

## **Arithmetic Dice Media as Counting Concept Introduction Media in Early Childhood Setting**

**Naili Rohmah<sup>✉</sup>, Edi Waluyo**

**DOI 10.15294/ijeces.v3i2.9486**

Department of Early Childhood Teacher Education, Faculty of Science of Education, Semarang State University, Indonesia

### **Article Info**

Received October 2014  
Accepted November 2014  
Published December 2014

#### **Keywords:**

Early Childhood; Arithmetic Dice; Counting Concept

### **Abstract**

Counting is one of mathematics branches that studies about operation, such as addition, subtraction, multiplication, and division. Arithmetic dice is a dice that is used for counting game. The purpose of this study is to know that Dice Arithmetic is beneficial as an introduction of counting concept for early childhood. This study employed an experimental method with pretest-posttest control group design. The subjects were children aged 5-6 years. The sample was taken using Purposive random sampling. The result of this study is that there was a significant influence on children when they were introduced to the concept of counting with Arithmetic Dice, compared to children who were introduced the concept of counting by conventional methods or worksheet. Arithmetic dice has principles like a six-sided dice. Each side of the dice is given a picture that can be assembled and the theme of the picture is customized based on the current theme. This study used two dice. Every child played two dice that had been prepared by the teacher. After the dice numbers appeared, the teacher directly asked the children some questions for example what the sum of the two numbers was, which number was bigger from the two dice, what the symbol of the number was.

### **How to cite**

Rohmah, N., & Waluyo, E. (2014). Arithmetic Dice Media as Counting Concept Introduction for Early Childhood. *Indonesian Journal Of Early Childhood Education Studies*, 3(2), 127-133. doi:10.15294/ijeces.v3i2.9486

## INTRODUCTION

Bloom states that 50% of a child's intellectual potential has been formed since the age of 4 years and reaches about 80% at the age of 8 years (Depdiknas, 2007: 5). In the age range of 4-6 years, child absorption of information is relatively high, thus, it is advisable to practice the basic capabilities and the establishment of behavior at this age, especially introducing mathematics. At the age of 5 years, numeracy skills play an important role as it helps develop other skills (Menon, 2010). Mathematics is the basis of human knowledge. Mathematics is one of the top human intellectual brilliance (Rachman, 2009: 191). Indonesia is a developing country, Mundia (2012) states that most children in developing countries have problems in learning mathematics. Most children, aged 5 years, can count up to 20 or more and know the relative size of the numbers 1 through 10, and can perform single-digit addition and subtraction (Siegler, 1998).

Math, which is given to children, is only to introduce them to the concept of counting without imposing that they must master the material provided. In recent years, children are interested in mathematics, they start to count everything in sight and look for the form, in the classroom and in various places (Bradekamp, 2011: 396). According to Barth, et al (2005) ability to present numbers and arithmetic capability is unique in every culture, its influence is to educate people, and it relies on verbal counting in giving the instruction. Furthermore, Butterwoth (2005) suggest that arithmetic skills are very important and effective in calculating social life and state. Basic mathematics is made to be a math strategy to be used to assist the acquisition of symbolic figures (Barth). Sophian in the journal entitled Numerical Knowledge in Early Childhood stated that the mathematical abilities of children at the beginning of school is predicted to affect the ability of the next school and more powerful than early reading skills, skills in terms of attention or socioemotional skills. So, math skills are the foundation for the formation of skills and other support.

The journal *the development of Arithmetical Abilities* written by Butterworth concludes that a lot of evidence to support the idea of a certain innate capacity to acquire skills of arithmetic, but the impact of the learning content and learning time in the development process require further investigation. Essentially, learning in kindergarten is always inserted messages of learning. Messages of learning will be easily digested by children

when teachers convey the message using learning media. An expert on the cognitive development of Swiss nationality, Jean Piaget said that the age of 2-7 years is at the pre-operational stage. The pre-operational stage is the stage where the child has a mental picture and able to pretend, short steps to use the symbol (Sujiono, 2004: 3.7). During the pre-operational stage, the use of children growing symbolic thinking, mental reasoning begin to emerge, and the use of the concept increases (Feldman, 2012: 220). Characteristics of children in the preoperational stage are to develop the ability to learn through symbols, language and mental representation of mind; children thinking processes are controlled more by the perception of logic (Bradekamp, 2011: 109). Child characteristics in the second stage of Piaget cognitive development which is also mentioned by Papalia et al (2008: 323) state that the expansion of the use of symbolic thought, or representational abilities appear at the end of the sensorimotor stage.

