



### Playing Number Wheel to Improve Early Numeracy Skill Action Research in Bon Thorif Kindergarten

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#### Abstract

Pupils' low early numeracy skill was found as a problem in a preliminary study with average percentage 52,05% based on observation and attitude test. This was resulted from paper and pencil activities involving drilling in the instruction. The researchers, therefore, offered direct solution for increasing early numeracy skill of kindergarten pupils B by playing Number Wheel at Kindergarten Bon Thorif located in Palembang South Sumatera, Indonesia. Number Wheel was media of pointing numbers modified from Charlesworth's media (2000, p.104). This media was in the shape of circle with 10 numbers from number 1 to 10 with different colours on its surface. This circle could spin at its center like a wheel and stop exactly on the clock hand pointing numbers. The method used classroom action research. The subjects were 13 pupils, 6 years old. Data collection techniques were test and non test. The data obtained from observation were gathered from field-notes and photographs. Data regarding an early numeracy skill were gathered by using an attitude test and observation. The indicator of the success of this research was shown by the improvement up to 71% for each pupil. The data analysis indicated that there was improvement 78,56% of pupils' early numeracy skill in the first cycle and 99,45% in the second cycle. This proved that the improvement was significant. The implication is that playing Number Wheel can be an alternative way to increase kindergarten pupils' early numeracy skill. Future study is suggested to develop more innovative media to improve early numeracy skill.

## INTRODUCTION

Numerous studies investigating the introduction of numerical concept, the use of media and strategies in teaching very young learners early numeracy skill have emerged, There is, however, a contradiction because the results of these various studies were solely theoretical and lack of concern in the prominence of delivering direct experience as the solution of the problems in order to improve educational practice. Facts found in Bon Thorif Kindergarten were: the activity used by the teacher to help pupils to understand numerical concept was still paper-and-pencil activity. The instruction in the classroom was teacher-centered because teacher used drilling method.

Based on the preliminary study, all six-year-old pupils of Bon Thorif Kindergarten were given action test resulting in average percentage 52.05%. This result indicated that pupils' early numeracy skill was still low in two aspects of early numeracy skill, i.e.: rote counting dan rational counting. This was used as the basic analysis in determining the success of research, which was an improvement up to 71% Mills (2003, p.418-41) which was the deal among teachers, researchers, and fellows as collaborators. By analyzing various theories related to the problem, researchers offered a solution, i.e.: learning activity which delivered direct experience for pupils to introduce numerical concepts by using various media.

Charlesworth (2012, p.8) regards playing as a wide arena for children to develop their understanding of symbolic function which was the basis of abstract understanding such as numerical concept. Charlesworth (2000, p.104) designs a media called Shape Discrimination which is played in Shape Discrimination and matching game. The theories shows that pupils's numeracy skill can be improved by using playing activities involving media. In this current research, media used was a modification of Charlesworth's media which was named Number Wheel. Based on the above description, to improve six-year-old pupils' early numeracy skill in Bon Thorif Kindergarten, a classroom action research by using Number Wheel game was conducted.

## LITERATURE VIEW

### *Early Numeracy Skill*

Pupils' early numeracy skill is very important to improve as its role is very vital on their life now or later. Samara & Clements (2008, p.67-94) claims that prekindergarten period is the ideal age for children to learn early Mathematics.

Apparently, the very first concept which has to be introduced is numerical concept, and early numeracy skill consequently becomes the first skill which has to be mastered by them. NCTM (National Council Teaching Mathematics) suggests 2 aspects taught in early numeracy skill, namely rote counting, which pupils mention names of numbers based on their memorization, and rational counting, which pupils match the names of numbers to a group of objects which has quantity (as cited in Charlesworth., 2005, p.229-236). The above literature had become the basis in developing the instrument, namely an instrument of pupils' early numeracy skill.

