

Kinesthetic Games Model to Improve Early Mathematics Ability in Early Childhood

Setiyo Utoyo, Irvin Novita Arifin, Abdul Rahmat
State University of Gorontalo
Indonesia

Abstract:- Objective of this research to develop a kinesthetic game model in enhancing the ability mathematicch beginning in early childhood. The research method used was the development of models developed by Borg & Gall. Model development design is carried out through the stage of needs analysis, product development and testing. Based on the results of a large scale test in several kindergartens in Gorontalo province, between Damhil Kindergarten, Pembina Kihajar Dewantoro Kindergarten, Al Murqi Kindergarten, Al Islah Kindergarten, Kartika Wirabuana Kindergarten, and Raudhatul Jannah Kindergarten. The effectiveness of the test model shows a significant increase in the process help children develop abilities mathematics early in early childhood. The results of this study generally illustrate that the kinesthetic game model is easy and practical to use. The kinesthetic game model can improve early math skills in early childhood.

Keywords:- Early Mathematics, Kinesthetic Games.

I. INTRODUCTION

Mathematical ability is one phenomenon that is very warmly discussed by all people, especially among parents. One of the goals of early childhood parents put their children is that their children are able to master mathematics. How many parents think that children are smart can master or be able to calistung (read, write and count) as early as possible. The parents have a concern that when a naknya continuing secondary school education will be hindered dikar e nakan child has not mastered math skills, because when children enter secondary school must go through a series of tests, one of which mathematical skills. Jamaris (2014) argues that the ability of mathematics is an ability that is obtained from various processes and not abilities that are mastered suddenly; the mathematical ability of an individual develops according to the stages of the individual concerned. Inability to child mathematics must be developed with the various processes that can provide appropriate stimulation that run private math skills that children develop optimally.

Piagetin Subarinah (2006), mathematical abilities for early childhood can be done through three stages: 1) the first stage namely understanding of the concept in the form of a kid understand the concept of experiential activities/play with objects concrete, 2) the second stage of the transition period in the form of process redirect think of abiding by towards the introduction of the abstract, where the object of con exists and can be introduced in the symbol form, 3) the third stage is recognize a number in the form of an

opportunity to know and visualize the symbol numbers of the concept that children understand. At t learn math through Home Visits Dienes in Ruseffendi (1992) known as *learning Joy full* that basically the level of one's learning process can be seen from the level of cognitive abilities. Cognitive abilities become a very important thing, and the ability to think possessed depending on the age of a person, so that the learning in adults should be different with the children's learning.

Based on the results preliminary study research in some kindergartens in the region of Gorontalo (TK Damhil, TK Negeri Pembina Ki Hajar Dewantoro, TK Al Murqi, TK Al Islah, TK Kartika Wirabuana, and TK Raudhatul Jannah) in the first semester of the first academic year 201 7/201 8 and interviews with teachers as well as the kindergarten principals, showing that the early mathematical abilities of early childhood are less encouraging, this can be seen from the work of children every day. This fact was also strengthened again when researchers conducted an initial evaluation of the daily activity plan for the second semester of the 2017/2018 academic year in group B, totalling 120 children in six TK institutions. The results obtained from 120 children most of the initial mathematical abilities have not developed as expected. This is allegedly due to lack of mastery of teachers in conveying learning and rather rigid in the learning process. Naturally, if children are increasingly away from this field of mathematical development. Another factor is the lack of the use of media and the approach to learning mathematics that is easy to understand and fun, of course the child is happy in accordance with the principle of learning while playing. This causes a dilemma for teachers are using the game in gift stimulation of the development of mathematics in each learning activity.

Problems math skills beginning in early childhood among encountered some TK Gorontalo province is of five indicators math skills early child research institute, observed that classification, matching, sorting, comparing, and counting results obese e rvasi 120 children data showed only 30% of children have early mathematical skills good criteria, 40% of all children have sufficient initial mathematical skills, and 30% of all children have early math skills with less criteria. Based on these data, the initial mathematical ability of kindergarten children in the province of Gorontalo is still in the less encouraging category (mid April 2018).

