

Lift the flap story book based on child-friendly improving the ability of students mathematical connection

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The Child-Friendly-Based Lift the Flap Story Book: Does this Media Affect the Students' Academic Self-Efficacy in Mathematics Learning?

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Abstract

This paper aims to determine the impact of the child-friendly-based lift the flap story book toward academic self-efficacy of fourth-grade students in learning mathematics. This is a quasi-experiment with pretest-posttest group design. The sample of the research is selected by the cluster sampling technique consist of 82 students from three classes. The data were collected through mathematics tests and academic self-efficacy scales. The test results were used for proving the prerequisite and hypothesis test with a significance level of 0.05. The results showed that the data in the control class, the experiment class I, and the experiment class II had normal distribution and the variance was homogeneous. The result of independent sample t-test for the control class and the experiment class I showed that sig.2 tailed 0,008 <0,05, while the result of the control class and the experiment class II showed that sig.2 tailed 0,002 <0,05. Based on the test results, it can be seen that the significance value is <0.05 so that the use of the child-friendly-based lift the flap story book on learning mathematics positively affects students' academic self-efficacy. Judging from the results of mathematics tests, there were different results on students who have high and low academic self-efficacy skills. Students with high academic self-efficacy were able to complete almost all questions correctly. While students with low academic self-efficacy could only solve some problems correctly.

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Keywords: academic self-efficacy, child-friendly, mathematics learning, picture story book

1. Introduction

Mathematics has relevance to our daily life. In the learning process, the main objective of mathematics education around the world is to focus on students' ability to apply the concept of mathematics in everyday life (Eurydice 2011; NCTM 2000). However, many students still find it difficult in applying mathematical concepts they have studied. The condition is recognised from the results of preliminary studies that was conducted to 173 students of grade IV. Preliminary data in this study were obtained from analysing textbook used by students, observing the learning process, giving questionnaires, and doing interviews. There are several results of textbook lesson analysis. First, the presented material is quite limited because some materials are not described completely in the textbook. Second, the textbooks are lack of stories related to daily life. Third, the image illustrations are not relevant to support the materials. Forth, the illustrations in the textbooks are too abstract, like the image of a person who has no mouth. Last, the content of the textbooks has not been encouraged students to improve their affective abilities yet. Furthermore, the observation results of mathematics learning process shows that the use of media in the learning process has not been optimal. This makes students feel saturated quickly, pay less attention to teacher's explanation, and are not able to carry out teacher's instructions properly.

Other condition is recognised from the questionnaire given to teachers and students. The teachers state that the limited material in the textbook make students feel difficult to understand the material. For this reason, the teachers need companion books that help the students to be more interested with the material and to understand easily the material in learning mathematics. Related to the use of media, students are more interested in visual media. They prefer textbooks which contain materials with illustrations and stories that can be found in everyday life. The results of the interviews with teachers indicate that many students have not been able to obtain good results in learning mathematics. Students seem unsure about completing the tasks given by the teacher. They are still hesitant about their own abilities. They can solve the question on the board well with teacher's guidance. However, not all students can get it right when working on similar questions in their textbooks. The teachers state that students are often hesitant in solving questions about two-dimensional figures in the form of stories. They are uncertain when counting the periphery and the area of two-dimensional figures, especially related to multiplication and division.

Based on the preliminary study previously mentioned, it can be seen that the students' academic self-efficacy ability is still low. Bandura (1995) explains that perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations. Based on the explanation, it can be seen that self-efficacy is a person's belief in his/her own ability to organize and to

implement a series of actions needed for achieving the expected results. Someone who believes in his/her abilities will have an impact on his/her behaviour and motivation, and ultimately it will determine his/her success or failure. On the other hand, relating to the needs of learning, visual learning media in the form of picture book can be an alternative solution in learning mathematics. The media is chosen by considering the needs, characteristics, and rights of students as children that must be fulfilled.

Article 3 of Law No. 23/2002 about the Protection of Children in Indonesia states that child protection aims to ensure the rights of children to live, grow, develop, and participate optimally in accordance with the dignity of humanity, and to get protection from violence and discrimination, in order to realize the quality of Indonesian children, morals, and welfare. Meanwhile, article 4 states that every child has the right to be able to live, grow, develop, and participate fairly in accordance with the dignity of humanity, and also to get protection from violence and discrimination (Republik Indonesia, 2002). Based on articles 3 and 4, it can be concluded that students have the right to develop and to participate in the learning process without violence and discrimination. The description has relevance to child-friendly learning, that is about the importance of avoiding violence, the respect for diversity in the environment of peers and society, non-discrimination, the care for the natural environment, and discipline. Through the child-friendly learning, violence to students can be avoided. This is supported by Kaplan's statement (2006) which explains that the corporal punishment has negative emotional effects. It can cause depression, anxiety, and other emotional problems.