**Table 1.** Table Early Numeracy Skill

No.	Early Numeracy Skill
1	Count in sequence objects 1-10
2	Count down objects 10-1
3	Pointed largest symbol of number
4	Pointed smallest symbol of number
5	Matching among number and symbol of number
6	Matching among symbol of number and number
7	Matching objects just as much
8	Matching objects not as much
9	Pointed objects more
10	Pointed objects less

This instrument consisted of two indicators: (1) pupils are able to count numbers from 1 to 10; and (2) pupils are able to match the number to its symbol. This instrument was used to conduct an action test with checklists consisting of 10 items of statements by using the provided scoring criteria. The reliability and validity test of this instrument was carried out through expert judgment in the fields of early childhood education, Mathematics, and language.

### *The Relationship between Math and Play*

Numerous literature and research results have become references in viewing the relationship between Mathematics and games. Feldman (2000, p.97) states that an interesting, concrete, useful, and fun experience is effective in developing positive attitude of understanding mathematical concepts. A study conducted by Arnold, et al. (2003, p.762-770) emphasized pupils' enjoyment in a preschool program of Head Start when pupils had to understand various mathematical concepts.

septs, which in turn this enjoyment had a positive impact in students' mastery of mathematic skills. Hansen (2005, p.208-212) adds that the ways to introduce mathematics concepts should be a direct experience in their real life either in school or at home, and one of the ways is by playing games. Griffiths & Moyles (2005, p.172) claims that mathematics and games are a useful partner. Moreover, pupils' success in mastering mathematics is determined by the ways given by adults to introduce that Mathematics is fun and useful for their life. Mathematics and games, thus, have positive relationship between each other.

#### Material "Number Wheel"

Media has been very important in a Mathematics instruction. Park, Boyd & Chae, 2008 (p.157-162) consider the importance of blocks in geometrical concepts, and the same thing applies to the introduction of numerical concept that we need media to offer an ease for pupils to understand numbers. Charlesworth (2000, p.104) designs a media called Shape Discrimination played in a Shape Discrimination and matching game to introduce shapes' concepts to pupils. This media consists of four to five circles with a clock hand in its center. Besides, each picture of shape in the circles has its couple in the cards. The way ho to play this game is that pupils are asked to spin the clock hand in the center of the circles and wait until the clock hand stops and points at a particular picture of shape, such as triangle. Then, they are asked to match the picture to the card containing the same shape.



Figure. 1. Number Wheel

In this research, the media was a modification from Charlesworth's media, and named Number Wheel. The Number Wheel consisted of two parts, namely main part and supporting part. The main part is a circle with numbers from 1 to 10 written on it. Each number had different color and there were pictures of objects which the number of these pictures are the same as the written number. The pictures on the Number Wheel are in line with the current themes. This circle could spin on its center which was on the buffer pole, so that it could be spun to point at one of the ten numbers written on the circle. The supporting parts were buffer pole and clock hand. This pole was the place in which the circle and the clock hand were conncted. The clock hand was static, and the circle was dynamic. The was how to play the Number Wheel was: first, the circle was spun until it stopped and its clock hand pointed at a particular number. Then, pupils were asked to count the number of pictures pointed by the clock hand. Playing Number Wheel was always accompanied by accompanying activity which was counting the number of objects which was suited with the learning themes.

The procedure of playing Number Wheel could be integrated into the classroom through: (1) conditioning with stories, wathcing videos, etc; (2) aperception of theme, sub-theme, and accompanying activity; (3) explaining the way to play Number Wheel; (3) creating the playing rules together; (4) paying Number Wheel and followed by accompanying activity in line with the theme; (5) administering action test in the end of the cycle; and (6) reviewing the activity.

The modifications from Charlesworth's media (2000, p.104) were (1) buffer pole was added as one of the components of the media; (2) the was to play Number Wheel was different from Shape Discrimination game which it was the circle spinning in Number Wheel game while it was the clock hand spinning in the latter one; and (3) the mathematic concept used was different as the Number Wheel introduced numerical concept while Shape Discrimination introduces shape's concepts.