Dice media is chosen because it can be used as a multifunctional media in the counting game. The dice media is used as a game medium because playing is every child's needs. The argument is also reinforced by Suyanto (2003: 161). He states that the principle of learning media is useful to help students learn to understand something that may be difficult or complex or to simplify things. Children know mathematics well when they are introduced to concrete objects to count (Guha, 2006). The dice is chosen as an alternative media in the introduction of the concept because of the scarcity use of dice as a medium for the introduction of the concept of counting as well as the lack of modification of the dice in terms of shape, color, and image.

Dice modification that the researchers use is to apply beige color as the basic color of the dice. The cube size which is originally only 1 x 1 x 1 cm will be modified into a 20 x 20 x 20 cm to meet the child's cognitive development in requiring a sizeable media. The use of universe images the instead of the black dot will enrich the knowledge of children in introducing the concept of the universe. This will make children easy to understand the counting concept. Barth, et al (2005) suggests that children compare and increase the number presented in different modalities before they start arithmetic instructions.

The purpose of this researcher is a temporary hypothesis of the concept as an attempt to test the correctness of the data found in the research and to strengthen the conclusion of the research.

**RESEARCH METHOD**

The approach used in this research is the quantitative approach. The method used in this study is an experimental research method. The experiment is the procedure that we use to find something that we do not know (Shaughnessy et al, 2006: 382). The research design is true experimental design (pure experimentation) pretest-posttest type Control Group Design (Sugiyono, 2010: 112). The pure experiment is an experiment that yields outcomes that are not ambiguous to cause an incident (Shaughnessy et al, 2006: 383). Pretest-posttest is used for selecting the Control Group Design since it is the highest experimental design to answer the hypothesis raised by researchers as well as to measure of

the value of pretest and posttest between the two groups.

The population in this study was a kindergarten B in Semarang which applied learning center. There are 556 kindergarten schools in Semarang city. The sampling technique in this study is purposive random sampling. Purposive random sampling is sampling that is chosen with particular consideration and is done in random with pretest-posttest control group so that the experiment should be purely random sampling. The sampling technique was conducted after observing that the sample was from early childhood schools that used the center learning model. The sample in this study is Siti Sulaechah 04 group B Semarang kindergarten as the experimental group and the Lab school

**Table 1. Instrument Design Counting Development Variable age 5-6 years**

Aspect	Indicator
Classification	Classifying digits with the same number
	Classifying odd and even numbers
Playing estimation	Estimating the result of a simple operation
	Estimating the order of before and after a number
Playing size	Measuring the length of the body
	Measuring with the help of measurement tool
	Understanding the concept of measurement >
	Understanding the concept of measurement <
playing statistics	Recognizing the concept of = (equal)
	Recognizing the concept of ≠ (unequal)
Ability to count	Counting numbers
Mentioning numbers 1-10	Recognizing the concept of symbol of numbers 1-10
Matching between the numbers and the symbol	Recognizing numbers and their symbol

**Table 2. The Instrument Design Arithmetic Dice Media**

Aspect	Indicator
Good dice media	Suitable for the child's age
	Realistic
	Simple
	Can be touched, held, and played
	Attractive in color and shape
	Can be applied in every different theme

UNNES group B Semarang kindergarten as the control group.

The independent variable in this study is the use of Arithmetic Dice Media. The dependent variable is a variable that is affected or becomes an effect because of the independent variables (Sugiyono, 2011: 61). The dependent variable in this study is the introduction of the concept of counting. The design of the instrument is presented in Table 1 and 2.

Methods of data collection in this study include documentation and observation. The method of documentation is used as a reinforcement purpose and focus of the problem, so this documentation method is used to determine the contents of the tools and materials that exist in the preparation centers as well as the documentary evidence of the research. Observation method is used to study human behavior. This study employs structured observation. According to Sugiyono (2010: 205), structured observation is an observation that has been designed systematically, about what will be observed, time and place the research is conducted. Thus, structured observation is done when researchers have known about the variables to be studied, in this case, is the concept of counting. Counting concept score is obtained by the researchers through the observation sheet using a checklist based on the indicators of research instruments. A checklist that is filled in the instrument refers to the rating scale. Sugiyono (2010: 141) states that Rating scale is the raw data obtained in the form of numbers and then interpreted qualitatively. Rating scale on a sheet of writing instruments are capable without being

assisted is scored 3, capable with help is scored 2 and unable to do is scored 1.