Related to illustrated story books, illustrations and stories presented in the books can give moral value to students. Illustrations and stories do not stand-alone. In other words, they are inseparable because they support each other to be presented to the readers (Huck et al., 1987). Based on the genre, there is a picture story book that can be used in the mathematics learning process, that is lift the flap book. This book is almost similar to a pop-up book. Puleo (2011) explains that the equation lies in the content of books that includes pictures and texts. The elements of pop-up books such as flaps, pull tabs, waterfalls, rotating discs, v-folds, multiple v-folds, floating layers, box & cylinder, hinged, coil or spiral, and double layers. Jackson (1996) states that 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. Dewantari (2014) asserts that initially the lift the flap book was a technology created from paper material that could help paramedics in explaining anatomical arrangement of human body before the existence of modern technology. Furthermore, in early 1765, a book publisher produced the lift the flap book as a medium of entertainment for children and adults. Based on this explanation, it can be seen that the lift the flap book is not only a means of conveying material and moral value but also an element of entertainment.

Based on the background above, this research used experimental testing for the child-friendly-based lift the flap book. It aimed to find out the effect of the child-friendly-based lift the flap story book on academic ability on self-efficacy of the fourth graders in math subjects.

2. Method

This research is a quasi-experimental with pretest-posttest group design. The aim is to determine whether there is an influence from the use of child-friendly-based lift the flap story book on students' academic self-efficacy ability in learning mathematics. To determine the sample, the research used cluster sampling technique with 82 students from three classes, two experimental classes and a control class. The students in experimental classes use the lift the flap story book, while the students in the control class use textbook for conventional learning. The data are collected through mathematics tests and the academic self-efficacy scale, conducted before and after learning in the control and experimental classes.

Table 1. Indicator of Academic Self-Efficacy

Source	Indicator	Item	Type	
			+	-
Mastery Experiences	(Experience of success and failure)	1) I make excellent grades on math tests	√	-
		2) I have always been successful with math	√	-
		3) I do well on math assignments	√	-
		4) Even when I study very hard, I do poorly in math	-	√
		5) I got good grades in math on my last report card	√	-
		6) I don't do well on even the most difficult math assignments	-	√
Vicarious Experiences	(Observation of success and failure)	7) Seeing other students do better than me in math pushes me to do better	√	-
		8) When I see how my teacher solves a problem, I can picture myself solving the problem in the same way	√	-
		9) When I see how other students solves a math problem, I can not see myself solving the problem in the same way	-	√
		10) I can not imagine myself working through challenging math problems successfully	-	√
Social Persuasion	(Acquisition of advice or guidance from others)	11) I compete with myself in math	√	-
		12) My teacher have told that I am good at learning math	√	-
		13) Other students have told me that I'm good at learning math	√	-
		14) My family have told me what a good math student I am	√	-
		15) I have not been praised for my ability in math	-	√
		16) My classmates dislike to work with me in math because they think I'm not good at it	-	√
Physiological State	(Emotional Readiness to face anxiety)	17) My classmates have told me that I have not a talent for math	-	√
		18) Just being in math class makes feel stressed and nervous	-	√
		19) Doing math work takes all of my energy	-	√
		20) I start to feel stressed-out as soon as I begin my math work	-	√
		21) My mind goes blank and I am unable to think clearly when doing math work	-	√
		22) My whole body was not becomes tense when I have to do math	√	-
		23) I'm not get depressed when I think about learning math	√	-

(+) favourable item, (-) unfavourable item

The instrument of the academic self-efficacy scale used in this research is adapted from the scale developed by Usher & Pajares (2009). In their research, the instrument of the academic self-efficacy scale is used for the validation study of the source of students' self-efficacy in mathematics learning. The aim of their study is to develop and to validate items of self-efficacy based on Bandura's theory regarding the source of self-efficacy in mathematics subjects. In the study, the validation process has three stages. In the last stage, after being analyzed using SPSS (Statistical Product and Service Solutions) Cronbach Alpha test produces 24 reliable items. Each source has six items that show adequate internal consistency with Cronbach Alpha coefficient ($\alpha = 0.05$) 0.80 for mastery experience, 0.84 vicarious experience, 0.88 social persuasion, and 0.87 physiological state. In addition to reliability testing, the instrument used by Usher & Pajares has also been tested for validity. The test results show that the correlation between sources of academic self-efficacy are all statistically significant ($p < 0.001$) and range from absolute values 0.32 to 0.77. Based on these results, this research uses the academic self-efficacy scale that has been adapted from Usher & Pajares (2009: 96-98). The instrument can be seen in Table 1.

