving skills that will grow in children so that children will become very dependent on the adults around them when solving problems. Guiding children to find solutions to solving problems through observation, inquiry, conducting experiments and discussions, or even reading activities are the right way to do.

Indicators that show problem solving abilities in children can be seen from the ability to observe, classify, compare, measure, communicate, conduct experiments, connect, make conclusions and use information (Wortham, 2006). Syaodih (2018) said that indicators of problem-solving ability include observing, collecting data and information (collecting), processing information (analyzing) and communicating information (communicating). Both of these opinions can be used as a reference for measuring problem-solving abilities in early childhood.

The ability to solve problems is an important ability for children to have in the 21st century (Rahman, 2019). The ability to solve problems grows at an early age and will develop and contribute to the ability of self-determination, namely the ability to act independently. In addition to training the ability to find solutions, the ability to solve problems can have an impact on the development of other abilities such as critical and systematic thinking skills, creativity, and communication (Shieh, 2014). In another opinion, it is said that the ability to solve problems is useful

for children when exploring their world or when children are doing their assignments at school (Lestari, 2020).

Based on the various opinions above, it is very important to stimulate early childhood students to develop problem-solving skills. Stimulation of the development of problem-solving abilities in children can be done through learning activities that present problems as their main basis. The problems presented to children must be open-ended so as to allow children to find various answers or solutions.

One of the learning media that can stimulate children's problem-solving skills is through STEAM-based magical flashlight media. This magic flashlight is a game made from paper, cardboard and plastic as the main media. This magic flashlight game can stimulate children's cognitive development, especially in problem solving indicators, because in this magic flashlight game children are invited to explore simple concepts in everyday life. The child will be presented with pictures of animals in the sea in complete darkness, then the child must find a way to make these animals visible by using a magic flashlight. Apart from exploring, children will also be presented with a number of questions about some of the animals in the dark sea picture, such as counting how many fish there are, distinguishing colors in animals, knowing the concept of many and few, and grouping animals according to size. In this media, the magic flashlight game includes STEAM learning, so this game can be categorized as a game with the aim of adding a lot of knowledge to children, especially in terms of science, mathematics, and art. Moreover, this game also aims to foster children's interest and enthusiasm in learning.

The application of STEAM-based learning in Indonesia at the PAUD level is still very rare. Based on the results of observations on the process of teaching and learning activities made by researchers at the KB As-sholihin, Purwakarta, various problems were found in the learning process including the lack of maximum cognitive development of children because the method used by the teacher was still monotonous which resulted in children feeling bored easily and unmotivated. Therefore, the research conducted by the researchers this time was to find out how the effect of the magic flashlight game in learning (STEAM) is to improve the problem-solving abilities of children aged 4-5 years in the KB As-sholihin.

## 2. LITERATURE REVIEW

### 2.1 Problem Solving Ability

Problem solving is a very first foothold that must be developed, encouraged, appreciated, and given encouragement to children because problem solving will definitely exist in their daily life. Problem solving is an intellectual process in early childhood students when they encounter a problem, and it appears in the form of a decision of action and thought by the child. If children do not have a solution or common ground, they will think again from the first to get an understanding of the problems that will be faced by children (Muqowwim, 2020). Problem solving abilities vary in each development and are according to the stages of age. Problem solving abilities in early childhood aim to overcome problems in their daily lives. Problem solving does not only deal with problems

in everyday life, but it can also explore children both in doing assignments at school and at home. (Sustainable, 2020). Problem solving skill is related to children's thinking processes, particularly how they understand their world, their ability to remember, solve problems, and make decisions. Problem solving abilities are the main thing that must be considered in children, especially when children are carrying out the learning and playing process, where children meet small problems that they solve themselves and children will solve problems or assignments given by their teacher at school. Problem solving requires children's ability to think, schools can develop this problem-solving ability and provide learning materials so that children can think critically and be able to solve a problem (Nadila, 2020).

### 2.2 Science and Mathematics

Science is the process of observing, thinking and reflecting on actions and events. Science is the way people think and see the world around. Science is the subject of discussion that examines facts/reality related to natural phenomena. In line with the opinion expressed by Hofman (1995) that science is knowledge about certain phenomena, processes used to collect and evaluate information and as a form of human adaptation to the environment.

Science for children is not chemistry, physics, biology, astronomy or geology. The content is indeed closely related to the fields of knowledge mentioned above, but for them, science is a form of learning about problems that come up and in accordance with their thinking and curiosity, then with the level of growth and development of their thinking. For example: what causes the wind to blow? What forms clouds? They always try to find answers to these questions, and the process of finding answers to these questions, is science for children (Sari, 2021). Science can be applied to early childhood education, children can be introduced to simple scientific concepts that will be beneficial for young children to be able to adapt to their daily environment. Apart from playing science, early childhood can be introduced to math games. So that the development of science and mathematics can help optimize early childhood development

Mathematics is very important in everyday life. Throughout everyday life, even every minute is not spared from the use of mathematics. Shopping, counting objects, time, place, distance and speed are mathematical functions. Understanding graphs, tables, diagrams is also a function of mathematics. Measuring length, weight and volume also used mathematical functions. In other words, mathematics is very important in human life (Utoyo, 2017).

## 3. METHODS

The method used in this research was 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 single subject research was developed by Sunanto (2005) 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 used 3 students of KB As-sholihin as research subjects. Data collection activities carried out using tools in the form of instruments. The instrument given to the subject was in the form of a problem-solving ability test, particularly in the form of basic questions in more detail. The method used in analyzing the data in this study was using graphical visual analysis techniques.

