

The Effect of Fable on Increasing Students' Understanding of Plane Figure Concept

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Abstract—Fables are stories that tell the lives of animals behaving like humans and having moral message. Fable is a media in learning mathematics about plane figure. The purpose of the study was to improve students' concept understanding and learning motivation in plane figure topic. The types of the research are mixed method. The quantitative research to measure understanding concepts by using test. Qualitative research to measure learning motivation by using questionnaires and to describe learning plane figure using fable. The data were statistically analyzed with SPSS 19, that is, independent sample t-test and Mann Whitney. The subject of this study were 52 fourth graders of elementary school which comprises two classes, participated in this study. Data collection techniques used tests and questionnaires. The study results are as follows: First, students' improved concept understanding indicated from the fact that the experimental class is higher than the control one, and second, students' learning motivation is moderate, which is indicated from a gain score of 0.55. It also discusses the characteristic of plane figure using fable. As the implication, the fables could be used to measure students' interest and reading ability in thematic learning for fourth graders.

Keywords—joyful learning; thematic; fable

I. INTRODUCTION

The low ability of Indonesian students in reading and mathematics is reported on the 2016 OECD data. According to the OECD, Indonesian ranked 62nd for Science, 63rd for Mathematics, and 64th for Reading out of 70 countries. In addition to these data, the 2012 Program for International Student Assessment (PISA), the ranking for Science and Mathematics is 64th out of 65 while Reading is 61st out of 65 countries. The average scores for PISA 2015 (and 2012) are 403 (382) for Science, 386 (375) for Mathematics and 397 (396) for Reading [1].

There are some hindrances in learning mathematics faced by students in several topics, including counting operations, fractions, and plain figures. Plain figures are part of geometry, which should have been taught as early as possible since they are all around us [2]. Problems in learning mathematics are probably caused by the inadequacy of learning facilities, both in the form of textbooks and learning media. Moreover, available textbooks are less attractive and colourless [2]. Mathematical difficulties must be overcome as early as possible, if not facing many problems at every level of

education, because mathematics is always needed, including in everyday life [3].

The students' low concept understanding is also the cause of Indonesia's low ranking in mathematics [1]. This can be viewed from the situation when the student was asked by the teacher to mention an example and the student could not mention the example that was asked. When the teacher asked again about the definition of a concept, the student just kept quiet. So, to find a mathematical concept, students cannot find it alone [4]. Understanding the concept of mathematics is very important for students because it becomes the basis of knowledge, which is the start goal of learning mathematics [5].

To overcome this problem, the researcher designed fables using tangram context. The goal is to create mathematics learning more interesting and fun. By creating an atmosphere and designing a fun mathematical learning model, it is hoped that the teaching and learning process of mathematics becomes more attractive, so that the notion that mathematics is really scary and boring can be eliminated gradually from our thinking. Finally, mathematics learning is likely to become a learning favoured by all individuals.

A joyful learning requires a relaxed atmosphere, free from pressure, safe, attractive, the emergence of interest in learning, full involvement, learners' attention, interesting learning environment, enthusiasm, feeling of joy, high concentration [6]. In addition, the use of fable aims to increase students' imagination. In other words, the children's high imagination motivates these students to produce creative and innovative works [7].

Moreover, a joyful learning is a learning that students could enjoy. Students feel comfortable, safe and fun. Exciting feelings contain affective elements, especially in aspects of learning attitudes and achievement motivation [8]. A joyful learning is a learning strategy, concept and practice which is a synergy of meaningful learning, contextual learning, constructivism theory, and active learning [9,10].

In this research, we define the "joyful learning" as a kind of learning process or experience which could make learners feel pleasure in a learning scenario/process. A joyful perception is found to have positive influence on the motivation of learning [11,12]. Fable using the tangram context aims to create joyful

learning. It was said to be fun because students use funny and interesting fables.

Motivation is defined as strength, encouragement, need, enthusiasm, pressure, or psychological mechanism that encourages a person or group of people to gain certain achievements in accordance with what they desire [13].

One who has great motivation will show interest, attention, full concentration, high perseverance, and achievement-oriented without demonstrating the feelings of boredom, unenthusiasm, and surrender [14]. Students who have high learning motivation will find it easier to follow the learning process because they feel learning is important, whereas students with low motivation do not seem excited so they have difficulty in understanding concepts and learning processes are not conducive [15].

In response to this view, it is highly recommended that teacher incorporates some shape puzzles such as tangram, Lego, and Froebel's blocks in the plane figure as part of geometry teaching and learning activities [16]. The tangram is an ancient Chinese geometric puzzle, which has seven pieces: two large triangles, one medium triangle, two small triangles, one square, and one parallelogram [17].