The results of research conducted by Mooney, et.al (2009) that children learn mathematics through games and exploration such as storytelling, singing, kinesthetic, imaginative and role playing. Mathematics learning

activities through games and exploration are more interesting and enjoyable students are involved in activities that cover their world. Games for children are very important because they can develop creatively, train kinesthetic, train concentration, perseverance and endurance to balance the body's activities.

Based on this background investigators designed a model of the game, especially in developing early childhood math skills. The development of children's mathematical abilities can be done through kinesthetic games. Kinesthetic can in the form of one's ability to express ideas, ideas, strengths, skills and express themselves related to the intelligence of his body. In child kinesthetic games can like things related to motion, such as exercise, gymnastics, art activities (motion and song, acting, choreographer), and other fine motor skills.

Kinesthetic game used to be a solution-solving in developing early math skills of children in the form of a fun game, where children are involved directly. Activities in this kinesthetic game are more focused on gross motor activities.

II. THE ORETICAL STUDY

➤ *Concept of Early Childhood Mathematical Ability*

The definition of mathematics in general is the ability that arises from thinking and mastered by a child in solving various problem she faced in a lifetime i-day. As in early childhood mathematics introduction activities include classifying objects based on colour, shape and size, making patterns, sequences and sizes, number concepts, correspondence one on one, concepts of comparing, geometry, estimation, currency, time and media use concrete media before operating abstract symbols, and interacting through play.

Susan Smith (2009) mentions several concepts of early childhood mathematics, namely, a) matching is the concept of one to one correspondence, b) classification, c) comparing, and d) ordering or serialation. The opinion explains that early childhood mathematics for that match/match corresponding pairs of objects, classifying objects, compare, and equality/- seriation. According to Kennedy (2008) mathematical concepts for early childhood are: a) matching and discriminating, comparing and contrasting, b) classifying, sorting and grouping, c) ordering, sequence and seriation.

In introducing mathematics to children early age will be more easily understood by children if given the opportunity to learn to experience themselves or use concrete objects because at an early stage, new children learn to use symbols and still cannot think systematically. Minetola (2004) mentions several stages of early childhood mathematics, starting from small number recognition, meaningful object counting, increasing magnitude concepts and counting based comparison, number after knowledge, comparison of neighbouring numbers, number after equals 1 more, mentally adding 0 and 1, mentally adding 2 to 5. From this opinion it can be interpreted as small number recognition, which means learning to count, improving the

concept of counting based on the ability to divide numbers, dividing adjacent numbers, then multiplying the number 1 or more, adding the number 0 and number 1, add number 2 to number 5.

Schwartz (2005) provides instructions/rules about learning mathematics for children, namely (1) the child learns from the concrete towards the representational, to abstract thinking, (2) the child's initial understanding of mathematics grows through experiences in making a collection of concrete objects, (3) the child's early progress starts from what is known towards the unknown, (4) children learn mathematics from simple knowledge to complex knowledge and skills. These signs direct the learning of mathematics for pre-kindergarten and kindergarten students that are meaningful according to their needs and cognitive development characteristics.

Based on the description of the above theory, it is explained that mathematical abilities are children's mathematical abilities obtained from various processes. These mathematical abilities can be applied in the form of concepts to solve problems that are realized in such knowledge classification, matching, sorting, comparing, numerating. This initial mathematical experience is a basic skill for understanding the next mathematical concept.

➤ *Kinesthetic Games*

Musfiroh (2008) said playing is an activity carried out on the basis of a pleasure and without considering the end result. Play activities can be done voluntarily, without coercion or pressure from outside parties (Hurlock, 1997). Santrock (2012) explains that playing is a fun activity carried out for the benefit of the activity itself. Freud and Erikson in Santrock (2012) play is a form of human self adjustment which is very useful to help children master the anxiety and ko n Flik. Piaget in Santrock (2012) describes the game as a medium that enhances cognitive development in children. Referring to the various opinions, the kinesthetic game in this study is a game that is performed in the form of kinesthetic motion in improving the early mathematical abilities of early childhood.

Kinesthetic games are games with characteristic movements involving large parts of muscles, and the purpose of movement skills is not so necessary. Such as the fundamental movement of kinetic skills in the form of walking, jumping and throwing. The process of forming motion in humans does not only occur automatically, but is the activity of learning and practicing by understanding motion and performing repetitive movements accompanied by awareness of rightness or action which is conducted. Therefore, the ability to move or motor skills is the ability to perform movements efficiently and effectively. Skills in general are a term that is often associated with a person as the ability to carry out specific goals (Ricard, 1998).