#### METHOD

The procedure in this classroom action research consisted of 4 phases, namely "planing, acting, observing, and reflecting" by Kemmis, S, & McTaggart, R (2000, p.567-607). Based on the preliminary study, the average of pupils' early numeracy skill was 52.05%. This result was the basis of the use of Number Wheel game to improve pu-

pils' early numeracy skill. This research is started by lesson plan by using Number Wheel in the first cycle which consisted of 6 meeting and accompanying activity with My Nation as theme and the way of Kubu tribe, South Sumatera looked for food as sub-theme and the activities were: (1) counting the caught fish; (2) counting stabbing animals; (3) counting the picked fruits. Another sub-theme was knowing the creations of Allah, such as human being, animals, and plants. This sub-theme was presented in three activities, namely: (1) counting the number of persons and the parts of body; (2) counting the number of shells; and (3) counting the numbers of Durian's seeds.

During the learning process by using Number wheel, the instrument of action of the game was filled out by collaborators consisting of researches, teachers, and fellows collaboratively. Then, action test was administered by using early numeracy skill's instrument. The total percentage of the scores obtained was calculated and it was found that the average percentage was 78.56%. Referring to the deal of the indicator of success of the research which was 71%, apparently there was a pupil named Pine whose numeracy skill was 70.56%. It showed that the success indicator was not achieved. Thus, collaborators did a reflection of the weaknesses of the given intervention in the first cycle, so that there were revisions in the intervention given the the second cycle. The revisions were the change of setting from indoor to outdoor, the seat was change from classical to circle shape, and accompanying activity which demanded pupils count and manipulate the counted objects.

The second cycle was conducted in 6 meetings with *Universe* as the theme and the sun, the moon, and stars as the sub-themes. This theme was represented in the following activities: (1) counting the shapes of the sun, the moon, and stars; (2) counting the number of clothes put under the sun ray; (3) counting the number of the stars in the picture. The next sub-theme included water, fire, and air and was represented in following activities: (1) counting the number of glasses in which I my self poured the water; (2) Counting the number of candles in my cake; and (3) counting the number of bubbles I made.



**Figure. 2.** Playing Number Wheel and Accompanying Activity

During the intervention process by using Number Wheel, the instrument of action of the game was filled out by collaborators consisting of researches, teachers, and fellows collaboratively. Then, action test was administered by using early numeracy skill's instrument. The total percentage of the scores obtained was calculated and it was found that the average percentage was 99.45%. Referring to the deal of the indicator of success of the research which was 71%, apparently all pupils' early numeracy skill had achieved more that the indicator of success, especiall Pine whose skill improved to 99.44%. Thus, all collaborators still did reflection, but the intervention by using Wheel Number was stopped.

## RESULTS AND DISCUSSION

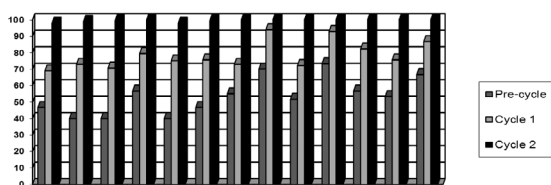
The results of the research were analysed into two ways, namely inferential statistics and qualitative analysis. Based on the analysis of inferential statistic shwon by the percentage table 1. and chart 1., it was found that the improvement average of pupils' early numeracy skill in the first cycle was 78.56%.

It is implied that there was improvement 26.51%, if it is compared to the findings in preliminary study or pre-cycle which was 52.05%. It was also found that the imperovement average of pupils' early numeracy skill in the second cycle was 99.45%. It is implied that there was improvement 47.4%, if it is compared to the findings in preliminary study or pre-cycle which was 52.05%. These two results indicated that there was significant improvement of pupils' early numeracy skill by using Number Wheel as it was

proven that pupils' early numeracy skill was getting improved from the first and second cycle, i.e.: from 26.5% to 47.45%.