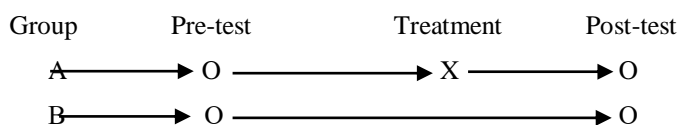
Learning plane figure will be more enjoyable through the use of media in the form of fables. Fable is not just a fun story, but it certainly has the moral lesson inside of the storyline [18]. In design the fable, researcher using tangram context. Tangram is a medium that may be used to facilitate students' geometric abilities. Tangram generates students to be excited and active in learning [19].

Tangram is considered beneficial for children in many ways, which include: 1) developing the sense of interest in geometry; 2) enabling them to distinguish various shapes; 3) developing intuitive feelings for geometric forms and relations; 4) developing the ability of spatial rotation; 5) facilitating the ability to use the right words to manipulate shapes (e.g. 'flipping', 'turning', 'shifting'); 6) studying what 'congruent' means [20].

Many studies have investigated about fables that each fable has, at least, a moral lesson in its narrative [18]. The difference between this study and the previous ones is that the product of fables using tangram to improve students' concept of understanding and learning motivation on the topic of plane figure.

II. METHOD

This study used a mixed method. The quantitative research used t-test, that is, independent sample t-test to measure concept understanding and Mann Whitney (i.e. N-gain score) to measure learning motivation. The research design used is Nonequivalent Groups Pretest-Posttest Design [12].



Annotation:

A: Experimental Class

B: Control Class

O: Pre-test and post-test on the mathematical concept understanding

X: The treatment of mathematics learning via fables using tangram context

The increase in motivation was analyzed by using the Gain score. The initial and final scores were used to obtain a Gain score:

$$g = \frac{\% \text{ posttest average score} - \% \text{ pretest average score}}{100 - \% \text{ pretest average score}}$$

The qualitative research is to describe learning plane figure through fable by using tangram context. The researcher used fable to create enjoyable learning for the student.

Furthermore, the data collection technique used the test to measure the development of students' concept understanding and some questionnaires to measure the increase in students' learning motivation in relation to the plane figure subject.

This study was conducted in one of Elementary School in Indonesia. The population of this study was all fourth grade students in 2017/2018 academic year. The population in this study were all fourth grade students of the school from the 2018/2019 academic year, as shown in table 1 below.

TABLE I. RESEARCH POPULATION

No	Class	Male	Female	Total
1	IV.A	15	10	25
2	IV.B	11	12	23
3	IV.C	12	13	25
Total		38	35	73

Table 1 shows the research population that consists of three classes. Then, the researcher chose two classes as sample. The sampling technique was cluster random sampling method, which is the selection of samples in class randomly by using pre-test of students' understanding concept and interview to the teacher.

In the three classes, the pre-test was conducted and then analyzed to acquire two classes, as shown in table 2. Based on the results of the initial data analysis, the study sample is class IV.A as the experimental class and IV.B as the control class.

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TABLE II. RESEARCH SAMPLE

No	Class	Male	Female	Total	Information
1	IV.A	15	10	25	Experimental class
2	IV.B	11	12	23	Control class
Total		26	22	48	

Table 2 shows two classes in the research. There are experimental and control classes. The experimental class used fable in learning plane figure. Meanwhile, the control class did not use fable in learning plane figure.

III. RESULTS AND DISCUSSION

The results of this study are the increase in concept understanding, in learning motivation, and in the description of plane figure learning by using fables. The first to be discussed is the increase in concept understanding of plane figure learning via pre- and post-tests.

Based on the results of calculations and statistical tests, it is obtained the average score of pre-test, post-test, and N-gain. It is also discovered, the results of independent sample t-test on the data of students' mathematical concept understanding of the experimental class taught through fables using tangram context and of the control class by employing conventional learning, as in table 3.

TABLE III. PRE-TEST, POST-TEST, N-GAIN AVERAGE SCORES AND T-TEST RESULTS OF THE DATA OF THE TEST ON MATHEMATICAL CONCEPT UNDERSTANDING IN THE EXPERIMENTAL AND CONTROL CLASSES

Test of mathematical concept understanding	Average Score			Results of data's t-test		Result of Mann-Whitney's test
	Pre-test	Post-test	N-gain	Pre-test Sig(2-tailed)	Post-test Sig(2-tailed)	N-Gain Asymp. Sig. (2-tailed)
Experi Mental	7.74	15.39	0.63	0.663 > 0.05 = α (H_0 accepted)	0.000 > 0.05 = α (H_0 rejected)	0.000 < 0.05 = α (H_0 rejected)

Table 3 demonstrates the pre-test's average scores of the experimental class and the control class is not much different. The results of the independent sample t-test on the pre-test's data also suggest that the sig value of $0.663 > 0.05 = \alpha$. The sig value is greater than 0.05, therefore H_0 is accepted.

