Analysis of Critical Thinking Skills in Problem Based Learning Model Based on Thematic Learning

by Kus Edi Sartono

Submission date: 23-Jun-2020 12:58AM (UTC+0700)
Submission ID: 1348152243
File name: ly_improving_the_ability_of_students_mathematical_connection.pdf (1.28M)
Word count: 3934
Character count: 21326

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

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

D A Meylana[1]*, P Pujiastuti[2] and K E Sartono[2]

[1] Program Pascasarjana Pendidikan Dasar, Universitas Negeri Yogyakarta, Jl. Colombo No.1, Caturtunggal, Depok, Caturtunggal, Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55281, Indonesia

[2] Universitas Negeri Yogyakarta, Jl. Colombo No.1, Caturtunggal, Depok, Caturtunggal, Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55281, Indonesia

*dwi.ardi2016@student.uny.ac.id

Abstract. This study aimed to: 1) produce a lift the flap story book based on child-friendly which is feasible to improve the ability of students' mathematical connection; and 2) reveal the effectiveness of the media in improving the ability of students' mathematical connection. This study is research and development. The preliminary data is collected through observation, questionnaire, and interview techniques to 173 students of fourth grade. The results of a preliminary study are used to basic of media development. Furthermore, data collected by scales and tests. The data analysis used descriptive analysis, normality dan homogeneity data and t-test. The results showed that: 1) the media has passed the criteria of feasibility based on expert validation result, the responses scale of teachers and student (very good); 2) the media has developed is effective to improve the ability of students mathematical connection based on t-test result where sig.2 tailed 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. Through media has been developed, students can improve the ability of mathematical connections and internalize the moral message about child-friendly.

1. Introduction

Mathematics has relevance to everyday life. Given the importance of mathematics education, the main goal of mathematics education around the world is to focus on the ability to apply mathematics to real life [1, 2]. In learning activities, the application of mathematical concepts is often related to real life and in the form of stories problems. Mathematics learning is often regarded as a learning that is difficult to understand by students. The mathematics learning difficulties are common, significant, and worthy of serious instructional attention in both regular and special education classes [3]. Learning also should be designed to be more interesting by considering the needs, characteristics of students, and the rights of students as children are met. Article 3 of Law No. 23/2002 about the Protection of Children in Indonesia stated 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 get protection from violence and discrimination, in order to realize quality of Indonesian children, morals, and welfare [4]. Meanwhile, article 4 stated that every child had the right to be able to live, grow, develop, and participate fairly in accordance with the dignity of humanity, and also get protection from violence and discrimination.

Based on article 3 and 4 could be seen that children have rights that must be met, one of them through learning activities.

The preliminary studies have been conducted through analysis of mathematical textbooks used by students, observation of learning activities, giving questionnaires, and interviews. The results showed that: 1) the material presented in the book is very limited; 2) lack of use of drawing illustrations to help students understand the material; 3) there are illustrations that are too abstract like the image of a child who has no mouth; 4) teachers are difficult to adjust the learning media that can improve students' cognitive and affective abilities; 5) teachers need more visual learning media for students because it is easy to use; 6) Students are interested in books that contain illustrations of pictures and stories that related to daily life. Furthermore, teachers said that in the process of the 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 form. Students feel hesitant to solve problems related to some mathematical concepts, especially in the form of stories questions. These problems indicated that the ability of mathematical connection needs to be developed. The ability of mathematical connections 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 [5].

Teachers expect that with learning media in the form of picture story book not only can improve students' mathematical connection but also affective abilities. 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 [6]. The moral message that was 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. The starting point of making the classroom child-friendly is to capture the interest of a child and then to sustain and extend it [7]. This could lead to curiosity among the children for further learning. The child-friendly environment aimed to develop a learning environment in which children are motivated and able to learn [8]. Through this activities, 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 such as depression, anxiety, and other emotional problems [9].

