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The Effects of the Use of the Child-Friendly Based Lift the Flap Story Book toward Students' Mathematical Connection Skill

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Abstract. This study aims to determine the effects of the use of the child-friendly based lift the flap story book on the mathematical connection skill of fourth-grade elementary school students. This is a quasi-experiment with pretest-posttest group design. The sample, consisting of three classes with a total of 82 students, is selected by means of the cluster sampling technique. The data are collected through tests to be used for normality test using Kolmogorov Smirnov and homogeneity test using Levene Statistic. The hypothesis is tested by the independent sample t-test with a significance level of 0,05. All data analysis is done with SPSS. The results of the study showed that the scores of the control class, experimental class I, and experimental class II are normally distributed and homogeneous, evidenced by a significance value $>0,05$. The result of t-test for control class and experimental class I is indicated by sig.2 tailed 0,008 $<0,05$ while control class and experimental class II is indicated by sig.2 tailed 0,002 $<0,05$. Based on these data, it can be concluded that there is a significant influence on the use of the child-friendly based lift the flap story book on the mathematical connections skill of fourth-grade elementary school. Based on indicators of mathematical connection skill, the student gets the highest results on the first indicator, which is capable to connect between concepts in a single mathematical topic and the lowest result on the second indicator, which is capable to connect material on certain topics with other mathematical topics.

Keywords: child-friendly, mathematical connection skill, picture story book.

INTRODUCTION

Mathematics learning is an activity that requires student's reasoning and skill to operate mathematical concepts. Students are asked to be able to complete the steps of learning mathematics systematically, from the planting up to the application of concepts. Based on these conditions, teachers should be able to create and innovate in order to achieve the learning objectives and every step can be passed well by students. Not only cognitive abilities but also affective and psychomotor abilities. The learning process should also be suitable to the characteristics of the students. Because of the importance of mathematics learning, preliminary studies in this study have been conducted through analysis of mathematical textbooks used by students, observation of learning activities, giving questionnaires, and interviews. The preliminary study aimed to know the current conditions of mathematics learning. The results of the analysis show that there are some shortcomings of textbooks (teacher and student book) covering the material presented in the book is very limited; 2) lack of exercise questions presented in story form; 3) the content of the material is not entirely in accordance with basic competence because there is material not described in the book; 4) lack of use of drawing illustrations to help students understand the material; 5) there are illustrations of images that are too abstract like the image of a child who has no mouth; and 6) the contents have not been able to reflect the efforts to improve the ability of students' affective.

Based on the results of the above analysis, learning activities should not only take from one learning resource. When only using textbooks, learning activities can be less effective. This condition can be known from the results of observations that have been done. The results of observations showed that the use of learning media in mathematics learning is still less than optimal. Some teachers had not yet been able to create a fun learning for students through the use of media. In the process of learning, these conditions resulted in students feeling quickly saturated. It is also influenced by the learning style of students who tend to the visual type. Judging from the

students' attitudes during learning activities, some students seem to pay less attention to teacher explanations, less active, and have not implemented teacher instruction properly. Furthermore, the results of the questionnaire analysis provided for teachers and students indicated that teachers feel the material limitations on textbooks make it difficult for students to understand the learning materials. Teachers also find it difficult to adjust the learning media with materials that students will use. Teachers need learning media that can improve students' cognitive and affective abilities. On the other hand, teachers need more visual learning media for students because it is easy to use. Meanwhile, the results of student questionnaire analysis showed that the book is very important to support their learning process. Most students are interested in books that contain illustrations of pictures and stories. They want picture story books that contain learning materials and exercises. They also are more interested in stories of daily life than fictional.