Before the instrument was used as research measuring instrument, it was firstly tested. Tests were carried out to determine whether the instrument was valid and reliable for research. To calculate the validity, the correlation coefficient was used. The coefficient correlation was calculated by the formula of product moment correlation. 30 out of 40 items were valid. The tested items were obtained  $R_{11} = 0.879$  while  $r_{table} = 0.304$  with a significance level of 5%, this meant  $r_{count} > r_{table}$  which meant that this research instrument was reliable. Data analysis used in this study was normality test, homogeneity, and t-test.

**RESULTS AND DISCUSSION**

The normality and homogeneity test using the formula one sample Kolmogorov Smirnov and Bartlett test is obtained some results shown in Table 3. The results indicate that the data pretest-posttest in each group showed a normal distribution of data and homogeneity. Results were considered normal and homogeneous when the results obtained was significantly more than 0.05.

The results of hypothesis testing and Table 4 data show that the test results of the posttest data were differently significant between arithmetic dice media and the introduction of the concept of counting on kindergarten pupils. This is shown by a significant increase score in the introduction of the concept of counting in the experimental group between before and after

**Table 3. Roof results in Normality and Homogeneity Test**

Test		<i>Pretest</i>	<i>Posttest</i>
Normality	Experimental	0.154	0.200
	Control	0.200	0.200
Homogeneity		0.529	0.840

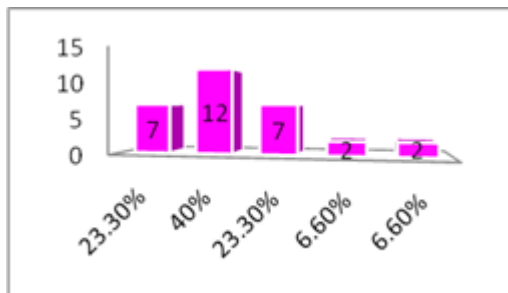
**Table 4. Hypothesis Test Result**

Group	Data	Mean	T	Sig. (2-tailed)
experimental	Pretest	58.70	18.8	-15.387
	Posttest	77.50		
control	Pretest	62.40	4.6	-5.237
	Posttest	67.00		

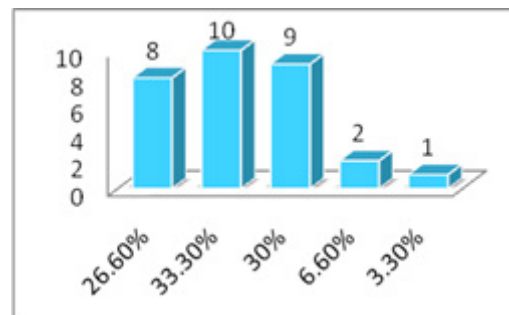
treatment with Arithmetic Dice media.

The Test the hypothesis is obtained that  $H_0$  is rejected and as a result,  $H_a$  is accepted. The result shows that the recognition of arithmetic concepts of the experimental group is higher than in the control group. The previous mean pretest value of the experimental group was 58,7 yet it changed into 77.5 in the posttest, thus, the experimental group score is 18,8 increase. Experimental group graph for pretest and posttest results can be seen in Figures 1 and 2.

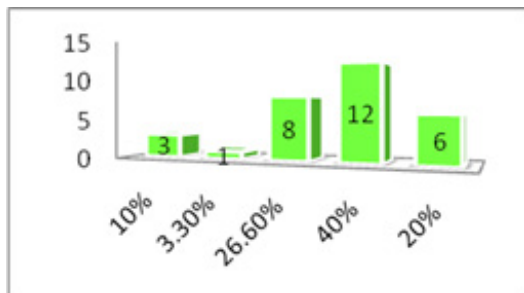
the arithmetic dice media gives effect to the introduction of the counting concept for children. Arithmetic dice media mediates learning for children, so it can be said that the arithmetic dice media is a supporting element in the stimulation of learning mathematics in kindergarten. The completion and function of the various elements or components supporting the educational process will largely determine the quality of children's learning outcomes obtained as output (Eliyawati, 2005: 13).