The results of the scale that has been converted are used to determine the effect of the child-friendly-based lift the flap story book on students' academic self-efficacy abilities. After being converted, the obtained data are used for prerequisite tests in the form of normality and homogeneity tests. Furthermore, the hypothesis test is conducted using independent sample t-test with a significance level of 0.05. Meanwhile, the mathematical test results are used to determine differences on high and low academic ability of self-efficacy for the students.

3. Results and Discussion

In this research, an academic efficacy scale with 23 items is prepared to find out the students' academic self-efficacy abilities using the child-friendly-based lift the flap story book. These items have been adapted from the scale developed by Usher & Pajares based on indicators: 1) experience of success and failure (Performance Accomplishments); 2) observation of success and failure (Vicarious Experience); 3) acquisition of advice or guidance from others (Verbal Persuasion); and 4) emotional readiness to face anxiety (Emotional Arousal). After processing the data, the average pretest for the control class is 59.46 while the posttest average increased to 68.04. In the experimental class I, the average pretest was 61.57 while the posttest average increased to 77.29.

Furthermore, in the experimental class II, the average pretest was 62.32 while the posttest average increased to 81.28. From these results, it can be concluded that all classes experience an increase in the results of academic self-efficacy scale at posttest and the highest average increases in experimental class II.

Based on the average acquisition above, the average increase in posttest is influenced by students' academic self-efficacy abilities. Students' self-confidence influences the efforts to complete their learning tasks, especially when they work on questions after using child-friendly-based lift the flap story book. This is in line with the opinion of Liu and Koirala (2009) which explains that if students believe that mathematics is important, then they can develop perseverance in mathematics learning process until they develop their self-efficacy abilities. High academic self-efficacy ability can determine the success of student learning. Zuya, Kwalat, and Attah (2016: 93) also explain "having a high level of self-efficacy about one's ability is important as it motivates one to succeed in life." From this explanation, it shows the importance of academic-self-efficacy ability for students because it can motivate them to successfully complete the tasks in their lives.

Table 2. Percentage of Students' Academic Self-Efficacy Scale based on Each Indicator

Indicator	Percentage					
	Control Class		Exp. Class I		Exp. Class II	
	pre	post	pre	post	pre	post
Performance Accomplishments (Experience of success and failure)	55,71%	66,67%	62,05%	76,34%	64,04%	79,78%
Vicarious Experience (Observation of success and failure)	71,48%	84,44%	69,46%	85%	68,52%	85,37%
Verbal Persuasion (Acquisition of advice or guidance from others)	56,48%	62,35%	58,18%	75,15%	58,49%	79,17%
Emotional Arousal (Emotional readiness to face anxiety)	56,17%	61,42%	57,89%	73,96%	59,26%	81,48%

Furthermore, recapitulated results of the academic self-efficacy scale based on each indicator can be seen in Table 2. The percentage for the posttest results of each indicator is higher than the pretest. Students get the highest pretest and posttest results on the second indicator, namely the observation of vicarious experience. Meanwhile, the lowest pretest result is in the first indicator, namely the experience of success and failure a performance accomplishment. The lowest posttest result is in the fourth indicator, namely the readiness of emotions to face anxiety (emotional arousal). The highest percentage for the second indicator is obtained on the posttest results in the experimental class II with a percentage of 85.37%. This condition shows that students have good academic self-efficacy ability on the second indicator. From the results of data analysis on the academic self-efficacy scale, it can be concluded that academic self-efficacy of students in the experimental class is higher than in the control class.