**Table 2.** Table Improvement Early Numeracy Skill in Precycle, Cycle 1, and Cycle 2

S u b - j e c t	Precycle	Cycle 1	Cycle 2	Total Improvement
1	46,67%	73,3	97,78%	51,13%
2	40%	72,78	98,89%	58,9%
3	40%	70,56	99,44%	59,4%
4	56,67%	80	100%	43,33%
5	40%	73,89	97,78%	57,8%
6	46,67%	73,89	99,44%	52,73%
7	55%	73,3	100%	45%
8	63,33%	93,89	100%	36,67%
9	51,67%	72,22	100%	48,33%
10	63,33%	92,78	100%	36,67%
11	56,67%	82,2	100%	43,33%
12	53,33%	76,67	100%	46,67%
13	63,33%	86,67	100%	36,67%
A v e - r a g e	52,05%	78,56	99,45%	47,45%



**Figure. 3.** Graph Improvement of Early Numeracy Skill

The results of the qualitative analysis can be seen in the data display described. In the preliminary study, a pupil named Pine was not able to arrange the number symbol into correct order. It was indicated by the order from 4,5,1,2,and 9. The pupil also was not able to match certain number to its symbol of number. It was indicated by the pupil's performance which mathed 4 seeds of red bean to the symbol of number 7. After the use of Number Wheel game carried out in 2 cycles, the pupil's early numeracy skill improved. It was shown by the fact

that Pine was able to count the number of stars without teacher's help. Besides, Pine was able to match the symbol of number 7 to the picture of seven stars. Moreover, when Pine was asked to show which one is more and which one is less in number, he was able to point number 8 with 8 seeds of red bean which was more in number and symbol of number three with three seeds of red bean which was less in number. The researchers made Pine as the indicator of class' success, as Pine had the lowest early numeracy skill compared to his friends. Based on the facts described above, it can be concluded that there was significant improvement of pupils' early numeracy skill.

In the previous related research, Siegler and Ramani (2009, p.545-560) reported, "A comparison of the effects of linear or circular board games on the development of children's early numeracy skills, based on a sample of 88 low-income children from 7 Head Start classrooms and 2 child care centers who randomly received either a linear board game, a circular board game, or a numerical activities intervention". Its relevance to the current research is that both research investigated the effect of using instructional media in Mathematics instruction on pupils' early numeracy skill. However, the point which both research is different is in terms of objectives and the scope of effect of the research. Siegler's and Ramani's research aimed to investigate the effect of the media while this current research aimed not only to investigate but also to implement the use of instructional media directly so that the positive effect could be gained directly by the students.

The limitations of this research are: (1) the researchers conducted this research only on 13 pupils in one class so that the impact was not seen in broader scope; (2) the research did not provide many good pictures of documentation as the collaborators' skill in taking pictures was not really good so that there were many photos which were not used as they were not good; (3) the quality of the materials made into the Number Wheel game was medium as the fund of the research was researchers' personal fund and there was no fund support from any parties.

**CONCLUSION**

Pupils' low early numeracy skill was found as a problem in a preliminary study with average percentage 52,05% based on observation and attitude test. The researchers, therefore, offered direct solution for increasing early numeracy skill of kindergarten pupils B by playing Number Wheel at Kindergarten Bon Thorif located in



Palembang South Sumatera, Indonesia 2011. In order to give broader impact to pupils to improve their early numeracy skill by developing instructional media of early numeracy skill which was more creative and innovative, a further study is necessary. This is because the research which modifies some existing instructional media to improve 6-year-old pupils' early numeracy skill was not limited by Number Wheel game only. Much reserach is needed regarding this. Besides the fact that the reserach in this scope has not been much, the results of the rese-arch can be used as an alternative way for teachers, parents, and stakeholders to improve pupils' early numeracy skill which was very prominent to be de-veloped for children as their foundation to master further mathematic concepts to be implemented in their daily life now or later.

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