The results of interviews with teachers showed that in the process of learning mathematics encountered several problems namely the low ability of students in applying the concept of geometry. It affected the mathematics learning activities, one of which is the learning about two-dimensional shapes. Another problem is that students are not yet sure to apply the mathematical concepts they have learned. In mathematics subjects, students still feel hesitant to solve problems related to some mathematical concepts, especially in the form of stories questions. This is seen when students are less confident of applying the concept of multiplication and division to find the circumference and area of two-dimensional shapes. These problems indicated that students' mathematical connection skill needs to be developed. The mathematical connections skill involves connecting conceptual and procedural knowledge, using mathematics on other topics, using mathematics in daily activities, viewing mathematics as an integrated whole, applying mathematical thinking skills and making models to solve problems in other subjects such as science, knowing connections among topics in mathematics, and recognizing various representations for the same concept[1]. Every scientific investigation or experiment is likely to require one or more of the mathematical skills of classifying, counting, measuring, calculating, estimating, and recording in graphs and tables[2].

The teacher expects that with learning media in the form of picture story book not only can improve students' mathematical connection but also affective abilities. Therefore, media used should be suitable to the learning needs and characteristics of students. Illustrations and stories in the picture story books can provide a moral message to students. The illustrations and texts are used to give the moral messages and do not stand alone, but they come as an inseparable unit and support each other to reveal the message to the readers[3]. The moral message that given to students is related to child-friendly learning namely about the importance of mutual respect for differences in peers and communities, nondiscrimination, care about the natural environment, and discipline. Through this learning activities, the teachers should be able to avoid corporal punishment to students if they couldn't solve the mathematics problems. In line with this statement, the corporal punishment had negative emotional effects[4]. It could cause depression, anxiety, and other emotional problems.

Based on the above conditions, the learning activities need a learning media in the form of the child-friendly based picture story book that can improve students' mathematical connection skill. Based on the genre of the picture book various, there is a picture book that can use in learning activities, namely lift the flap story book. This book has a similar form to a pop-up book. The equation lies in the content of the books that include pictures and texts. The elements of pop-up book such as flaps, pull tabs, waterfall, rotating disc, v-fold, multiple v-folds, floating layers, box & cylinder, hinged, coil or spiral, and double layer[5]. A pop-up is a three-dimensional structure, formed by the action of opening a crease. This definition does not include rotating disks, lift-up flaps, pull tabs and other two-dimensional paper-engineered devices commonly described as pop-ups[6]. Based on these two explanations, it can be seen the difference between the two books. The pop-up book has a three-dimensional shape while the lift the flap book has a two-dimensional shape. Flaps can be interpreted open-close to the right, left, up, or down. In the beginning, lift the flap book is a technology created from paper material that can be a media of the medical study to explain how the composition of the human anatomy before the existence of modern technology. Furthermore, in 1765, there is a publisher who produced the lift the flap book as a media of entertainment for both children and adults[7]. Based on the explanation it can be known that the lift the flap book has an important role in helping someone deliver the material or topic. Meanwhile, this book not only contained a topic of knowledge but also elements of entertainment.

Based on the preliminary study above, in this study will be experimental testing of selected media. The goal is to find out the effect of the child-friendly based lift the flap story book toward the students' mathematical connection skill.

METHOD

This research is a quasi-experimental research with pretest-posttest group design. This method used to see whether there is an increase in students' mathematical connection skill of two classes of students who get different treatment. That is, the experimental class is given special treatment in the form of learning using the child-friendly

based lift the flap story book, while the control class got learning with the conventional model in other words only using the textbook (students' book and teachers' book). The research of quasi-experiments in this study is chosen because the researcher is not able to completely control the variables from outside the research that could threaten internal validity. Researchers are only able to control certain independent variables that potentially affected the dependent variable so that the experimental and control class conditions remain balanced.