➤ *Early Childhood Mathematical Ability Model Developed Through Kinesthetic Games*

This research develop early childhood math skills through kinesthetic game activities. The development of mathematical abilities is carried out through activities that involve children directly in the game that researchers have previously designed. Learning be a game that involves gross motor movements in children in these activities are designed with reference to the development of mathematical concepts that are tailored to the child's age.

This kinesthetic game in it is simulated with the game of motor movement in balancing, dynamic movements and motor skills. So that children will feel comfortable and happy and interested in participating in these activities, with conditions like this will make it easier for children to absorb new information about simple mathematical concepts.

Through this kinesthetic game, in addition to the mathematical abilities of children can be trained, also skill I and attitude of children can be developed simultaneously. Skill I here can be in the form of singing ability, motor skills and even the attitude of children can be instilled early. Attitude of this child can be seen in the form of how children are able to obey the rules in the activities, respect each other in group activities, sensitivity to others or sympathy, and how the child's attitude to accept defeat and victory in the game. The early childhood math abilities that researchers developed in this study through kinesthetic games based on the theoretical foundation above are: 1) classification, 2) matching, 3) sorting, 4) comparing and 5) spelling

III. RESEARCH METHODOLOGY

This study uses a model development design procedure (R and D). The method used is the Borg and Gall research model of Abdullah's modification, 2008 which consists of five steps, namely: 1) analysing the product to be developed, 2) developing the initial product, 3) expert validation and revision, 4) small-scale field trials and product revisions, and 5) large-scale trials and final products.

Sampling using purposive sampling technique. The research sample was chosen after the researcher conducted a preliminary study into several existing TK in the Gorontalo region. The kindergartens were sampled in the first trial (small scale) in Damhil Kindergarten, then the second trial was conducted at TK Pembina Kihajar Dewantoro, TK Al Murqi and Al Izlah TK Kartika Wirabuana, and TK Raudhatul Jannah.

Data collection techniques through 1) check list of field observation through observation and interview sheets, 2) check list assessment of early math abilities of kindergarten children, 3) Questionnaire, 4) Expert assessment instruments, 5) Field notes 6) Questionnaire as assessment instrument, 7) check list of early childhood math abilities assessment. Early mathematical ability instruments for early childhood in research using observation, questionnaires and tests. Data analysis techniques are used with qualitative and quantitative data. Data to qualitatively

analysed at the time of data collection in progress and after completion of a certain period of data collection by way of summarizing the data to choose things that are basic and essential. For quantitative data obtained From the results of the questionnaire distribution, it was analysed using descriptive analysis techniques with percentages, while the test results data (pre-test and post-test) the initial mathematical abilities of kindergarten-aged children were analysed by t-test.

IV. RESEARCH RESULTS AND DISCUSSION

The results of the implementation of the study were obtained from the results of preliminary studies conducted in several kindergartens in the Gorontalo region, found the fact that the teacher did not have a specific method in dealing with the problem of early mathematical abilities in children. Ways to do so far only with conventional learning, such as more teachers convey instructions, accustomed to habituation writing on the blackboard, d i addition, teachers still use the old tradition that only focus on activities in the classroom, not be right playing outside the classroom especially in mathematics learning. So it can be concluded that the kinesthetic game model is an innovative model to improve the initial math skills in the Gorontalo region. The kinesthetic game model is designed through an in-depth theoretical study process and will be carried out several times in the field testing process.

A. Phase I trial results (small scale)

Based on the trial phase I kinesthetic game model to improve children's mathematical abilities in kindergarten Damhil Gorontalo has produced a product revision:

➤ *Alternative types of games used in research.*

In the selection of the right type of game is one of the causes of whether or not the game is performed properly. In practice there are 10 games that are tried and adjusted to the meeting schedule. The types of games are 1) running agile, 2) running Zig-zag, 3) Running Together with Flags, 4) Guess and Terka, 5) Throw Your Bolts) 6. Jump over Your Stars, 7) Run Relay, 8) Tiptoe in the House Image, 9) Where Is Your Home, 10) Creeping Under Obstacle.