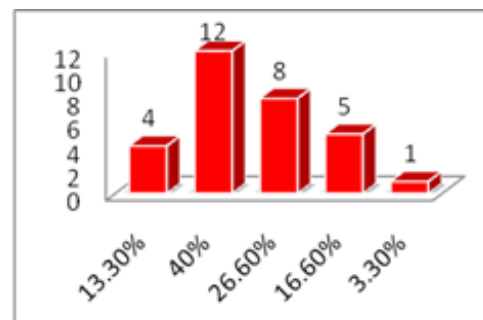
Picture 1. Experimental group pretest result



Picture 3. Control group pretest result



Picture 2. Experimental group posttest result



Picture 4. Control group posttest result

On the other hand, the control group pretest average score was 62,4 and it increased in the posttest with 67,0, thus, the control group score increase is 4,6. The result can be seen in graph 3 and 4. Although the score of the tests in both groups increased, the increase in the experimental group was higher than the increase in the control group. Thus, the arithmetic dice media in this study is effective to introduce the counting concept in early childhood. The analysis of the results of pretest and posttest in experimental and control group uses an independent t test. The different results between the experimental and the control group are influenced by the media being used as a treatment in the experimental research.

The use of arithmetic dice media that highlight the realistic aspect, colors, compliance with the theme and the size of the media, thus

The treatment used in this study refers to the concept of early childhood of five to six years of age in counting. Mathematics is the basis of human knowledge. In the age range of 4-6 years, child absorption of information is relatively high, thus, it is advisable to practice the basic capabilities and the establishment of behavior at this age, especially introducing mathematics. Introducing the math concept for early childhood is different from introducing it to adults. Early childhood should be introduced to math through games and media which are not dangerous for them. Piaget furthermore states that improving the child mental development to the higher level can be done by enriching child's experience especially concrete experience because the basic

child mental development is through active experience by using their tools around them (Depdiknas, 2007:5). Repeated exposure will fasten the concept of counting (Menon, 2010).

Inawati (2011) states that at the kindergarten level, there should be an approach that can interest them to know the concept of numbers, thus when they know the concept of numbers which is difficult at first will be fun for them to increase their motivation to know the concept of numbers through manipulative playing instrument method.

Dice is a cubical medium which has 6 equal sides which have 6 numbers on each side and it will be equal to 7 when added up on the sides. It is a concrete medium that can be used as a medium for children to count in the learning center. Learning center is a place where a teacher gives many supportive games which support their ability to read, write, count as a preparation for children to study further. The final objective when a child follows activities in preparation center is he or she will be ready to absorb material when he or she is in the elementary school. Arithmetic dice are dice used for math games, especially counting (arithmetic) so that children get the new media in the introduction of the concept of counting. Learning math is usually less interesting and less fun which can make children unhappy and get bored quickly, thus they think that learning math is hard and boring (Wahyu, 2012)

Modified Arithmetic Dice Media used in this study are dice made of flannel measuring 20x20x20. Instead of the dot, each side is filled with pictures. During the research, the ongoing theme was the universe. There were some pictures representing the theme such as sun, moon, stars, cloud, lightning and rainbow. According to Eliyawati (2005: 11), the theme is the main idea, thematic activity is an approach in education which is based on central key ideas about children and their surroundings.

Preparation center is a place for teachers in providing a wide variety of games to support the children's ability to read, write, and count to prepare them to study further. Moreover, Bath states that the introduction of counting concept for early childhood is more suitably done in preparation center where reading, writing and counting are introduced to prepare them to study further and counting is a part of mathematics. Math games which include counting are done in preparation center.

Generally, the result of the research suggests that the use of arithmetic dice media can increase the counting concept, in the words, it gives significant impact to the concept of counting

in kindergarten students. The mean score on the posttest of counting concept in the experimental group is higher than the control group.

## CONCLUSION

Based on the above discussion, it can be concluded that arithmetic dice media introduced in preparation center give significant impact to the introduction of counting concept. Butterworth (2005) also argues that counting is the basis of arithmetic for most children. Counting is a part of mathematics. The counting ability of young children will help them get other mathematics abilities. The development of arithmetic dice media can be used as an introduction to the concept of early childhood numeracy. Arithmetic dice has principles like a six-sided dice. Each side of the dice is given a picture that can be assembled and the theme of the picture is customized based on the current theme.