Based on the above conditions, the learning activities need a learning media in the form of picture story book based on child-friendly that can improve the ability of mathematical connection. 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 and cylinder, hinged, coil or spiral, and double layer [10]. A pop-up is a three-dimensional structure, formed by the action of opening a crease [11]. Based on these two explanations, it can be known that 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. At the beginning in 1765, there is a publisher who produced the lift the flap book as a media of entertainment for both children and adults [12]. Based on the explanation, it can be known that the lift the flap story book has an important role in helping someone deliver the material or topic as well as elements of entertainment. Therefore, this research is conducted to produce a lift the flap story book based on child-friendly in order to improve the ability of students' mathematical connection and to know the effectiveness of the product in improving the mathematical connection of fourth-grade students.

2. Method

The procedures in this study are research and information collecting, planning, develop the preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, and dissemination and implementation [13].

The preliminary data is collected through observation, questionnaire, and interview techniques to 173 students of fourth-grade. Based on the total number of subjects, in this study is taken 135 students who come from six classes with certain characteristics. The selection of research subjects based on equality covering the application of the current curriculum, the status of public schools, accreditation status, the number of students of fourth-grade, and the availability of facilities and infrastructure of learning support. The subjects of the preliminary field testing phase are a teacher and eight students. Furthermore, data collection techniques in this research include scales and tests. The effectiveness of lift the flap story book based on child-friendly is analyzed with independent t-test after fulfilling the prerequisite tests normality test and homogeneity test.

3. Results and discussion

There are some findings from the development that has been done. At the stage of research and information collecting obtained information about the learning needs of teachers and students on learning mathematics. The results showed that teachers and students need the media of mathematics learning in the form of picture story books that can improve the ability of students' mathematical connection. These results become the background in this research and development. Furthermore, at the planning stage, the researcher have considered the various objectives and benefits of media development. At this stage included the determination of materials based on learning needs, core and basic competencies, and child-friendly content based on the characteristics of students. At the develop a preliminary form of product stage, the media is developed based on the planning that has been made.

3.1. Description of product development

Lift the flap story book based on child-friendly consists of four main components, namely: 1) folds containing questions and answers as well as other information; 2) colorful picture illustrations; 3) stories that contain learning materials and daily life; and 4) stories based on child-friendly. Folds (flip-flap) are an important part of this media. Each page has at most 8 folds. The figure 1, 2, and 3 is an example of lift the flap story book that had been developed in this study.

Figure 1. An example of the products that had been used in the learning activities.

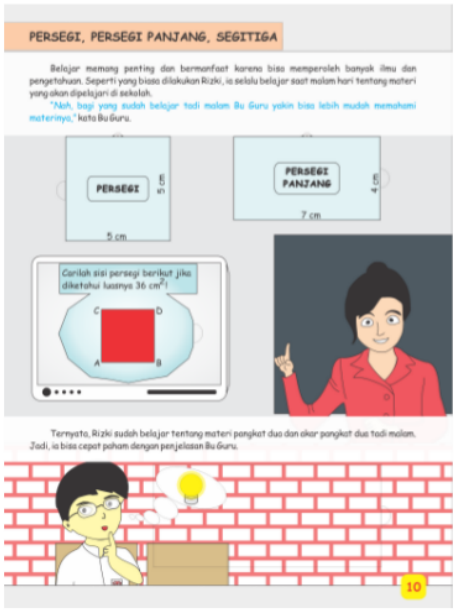

Figure 2. A design of the front side.

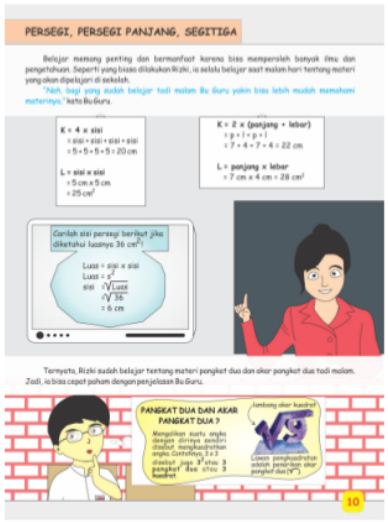

Figure 3. A design of the back side (behind the fold).