## 4. RESULT & DISCUSSION

The results of the initial observations that the researchers conducted in the field were to find that there were 18 students aged 4-5 years who were undergoing their preschool period at KB As-sholihin. Researchers found that in this global condition the children in the KB As-sholihin still lacked development in the cognitive aspect, namely problem solving. For more effective results, researchers conducted research on only 3 children. The researcher made observations, gave examples of similar questions related to problem solving and also thoroughly observed the 3 children. In the initial conditions of the study, the researcher found that these three children still had low knowledge in terms of problem solving. A thorough explanation of the results of the research on the 3 children will be presented below.

### 4.1 Data Description

**Table.1. Baseline Acquisition Score**

Name	Session Test Achievement to (%)		
	1	2	3
<b>FZA</b>	40%	40%	42%
<b>TVS</b>	40%	42%	42%
<b>RAN</b>	40%	42%	40%

From the table above, it can be concluded that the 3 subjects had baseline I results with an average percentage of 40%. This explains that the subject's ability to solve problems was still low.

**Table 2. Intervention Gain Score**

Nama	Session Test Achievement to (%)		
	1	2	3
<b>FZA</b>	64%	80%	96%
<b>TVS</b>	80%	86%	98%
<b>RAN</b>	74%	80%	88%

From the table above, it can be concluded that the results of the intervention for the 3 subjects increased from 64% to 98%.

**Table 3. Gain Score**

Name	Session Test Achievement to (%)		
	1	2	3
<b>FZA</b>	84%	86%	90%
<b>TVS</b>	86%	88%	94%
<b>RAN</b>	84%	88%	94%

The table above depicts that the results at baseline II were stable, with a score of 84-94%.

### 4.2 Data analysis

The components of analysis between baseline conditions (A1), intervention (B) and baseline 2 (A2) in improving problem solving abilities are as follows:

**Table 4. Inter-condition Analysis**

Condition Analysis	Baseline 1 (A1)/ Intervention (B)	Intervention (B)/ Baseline 2 (A2)
Number of Variables	1	1
FZA	1	1
TVS	1	1
RAN		
Directional Trends and Effect	(+)	(+)
FZA	(+)	(+)
TVA	(+)	(+)
RAN		
Stability Change		
FZA	Unstable/unstable	Unstable/unstable
TVA	Unstable/unstable	Unstable/unstable
RAN	Unstable/unstable	Unstable/unstable
Level Change		
FZA	42-64 (-22)	96-84 (+12)
TVA	42-80 (-38)	98-86 (+12)
RAN	40-74 (-34)	88-84 (-4)

Data Overlap	$\frac{0}{0} \times 100\% = 0\%$	$\frac{0}{0} \times 100\% = 0\%$
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Based on the results of data analysis within the conditions and the results of the 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 the intervention using the magic flashlight game media in the baseline condition (A1), the tendency towards the ability to solve problems in FZA, TVA and RAN tended to be flat (=) and still low which lied in the range of 40% to 42%. When given treatment in the intervention conditions, the tendency towards problem-solving abilities in children who previously had difficulty solving problems continued to increase (+), which lied in the range of 64% to 98%, and the tendency of the child's ability to solve problems in learning without using a magic flashlight media was seen. The ability of children with learning difficulties remained and increased (+), which was in the range of 84% to 94%. This proves that the magic flashlight game media was effective in improving problem-solving abilities in children aged 4-5 years at KB As-sholihin.



Figure 1. Field Documentation

This research was carried out in schools for 9 times in which the observations were made in three conditions, namely 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 children's abilities tended to level off and was still low with a range of 40% - 42% 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 64% to 98%. Day six the percentage of children's abilities was quite stable at 96%, the observation was stopped because the children were able to solve the problems in the magic flashlight game correctly.

In the baseline session (A2) three observations were made, in the first observation the ability to solve problems was 84%, 90%, and 94%. Variable measurements in this study are percentages. In SSR (Single Subject Research) research in line with the opinion of Sunanto (2005), the percentage is meant 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 of the data described above, it can be proven that the magic flashlight game was effective in increasing problem-solving skills in children aged 4-5 years at KB As-sholihin. Along with the above, according to Sudjana and Rivai (as cited in Arsyad 1997), the benefits of learning media in the student learning process, includes using learning media will be more interesting, learning materials will have a clearer meaning, teaching methods will be more varied, and students will get more carry out learning activities.

## 5. CONCLUSION

By using this magic flashlight game, it is easier for children to understand the material provided by researchers. This can be seen from the research data in the baseline condition before the intervention was given (A1), indicating that the child's ability to solve problems was still low, only 40% -42%. After being given treatment by using a magic flashlight game, the child's ability to solve problems increased, the child was able to recognize concepts, know the function of an object, recognize symbols and the concept of numbers 1-10, group objects according to color, size, etc. Besides, children were able to know the concept, around 96%, 98% and 88% of them. And after the treatment was stopped the child's ability was stable and continued to increase, where the child was able to recognize concepts, know the function of an object, recognize symbols and the concept of numbers 1-10, group objects according to color, size etc. Moreover, children were able to know the concept of a lot or a little, as much as 90%, 94% and 94%. Based on the discussion above, it can be concluded that magic flashlight games were effective in improving problem solving abilities in children aged 4-5 years at KB As-sholihin.

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