➤ *Game media used in research.*

The media used in the game looks quite effective and fun as a child's physical process with guided game rules.

➤ *Assessment used in research*

The use of the assessment format used is in accordance with the age and level of child development. Materials, media and tools, written language are also easily understood by teachers who use at the time of assessment. In determining the format and indicator of the development of initial mathematical abilities in children, the process has been revised with expert and expert input.

➤ *Game design used in the study*

The game design used has been designed in such a way that it can train the child's early mathematical abilities. The designs that have been made have also considered the

level of difficulty for children for each meeting and they can follow them and practice them well.

➤ *The results of improvement in early childhood math skills*

The resulting increase in math skills of children that occurs is done by comparing the results obtained when the initial assessment to final assessment. The initial assessment is carried out before the game model is introduced to the child, while the final assessment is done after the child follows the game. From the results of the final assessment of the implementation of the phase I kinesthetic game model there was an initial mathematical improvement in children compared to the initial assessment.

With the implementation of a trial of the kinesthetic game model in the development of children's mathematical abilities in TK Damhil Gorontalo shows an encouraging fact. Children look happy to follow this learning model, and their mathematics learning outcomes increase significantly. Based on the results obtained, then in the next stage the researchers will conduct the development of the model by conducting phase II trials (large scale) in Five Kindergartens in Gorontalo province.

B. Phase II trial results (large scale)

In the implementation of phase II trials various shortcomings experienced in the previous trials were no longer found. Various things that support the simplicity and practicality of this game model are 1) available kinesthetic game design that is easy to understand by the teacher, the availability of media for each game attracts children's attention, 3) the kinds of games that are practiced are interesting and can help teachers control the physical and kinesthetic of children. 4) the assessment tools provided are easy to understand and practical to use. Based on the results of the study it was found that handling problems early learning math skills in early childhood requires mastery of the teacher, both in the media in order to optimize the more interesting and fun, as well as in using a social approach to emotional. The delivery of material should be in accordance with the context of the child's life, and create creations and imaginative learning.

So the discussion of initial mathematical abilities can be achieved as targeted kinesthetic learning game is a game that is suitable for use in improving the math skills of children beginning kindergarten. Through the game method, the children are very enthusiastic and happy to participate in activities, not only that the children are also challenged to complete all stages of the game in accordance with the instructions and rules set together in the activity. In Besides that, the strategy with the game not only has an impact on improving the initial mathematical skills, but other important aspects are also able to be developed simultaneously such as developing children's socialization, courage, independence, attitude of the child in communicating with friends, motor skills, physical processing, language, and several other aspects. This is as stated by NCCA (2007); Through active learning, the baby, toddler and young child follow their goals and goals through

first hand experiences of the world around them, individually, in pairs, in groups, in families and in the community.

Planning for designing a model or a way to practice math skills in children, an educator must be creative and not arbitrary. Considering that the age child is very moody and easily bored, then the model design or stimulation method chosen must certainly be interesting and fun for the child, because if these two things are not fulfilled then instead of a positive outcome that manifests it actually worsens the situation. To obtain an interesting and enjoyable early mathematical development model for children, they must pay attention to the characteristics of early childhood. Among the characteristics of early childhood should be considered Are early childhood was like to play, they have a world called world of play. Therefore, if you make a model of learning for early childhood, it should be designed in the form of a game.

This is reinforced by the results of research published by Sarama and Clements in journals published by Ontario (2011) suggesting that mathematical experiences can be narrowed down into two forms, playing mathematics and playing with mathematics. It can be interpreted that mathematics can be done in two ways, namely through games that use mathematics and play with mathematics itself. Thus through the game is one of the strategies suitable for use in improving early math skills in early childhood.