Figure 1 is an example of the products that had been used in the learning activities. Students used lift the flap story book individually as well as group learning. A fold in the front side containing the question (can be seen in figure 2) while the back side containing the answer or other information (can be seen in figure 3). Furthermore, the illustration of the picture is presented with colorful. The story in the book relates to the subject matter, especially the two-dimensional shapes material. The selection of materials based on the preliminary study results. Meanwhile, stories are presented based on everyday life in order to be easily understood by students. On the other hand, the main story related to child-friendly so that students can get the moral message that is expected to be applied in everyday life. A child-friendly moral

message is presented through the interaction between the characters. Lift the flap story book based on child-friendly is a learning book media compiled in correspond with the values of characters and functions as a supplement book for the students' main books. This book is designed and developed with Microsoft Word and Corel DRAW X7. Furthermore, the book is printed use ivory paper for the cover and content pages with the size of A4 (21 cm x 29.7 cm). The type of image used in this book is cartoons.

3.2. Validation of material and media experts

The validation of material and media experts aims to derive the feasibility of lift the flap story book based on child-friendly. Validation results can be seen in table 1.

Table 1. Results of the material and media experts' validation.

Aspect	Mean Score	Criteria
Material Experts' Validation (material truth; material accuracy; material update; facilitation of the ability of mathematical connection and academic self-efficacy; use of language and spelling)	4.8	Very Good
Media Experts' Validation (size; layout, typography, and illustrations of the book cover; layout, typography, and illustration of the book content)	4.8	Very Good

Based on table 1, the media is declared feasible in terms of its materials. The total means of the whole aspect is 4,8, classified as being in very good criteria. Furthermore, this media also declared a feasible learning media. The total means of the whole aspects is 4,8 and classified as being in very good criteria. Therefore, the validation results showed that the child-friendly media-based flap story book is worthy of use in the next stage. In addition, the validator response indicates that there are advantages of the book using illustrated and stories. This is in line with some previous researchers 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 everyday life [14-16].

3.3. Teachers' and students' response

After the validation stage, then the media is tested through the preliminary field, main field, and operational field testing to obtain teachers' and students' response to lift the flap story book based on child-friendly. In the operational field testing stage, the responses obtained from teachers and students in the experimental class I and experimental class II. These results can be seen in figure 4.

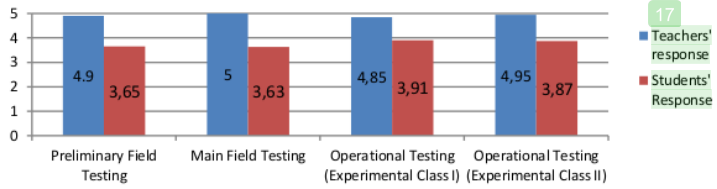

Figure 4. The results of teachers' and students' response.

Figure 4 showed that there is an average difference in teacher and student response outcomes. The teacher response that has the highest average and also the lowest is in the main field testing stage. Meanwhile, the highest average student response is in the operational field testing (experimental class I) whereas the lowest is in the preliminary field testing stage. The maximum average of for teacher response is 5 whereas student response 4. Based on the average obtained, all teacher responses show very good criteria because the average range is between ≥4,2-5,0. Then, all student responses also showed very good criteria based on the average range between ≥3,25-4,0. Furthermore, it can be concluded that teacher and student response is very good to lift the flap story book based on child-friendly to improve the ability of mathematical connection in fourth-grade elementary school.

3.4. The results of the tests

In the operational field testing stage, the tests were given to students in the control class, experiment I, and experiment II. The experimental class received treatment in the form of learning activities use lift the flap story book based on child-friendly 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 namely the control class attained an average of pretest score of 43.15 and posttest of 62.37. Furthermore, experimental class I attained an average of pretest score of 48.56 and posttest of 73.89 while experimental class II attained an average of pretest score of 46 and posttest of 75.11. Overall, the experimental class II has better cognitive abilities than any other class based on posttest result. The above results showed that the ability of mathematical connections between students is different. These conditions 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 [5]. Very few students regard mathematics as a dynamic science [5]. Related to that, that there needs to be a connection between mathematics lessons with what students can find today or by taking the matter of life (breathe life) as a mathematics lesson [5].