In the second indicator, students gain self-confidence from their observations results on others' failure and success. Bandura (1997: 87) explains that "more often in everyday life, people compare themselves to particular associates in similar situations, such as classmates, work associates, or people in other settings engaged in similar endeavors". From this explanation, it can be inferred that in everyday life people often compare themselves with others in the same circumstance. In the context of learning, students through their observations of teachers and other students carry out the comparison. Observation of others has a strong influence on students because they can get information about others' ability to complete a similar task. When the people they observed are able to complete their tasks properly, students who have high academic self-efficacy will be confident that they are also able to complete similar tasks. The explanation is supported by Schunk's statement (1995: 113) which confirms, "People acquire self-efficacy information from knowledge of others through social comparisons. Those who observe similar peers perform a task are apt to believe that they, too, are capable of accomplishing it". Thus, in the second indicator, students need a lot of information obtained from others. In the scope of learning, teachers and other students can become the important sources to make it happen. This is in line with Schunk's statement (2011: 216), namely "Students acquire much information about their abilities from perform knowledge of how others. Classroom models - teacher and peer - are important sources of vicarious efficacy information".

The observation results on the success and failure of others influence students' beliefs to take actions that are beneficial for themselves, namely completing their learning tasks well. Artino (2012: 77) also explains, "Efficacy belief, therefore, is a major basis of action. People guide their lives by their beliefs of personal efficacy". Related to this opinion, a person's belief can be the basis for the emergence of action. A person's success in completing his or her tasks can be determined by how high his or her self-confidence is. Likewise, in the learning process, students who have high academic self-efficacy can complete their learning tasks well.

The use of illustrations and stories has a good effect on students. This is in line with some previous researchers which state that the subject matter presented in the form of story will be easier for them to digest its meaning (Colwell, 2013; Mourao, 2016). This condition is in accordance with the characteristics of fourth-grade

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students who are still in the concrete operational stage. The child's cognitive level of sensitivity develops in 0-2 years old, pre-operational develops in 2-7 years old, concrete operational develops in 7-11 years old, and formal operational develops in 11-adult (Piaget, 2003). The fourth-graders are in the age of seven to eleven or twelve. Based on Piaget's theory, fourth-grade elementary school students include in the concrete operational stage. Students can not think abstractly nor imagine things that are abstract. In other words, students think on the basis of concrete or real experience. Therefore, they need concrete things in pictures and stories that can be encountered by students in daily life.

7 After obtaining the pretest and posttest data on the academic self-efficacy scale, the next test is the prerequisite test in the form of data normality test using Saphiro-Wilk and data homogeneity test using Levene-Statistics. The results of the normality test using pretest and posttest data show that the significance value for all data in the control and experimental classes is higher than 0.05. Thus, all data obtained is normally distributed. Furthermore, the homogeneity test results show that the significance value for pretest and posttest data between control and experimental classes is more than 0.05. Thus, all classes have homogeneous variants. After knowing that the data is normally distributed and the variance is homogeneous, the statistics used are parametric statistics. Independent sample t-test is used to test the hypothesis. The hypothesis tested is the influence of child-friendly-based lift the flap story book on the academic self-efficacy of fourth grade elementary school students. Hypothesis test uses posttest data from the control and experiment classes.

The results of testing the hypothesis of the posttest data of the control and experimental class I academic self-efficacy ability using independent sample t-test obtained a sig. (2-tailed) value of 0.003. These results indicate that $0.003 < 0.05$ so H_0 is rejected. Meanwhile, the results of testing the hypothesis of the posttest data of the control and experimental class II obtained a value of sig. (2-tailed) 0,000. These results indicate that $0,000 < 0,05$ so H_0 is rejected. From the two test results above, it can be concluded that the child friendly based elevator the flap story book applied in the experimental class I and experiment II influences students' academic self-efficacy. 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 value that can be applied in the daily life of the students. The illustrations and texts are used to give the moral value. They do not stand alone, but they come as an inseparable units and support each other to reveal the message to the readers (Huck et al., 1987). This is in line with some previous researchers which states that through illustrations and stories based on character values, students can get examples from the characters, and they can reflect stories and materials in daily life (Richter, Appel, & Calio, 2014; Turan & Ulutas, 2016; Zaky, 2016).

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Based on the test results, it can be inferred that the goal of learning focus not only on cognitive abilities but also on affective ones. 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 (Huck et al., 1987). 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 (Young, 2002).

4. Conclusion

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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 the obtained results of preliminary study, the students' academic self-efficacy is still low. This research 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 contains illustrations and stories. The presented story is related to the moral value about the child-friendly such as the importance of mutual respect for differences in peers and communities, non-discrimination, care about the natural environment, and discipline. The results based on each indicator of academic self-efficacy showed that the students get the highest results on the second indicator, which is observation on success and failure (vicarious experience) and the lowest result on the fourth indicator, which is emotional readiness to face anxiety (emotional arousal). 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 academic self-efficacy ability.

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