V. CONCLUSION

The results of the preliminary study and research obtained the following conclusions: 1) The teacher does not have a specific method in dealing with the problem of early mathematical abilities in children. The methods that have been carried out so far have only been with conventional learning, such as the teacher conveying more with instructions, accustomed to writing on the floor, besides that the teacher still uses many old traditions that only focus activities in the classroom to play outside the classroom especially in mathematics learning. 2) The kinesthetic game model is designed through an in-depth theoretical study process and several times the trial process in the field. The model was developed by taking into account the characteristics of early childhood as well as facilitating different learning styles and had gone through expert validation processes such as available kinesthetic game design, availability of media for each game, availability of various types of games practiced and the availability of learning assessment tools. The results of expert validation concluded that the practical and effective kinesthetic game product model for teacher use, and the effectiveness of the results of the model developed. 3) The trial results kinesthetic second stage game model (scale besar) is done precisely in six kindergartens in the province of Gorontalo, prove that effectively models kinesthetic games can improve math skills early childhood.

REFERENCES

- [1]. D. Gall, Meredith, Joy Gall, and Wolter R. Borg, 2003, *Education Research and Introduction*, Boston: Pearson Education, Inc.
- [2]. Jamaris Martini, 2014, *Learning Difficulties "Perspectives, Assessment and Management"* Jakarta: Penamas Murni Foundation.
- [3]. Leonard M. Kennedy, Steve Tipps, Art Johnson, 2008, *Learning from Mathematical Guiding Children*, United States of America: Thomson Wadsworth.
- [4]. Minetola R. Janice, Robert G. Xiegentuss, And J. Kent Chirman. *Teaching Young Children's Mathematics*. First Published 2004. New York: Roulledge.(on line book)
- [5]. Musfiroh Tadkiroatun.2008. *Smart Through Playing (how to Sharpen Multiple Intelligences in Early Childhood)*.Jakarta: Grasindo.
- [6]. Mooney, Claire, Briggs, Mary, Fletcher, Mike, Hansen, Alice, Mc Cullouch, Judith.2009.*Primary Mathematics: Teaching, Teory, and Practice*. Exeter: Learning.
- [7]. National Council of Teachers of Mathematics, 2000, *Principles and standards for school mathematics*, Reston, VA: Author
- [8]. Nurani Yuliani & Bambang Sujiono , 2010 , *Multiple Spots Based Creative Play*. Jakarta: index
- [9]. NCCA.2007,(<http://www.ncca.ie/uploadedfiles/curriculum/ld%20background%20paper%20may.pdf>)
- [10]. Oers Van Bert.2011. *Are You Sure Stimulation Mathematical Thingking Gurung Young Childrens Play*. University Amsterdam.
- [11]. Ontario.2011
www.edu.gov.on.ca/eng/literacynumeracy/inspire/
.Capacity Buliding Series Maximizing Student Mathematical Learning in the Early Years.ISSN: 1913 8482 (Print) ISSN: 1913 8490 (Online) ca / eng / literacy numeracy / i.
- [12]. Rosalind Charles worth and Karen K. Lind, 1990, *Math& Science for Young Children*, United States of America: Delmar Publisher Inc
- [13]. Russefendi ET, 2001, *an introduction to helping teachers develop their competence in learning mathematics to improve CBSA*, Bandung: Transito
- [14]. Subarinah, 2006, *Elementary Mathematics Learning Innovation*, Jakarta: Ministry of National Education
- [15]. Susan Sperry Smith.2009. *Early Childhood Mathematics*.United States of America: Pearson. Bandung: Teenagers Rosdakarya.
- [16]. Santrock, John W. 2012. *Development Life-span*.13 th Edition.University of Texas, Dallas: McGraw-Hill
- [17]. Schwartz.Sydney L. 2005, *Teaching Young Children Mathematics*, Westport, CT: Praeger
- [18]. UtoyoSetiyo, 2014, *Initial Mathematical Ability Improvement Through Problem Solving Approach*, Jakarta: PPs UNJ
- [19]. UtoyoSetiyo, 2015, *Kinesthetic Learning InEarly Childhood, Ideas Into Action*,Gorontalo: Proceedings of the National Seminar and International Conference, Volume I Number September 1 2015
- [20]. UtoyoSetiyo& Irvin NovitaArifin, 2017, *Mathematics Game Guide Book*, Gorontalo: Ideas Publishing
- [21]. UtoyoSetiyo, 2017, *Early Childhood Mathematics Development Method*, Gorontalo: Ideas Publishing
- [22]. NCCA.2007,(<http://www.ncca.ie/uploadedfiles/curriculum/ld%20background%20paper%20may.pdf>)