The theorems in the process of learning mathematics, one of which is the theorem of connectivity [17]. 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 and 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. On the other hand, pretest and posttest were given to students also affect student learning outcomes. The type of questions given in story form is suitable with the material presented on the lift the flap story book based on child-friendly. The use of illustrations and stories has a good effect on students. This is in line with some previous researchers which stated that the subject matter presented in the form of the story will be easier for them to digest its meaning [18, 19]. These accordance with the characteristics of fourth-grade students. 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) [20]. The fourth-graders are in the age of seven to eleven or twelve. Based on Piaget's theory, fourth-grade students included the concrete operational stage. Students couldn't think abstractly or imagine things that are abstract or in other words students think on the basis of concrete or real experience. 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 is the prerequisite and hypothesis test. The prerequisite test is performed by normality test data using Kolmogorov-Smirnov while homogeneity test data using Levene-Statistic test. Furthermore, hypothesis testing is done by t-test. 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. Hypothesis test in this research using independent sample t-test. 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 value <0,05 so Ho is rejected or there are significant effects from using the lift the flap story book based on child-friendly toward student's mathematical connection skill.

4. Conclusion

Lift the flap story book based on child-friendly is a media developed 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 lift the flap story book based on child-friendly. 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 showed that the lift the flap story book based on child-friendly is feasible to improve the ability of students' mathematical connection and effective to improve the ability of students' mathematical connection.

Acknowledgments

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.

References

[1] Eurydice 2011 *Mathematics Education in Europe: Common Challenges and National Policies* (Brussels: Education, Audiovisual and Culture Executive Agency)
[2] NCTM 2000 *Principles and Standard for School Mathematics* (Reston: NCTM)
[3] Garnett K 1998 Reprinted from Division for Learning Disabilities Journal of CEC
[4] Republik Indonesia 2002 *Undang-Undang Republik Indonesia Nomor 23 tahun 2002 tentang Perlindungan Anak*
[5] House P A and Coxford A F 1995 *Connecting Mathematics across the Curriculum* (Reston: NCTM) p 225
[6] Huck C S, Hepler S and Hickman J 1987 *Children's literature in the elementary school* (New York: Holt, Rinehart, and Winston) p 197
[7] Edgington M 1998 *The Nursery Teachers in Actions: Teaching 3, 4 and 5 Years olds* (London: Paul Champman Publishing Ltd)
[8] Young M 2002 *From Early Child Development to Human Development: investing in our children's future* (Washington DC: The World Bank) p 18
[9] Kaplan Y A 2006 *The International Journal of Children's Rights* **14** pp 363
[10] Puleo B 2011, *Next Stop: Pop-Ups (The Influence of Paper Engineering on Visual Media)* [Online] Retrieved from www.popuplady.com/pdf/BernadetteThesisHx.pdf
[11] Jackson P 1996 *The Pop-Up Book: Step-By-Step Instructions For Creating Over 100 Original Paper Projects* (New York: Henry Holt and Company) p 6
[12] Dewantari A A 2014 *Sekilas Tentang Pop Up, Lift The Flap, dan Movable Book* [Online] Retrieved from http://dgi.or.id/read/observation/sekilas-tentang-pop-up-lift-the-flap-dan-movable-book.html
[13] Borg W R and Gall M D 1983 *Educational research* (New York: Longman Inc) p 775-776
[14] Richter T and Calio F 2014 *Social Influence* **9** pp 172–188
[15] Turan F and Ulutas I 2016 *Journal of Education and Practice* **7** pp 169-176
[16] Zaky E A 2016 *International Journal of Science and Research* **5** pp 1296-1298
[17] Bell F H 1978 *Teaching and Learning Mathematics in Secondary School* (New York: Wm. C. Brown Company Publisher) p 143-144
[18] Colwell C 2013 *Journal Music Therapy and Special Music Education* 5 pp 174-187
[19] Mourao S *CLELE Journal* **4** pp 25-43
[20] Piaget J 2003 *The Psychology of Intelligence* (New York: Taylor and Francis e-Library) p 136