The sample, consisting three classes of fourth-grade with amounted to 82 students, is selected by means of the cluster sampling technique. The three classes in this study namely the control class, the experimental class I, and the experimental class II. The data are collected through tests. The tests are administered to investigate students' mathematical connection skill before and after the treatment. The test instruments are validated through expert judgment and are then tried out. The results of the tryout are analyzed using the Cronbach Alpha assisted by SPSS Version 16.0 to assess the reliability. The data are collected through tests to be used for normality test using Kolmogorov Smirnov and homogeneity test using Levene Test. The hypothesis is tested by the independent sample t-test with significance level 0,05.

RESULTS AND DISCUSSION

Mathematical connections are the connection between mathematical concepts, between mathematics and other disciplines, and mathematics with daily life. In this study, to know the mastery of mathematical connection skill after using the child-friendly based lift the flap story book has been prepared the test instrument with five items. These five items are developed to be able to measure students' mathematical connection skill based on indicators: 1) capable to connect between concepts in a single mathematical topic; 2) capable to connect material on certain topics with other mathematical topics; 3) capable to connect the material in mathematical topics with science other disciplines; and 4) capable to connect mathematical concepts with daily life that can be found by students. Furthermore, each student from the control class, the experimental class I, and the experimental class II obtained the pretest and posttest. There are five items for each pretest and posttest that have been analyzed through validity and reliability. The Pretest is given before treatment while posttest is given after treatment. The experimental class received treatment in the form of learning activities using the child-friendly based lift the flap story book while the control class in the form of conventional learning in other words only use the textbook (teachers' book and students' book). The summary of the average pretest and posttest results of the control class, experimental class I, and experimental class II can be seen in table 1.

TABLE 1. Recapitulation of Students' Mathematical Connection Skill Tests

Class	n	Min. Score	Max. Score	Mean
Control Class	27			
pretest		10	70	43,15
posttest		30	87	62,37
Experimental Class I	28			
pretest		30	67	48,56
posttest		47	100	73,89
Experimental Class II	27			
Pretest		30	70	46
posttest		50	100	75,11

n = numbers of student

Based on table 1 can be known that the control class attained an average of the pretest score of 43,15 and the posttest of 62,37. Furthermore, experimental class I attained an average of the pretest score of 48,56 and the posttest of 73,89 while experimental class II attained an average of the pretest score of 46 and the posttest of 75,11. The results showed that of the three classes, the class that obtained the lowest average of pretest is the control class whereas the highest is the experimental class II. On the other hand, the class that obtained the lowest average of posttest is the control class whereas the highest is the experimental class II. Overall, the experimental class II has better cognitive abilities than any other class. Other results can be seen in table 2 about the percentage of test results based on indicators of mathematical connection skill.

TABLE 2. Percentage of Students' Mathematical Connection Skill Tests based on each indicator

Indicator	Percentage					
	Control Class		Exp. Class I		Exp. Class II	
	pre	post	pre	post	pre	post
capable to connect between concepts in a single mathematical topic	56%	73%	65%	87%	61%	83%
capable to connect material on certain topics with other mathematical topics	8%	33%	7%	21%	15%	48%
capable to connect the material in mathematical topics with science other disciplines	46%	68%	27%	39%	44%	80%
capable to connect mathematical concepts with daily life that can be found by students	48%	65%	24%	38%	49%	81%

Table 2 showed that the percentage of mathematical connection test results has improved for all three classes. The percentage of posttest for each indicator has higher than pretest. Based on the above results can be known that students get the highest results on the first indicator, which is capable to connect between concepts in a single mathematical topic. Meanwhile, they obtained the lowest result on the second indicator, which is capable to connect material on certain topics with other mathematical topics. The most difficult item for students is about connecting between the two-dimensional shape area and other topics like multiplications until thousand number. Almost all students can not solve the problem correctly. This can be seen from the percentage of students' mathematical connection skill on the second indicator, namely the pretest of 8% and the posttest of 33% in control class, the pretest of 7% and the posttest of 21% in experimental class I, while the pretest of 15% and the posttest of 48% in experimental class II. This condition indicates that students' mathematical connection skill still needs to be improved again for the second indicator, which is capable to connect material on certain topics with other mathematical topics. Meanwhile, the easiest item for students is about connecting between concepts in a single mathematical topic. In this item, students gain a connection problem about the area of the two-dimensional shape. Many students can answer correctly. This can be seen from the increasing percentage on pretest and posttest, namely the pretest of 56% and the posttest of 73% in control class, the pretest of 65% and the posttest of 87% in experimental class I, while the pretest of 61% and the posttest of 83% in experimental class II. The highest percentage was obtained in the experimental class II. This condition indicates that the students have been able to solve the problems on the first indicator quite well, which is capable to connect between concepts in a single mathematical topic.