## REFERENCES

- Barth, Hillary. (2006). *Journal: Non-symbolic arithmetic in adults and young children* (<http://www.wjh.harvard.edu/~lds/pdfs/barth2006.pdf> accessed on September 1, 2014 at 09.14)
- Barth, et al. (2011). *Journal: Abstract number and arithmetic in preschool children* (<http://www.pnas.org/content/102/39/14116.full> accessed on May 14 2013 at 14.08).
- Bradekamp, Sue. (2011). *Effective Practices in Early Childhood Education: Building a Foundation*. United States
- Butterworth, Brian. (2005). *Journal: The development of arithmetical abilities*. (<http://www.mathematicalbrain.com/pdf/BUTTJCPP05.PDF> accessed on September 1 2014 at 09.59)
- Butterworth, Brian. (2005). *Arithmetical skills are essential to the effective exercise of citizenship in a numerate society (The development of arithmetical abilities* <http://www.ncbi.nlm.nih.gov/pubmed/15660640> accessed on April 10 2013 at 10:28).
- Depdiknas. (2007). *Pedoman pembelajaran bidang pengembangan kemampuan kognitif di Taman kanak-kanak*. Jakarta: Depdiknas
- \_\_\_\_\_. (2007). *Pedoman Pembelajaran Permainan Berhitung Permulaan di Taman Kanak-kanak*. Jakarta: Depdiknas
- Eliyawati, Cucu. (2005). *Pemilihan dan pengembangan sumber belajar untuk anak usia dini*. Jakarta: Depdiknas
- Feldman, Robert, S. (2012). *Child Development*. Sixth Edition. United States of America
- Guha, Smita. *Journal: Using mathematics strategies in early childhood education as a basis for culturally responsive teaching in India*. International Journal of Early Years Education, vol 14

- Inawati. (2011). *Meningkatkan Minat Mengenal Konsep Bilangan melalui Metode Bermain Alat Manipulatif-Maria Inawati-Jurnal Pendidikan Penabur* - No.16/Tahun ke-10/Juni 2011 <http://www.bpkpenabur.or.id/files/Hal.1-10> (accessed September 2, 2014 at 11:00).
- Jacobi, Jill C. et al. (2014). *Journal: Teaching Preschoolers to Count: Effective Strategies for Achieving Early Mathematics Milestones*. Early Childhood Educ J.
- Mundia, Lawrance. (2011). *Journal: The Assessment of Math Learning Difficulties in a Primary Grade-4 Child with High Support* ([http://www.iejee.com/4\\_2\\_2012/IEJEE\\_4\\_2\\_Mundia\\_347\\_366.pdf](http://www.iejee.com/4_2_2012/IEJEE_4_2_Mundia_347_366.pdf) accessed on September 1, 2014, 08:45).
- Naito, M & Miura H. (2001). *Journal: Japanese children's numerical competencies: Age and schooling-related influences on the development of number concepts and additi-skill*. Developmental Psychology
- Papalia, Diane, E. et al. (2008). *Human Development*. Alih bahasa AK Anwar. Jakarta: Kencana
- Priyanti, Wahyu. (2012). *Peningkatan Pengenalan Berhitung Melalui Model Pembelajaran Kooperatif Metode Jigsaw Pada Anak Kelompok B di TK Aisyiyah 56 Baron Tahun 2011/2012*. Thesis. <http://jurnal.fkip.uns.ac.id/index.php/paud/article/view/1386> (accessed on September 2, 2014 at 10.16)
- Rachman, Maman, dkk. (2009). *Filsafat Ilmu*. Semarang: Unnes Press
- Shaughnessy, John J, dkk. (2006). *Research Methods in Psychology*. New York: McGraw Hill
- Sujiono, Y. N. (2004). *Metode Pengembangan Kognitif*. Jakarta: Universitas Terbuka
- Suyanto, Slamet. (2003). *Konsep Dasar Pendidikan Anak Usia Dini*. Yogyakarta: UNY Press
- Slusser, et al. (2012). *Journal: Developmental Change in Numerical Estimation*
- Sophian, Catherine. *Jurnal: Numerical Knowledge in Early Childhood*. [www.child-encyclopedia.com/documents/SophianANGxp.pdf](http://www.child-encyclopedia.com/documents/SophianANGxp.pdf). (accessed March 18, 2013, 11:50)