Analysis of Critical Thinking Skills in Problem Based Learning Model Based on Thematic Learning

ORIGINALITY REPORT

18%	12%	14%	11%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	M Hasbi, A Lukito, R Sulaiman. " Mathematical Connection Middle-School Students 8 in Realistic Mathematics Education ", Journal of Physics: Conference Series, 2019 Publication	2%
2	iiste.org Internet Source	2%
3	garuda.ristekdikti.go.id Internet Source	1%
4	hal.sorbonne-universite.fr Internet Source	1%
5	ecommons.aku.edu Internet Source	1%
6	aip.scitation.org Internet Source	1%
7	Erni Rachmawati, Getut Pramesti, Henny Ekana Chrisnawati, Laila Fitriana. "Developing of the module based on the smash book by pop up	1%

with polyhedron’s subject matter to improve students learning outcomes in mathematics", AIP Publishing, 2019
Publication

8	doaj.org Internet Source	1%
9	Submitted to University of Newcastle Student Paper	1%
10	Submitted to University of the Arts, London Student Paper	1%
11	Rachmat Hidayat, Ignatius ., Mirna Dianita, Niki Hadian. "Learning with Problem Solving Approach as Efforts to Improve the Ability of Mathematical Connection of Students in Accounting Study Programs in Bandung", International Journal of Engineering & Technology, 2018 Publication	1%
12	Darmanto Minggele. "Pengembangan Perangkat Pembelajaran Kooperatif Tipe STAD untuk Meningkatan Motivasi Belajar Siswa Kelas VIII Pada Materi Faktorisasi Suku Aljabar", Ekspose: Jurnal Penelitian Hukum dan Pendidikan, 2019 Publication	1%
13	Ni Komang Chika Oktaviani, Ari Prastika Ari	1%

	Prastika, Fauziatul Fajaroh, Suharti Suharti. "Incorporation of polya's problem solving into process guide inquiry in learning buffer solution", AIP Publishing, 2020 Publication	
14	unitec.researchbank.ac.nz Internet Source	1%
15	Submitted to Republic of the Maldives Student Paper	1%
16	jurnal.uns.ac.id Internet Source	<1%
17	Submitted to University of the West Indies Student Paper	<1%
18	Submitted to Open University Malaysia Student Paper	<1%
19	Rosalina Rolina, Sri Aryani, Erik Taufiqurrohman. "COMPARISON OF THE ABILITY OF MATHEMATICAL REASONING OF SMK STUDENTS USING A METACOGNITIVE SKILL APPROACH THROUGH ADVANCE ORGANIZER LEARNING MODELS WITH A SAINTIFIC APPROACH THROUGH DISCOVERY LEARNING", (JIML) JOURNAL OF INNOVATIVE MATHEMATICS LEARNING, 2018 Publication	<1%

20	Submitted to Manuel S. Enverga University Student Paper	<1%
21	W N Hidayat, A T Oktaviani, A Setiani, A Sugestuwandeli, T A Sutikno. "Development of camlearn as mobile learning media for photography equipment course", IOP Conference Series: Materials Science and Engineering, 2020 Publication	<1%
22	etheses.uin-malang.ac.id Internet Source	<1%
23	Submitted to Australian National University Student Paper	<1%
24	www.laps.in Internet Source	<1%
25	Ardina T. P. Retno, Sulistyo Saputro, Maria Ulfa. "Properness test: Development of an inquiry-based learning module to improve science literacy in thermochemistry subject", AIP Publishing, 2018 Publication	<1%
26	Submitted to Universitas Negeri Surabaya The State University of Surabaya Student Paper	<1%
27	Hendrick L, Martono Martono, Indri Astuti. "The	<1%

Using of Film Media to Analyze Intrinsic Element in Literature in High School", International Journal of Learning and Instruction (IJLI), 2019

Publication

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		

Analysis of Critical Thinking Skills in Problem Based Learning Model Based on Thematic Learning

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8