These results showed that the mathematical connections skill between students is different. It can be influenced by the teacher's routine in learning activities, one of which teachers often give the exercise to students. However, the type of questions given to students not related to the students' daily life. Many students viewed mathematics as a static science because they felt the mathematics lesson learned is not related to his life [8]. Stenn in 1978 [8] stated that very few students regard mathematics as a dynamic science. Related to that, Swetz in 1984 [8] added that there needs to be a connection between mathematics lessons with what students can find today or by taking the matter of life as a mathematics lesson. The above opinion is also similar to Bruner & Kenney in his observational study of 1963 [9] about the theorems in the process of learning mathematics, one of which is the theorem of connectivity. According to his explanation, the connection theorem is essential to see that mathematics is a coherent science of its various branches such as algebra, geometry, trigonometry, and statistics. In the learning activities, the branches of mathematics tend to be taught separately. It makes students have to learn the concept and skills are too many. Other impact, students don't recognize the general principles that are relevant to the various fields. The condition will be different when the between the topic of mathematics is intertwined, both with other topics as well as the student's daily experience. This can make students become aware of the benefits of learning math.

Pretest and posttest were given to students also affect student learning outcomes. The type of questions was given in story form. It suitable with the material presented on the child-friendly based lift the flap story book. The use of illustrations and stories has a good effect on students. This is in line with some previous researchers [10, 11] which stated that the subject matter presented in the form of the story will be easier for them to digest its meaning. This condition is in accordance with the characteristics of fourth-grade students who are still in the concrete operational stage. The child's cognitive developmental level of sensitivity (0-2 years), preoperational (2-7 years), concrete operational (7-11 years), and formal operational (11-adult)[12]. The fourth-graders are in the age of seven to eleven or twelve. Based on Piaget's theory, fourth-grade elementary school students included the concrete operational stage. Students could not think abstractly or imagine things that are abstract or in other words students think on the basis of concrete or real experience, is not abstract. Therefore, they need something concrete in the form of pictures and stories that can be encountered by students in daily life.

After obtained pretest and posttest result, the subsequent test that test requirement of analysis and hypothesis test. Test requirements of analysis are performed by normality test data using Kolmogorov-Smirnov while

homogeneity test data using Levene-Statistic test. Furthermore, hypothesis testing is done by t-test. The results of the normality test using pretest and posttest data showed that the significance value for the control class and experiment is greater than the predefined alpha value, that is 0,05. Thus, H_0 is rejected, in other words the sample group came from a normally distributed population. In the next analysis requirements test, the homogeneity test data using pretest and posttest result showed that the significance value of pretest and posttest result in control and experimental class is more than 0.05. Thus it can be concluded that all classes have the same or homogeneous variance. Based on the results of normality and homogeneity test, the control class, experimental class I, and experimental class II are normally distributed and homogeneous, evidenced by significance value $>0,05$. Thus the statistic used to test the hypothesis is parametric statistics. The hypothesis test in this research using independent sample t-test. The hypothesis tested is the influence of the media of the child-friendly based lift the flap story book toward the mathematical connection skill of fourth-grade students. The hypothesis test used posttest data from three classes. The hypothesis test is done twice to get the test result from control class and experimental class I and control class and experimental class II. The test criteria used are the sig. (2-tailed) $>0,05$ then H_0 accepted or there is not an effect of the child-friendly based lift the flap story book toward students' mathematical connection skill. While if sig. (2-tailed) $<0,05$ then H_0 is rejected or there is an effect of the child-friendly based lift the flap story book toward students' mathematical connection skill. The results of hypothesis test can be seen in table 3.

TABLE 3. The t-test of mathematical connection skill

Class	Condition	Sig. (2-tailed)	Finding
Control	Posttest	.008	H_0 is rejected
Experimental I			(.008 < .05)
Control	Posttest	.002	H_0 is rejected
Experimental II			(.002 < .05)

Based on table 3, the hypothesis test of the control class and the experimental class I using posttest data showed that the value of sig. (2-tailed) obtained is 0,008. Based on a significance level of 0,05, it can be concluded that $0,008 < 0,05$ so that H_0 is rejected or there is an effect of the child-friendly based lift the flap story book toward students' mathematical connection skill. Meanwhile, the hypothesis test of the control class and the experimental class II using posttest data showed that the value of sig. (2-tailed) obtained is 0,002. Based on a significance level of 0,05, it can be concluded that $0,002 < 0,05$ so that H_0 is rejected or there is an effect of the child-friendly based lift the flap story book toward students' mathematical connection skill. In summary, the result of t-test for control class and experimental class I is showed by sig. (2-tailed) $0,008 < 0,05$ while control class and experimental class II is showed by sig. (2-tailed) $0,002 < 0,05$. Based on hypothesis test result, it can be concluded that all sig. (2-tailed) $< 0,05$ so H_0 is rejected or there is a significant effect from using the child-friendly based lift the flap story book toward student's mathematical connection skill. In addition, the above results indicated that there is the positive effect of using the child-friendly based lift the flap story book to help students understanding the material of the two-dimensional shape and also providing a child-friendly moral message that can be applied in the daily life of the students. The illustrations and texts are used to give the moral messages and do not stand alone, but they come as an inseparable unit and support each other to reveal the message to the readers [3]. This is in line with some previous researchers [13, 14, 15] which stated that through illustrations and stories based on character values, students can get examples from characters, and can reflect stories and materials that are in daily life.

Based on the test results can be known that goals of learning not only focus on cognitive abilities but also affective. The content of child-friendly in the media can improve students' affective abilities. The starting point of making the classroom child-friendly is to capture the interest of a child and then to sustain and extend it[3]. This could lead to curiosity among the children for further learning. In line with the explanation, the child-friendly environment aimed to develop a learning environment in which children are motivated and able to learn[16].

CONCLUSIONS

The child-friendly based lift the flap story book is a media selected based on the preliminary study of the need assessment in learning mathematics. Based on preliminary study results obtained information that students' mathematical connection skill is still low. This study intends to provide feedback from the students' learning needs through experimental testing to find out the effects of the child-friendly based lift the flap story book. In addition to loading materials and exercises, the media also contained illustrations and stories. The story presented related to the moral message about the child-friendly such as the importance of mutual respect for differences in peers and communities, nondiscrimination, care about the natural environment, and discipline. The results based on each indicator of mathematical connection skill showed that the students get the highest results on the first indicator, which is capable to connect between concepts in a single mathematical topic and the lowest result on the second indicator, which is capable to connect material on certain topics with another mathematical topic. Other

results showed that three classes are normally distributed and have homogeneous variance. Furthermore, the result of t-test indicated that all sig. (2-tailed) $<0,05$ so there is a significant effect from using the child-friendly based lift the flap story book toward student's mathematical connection skill.

ACKNOWLEDGMENT

The authors would like to express profound thanks and appreciation to the DP2M DIKTI (Directorate of Higher Education), Ministry of Research, Technology, and Higher Education Republic of Indonesia through “Tim Pascasarjana” Research Grant 2018 for the financial support.

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