This means, there is no significant difference on the average score of the initial ability to understand mathematical concepts between the students who will obtain explorative learning and the students who will gain direct learning. However, the post-test's results indicate the test's average score of the experimental class is higher than the control class.

Based on the result of independent sample t-test on the post-test's data, it is discovered that the sig value $0.000 < 0.05 = \alpha$. The sig value is smaller than 0.05, therefore H_0 is rejected. In other words, there are differences in understanding mathematical concepts between the students who practise fables using tangram context and the students who obtain conventional learning.

In addition, referring to the aforementioned table, it appears that the N-gain's average score on the students' mathematical concept understanding of the experimental class is higher than the control one. The N-gain's average score of the experimental class is 0.63 while the control class is 0.27. The average N-gain of the students' understanding mathematical concepts in the experimental class is in the medium category and the control class is in the low category.

Mann-Whitney test results of N-gain data indicate the sig value $0.000 < 0.05 = \alpha$. The sig value is smaller than 0.05, therefore H_0 is rejected. This means that the increase in mathematical concept understanding of the students who

practise fables using tangram context and the students who obtain conventional learning. In conclusion, there is the improvement of mathematical concept understandings of both students who practise fables using tangram context and who employ conventional learning.

The second result is the increase in students' learning motivation in Maths learning, particularly plane figure subject. The increase in learning motivation is indicated by comparing the data of filling in questionnaires between before and after practising fables using tangram context on the plane figure's topic. The increased student learning motivation is obtained by finding a Gain Score. The results suggest that students have experienced some increased motivation. The increase in motivation may be viewed on the amount of Gain Score obtained (i.e. 0.55), which is classified as being in the medium category.

To investigate if there is a difference in motivation between before and after implementing fables using tangram context, questionnaire data were employed. Testing was conducted by t-test for the dependent sample. The test results show that the sig value is 0.000, which means that sig $< 0.05 (\alpha)$, therefore H_0 is rejected. This means that there is a significant difference in motivation between before and after using fable.

The third result of this research is the description of plane figure learning by using fables that employ tangram context. This is considered as a qualitative research. The description of this plane figure by using fables was initiated when students read a fable as shown in figure 1.

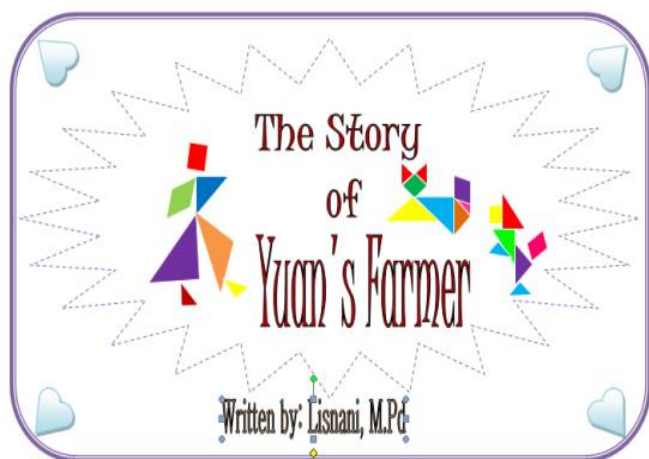


Fig. 1. Cover of fable.

Figure 1 shows the cover of fable using tangram context, designed by the researcher. The fable tells the life of a farmer who lives alone and has two pets, that is, a dog named Doggy and a cat named Cathy. These pets are always fighting each other and the farmer becomes confused. One day, there is an occurrence when the farmer and Cathy are attacked a couple of times by another animal and Doggy attempts to save them.

Next, the students were required to explain various shapes of plane figure alternately, based on the pages of the fable as shown in figure 2.

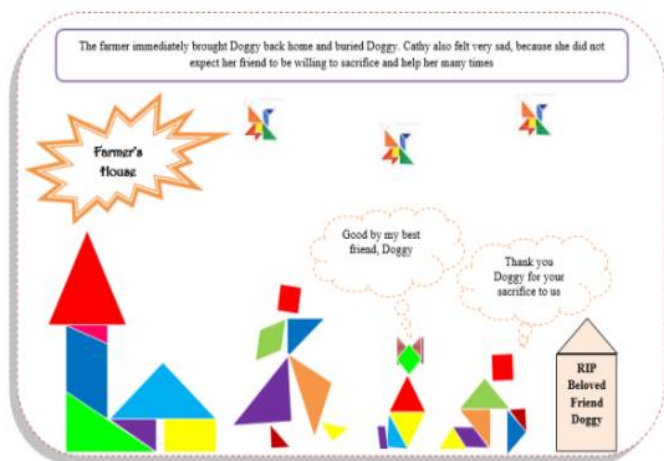


Fig. 2. The fable's content.

After reading the fable, the students were required to describe the moral message that would be achieved. This is because each fable, fable comprises a moral or a message delivered to its readers as demonstrated in figure 3.

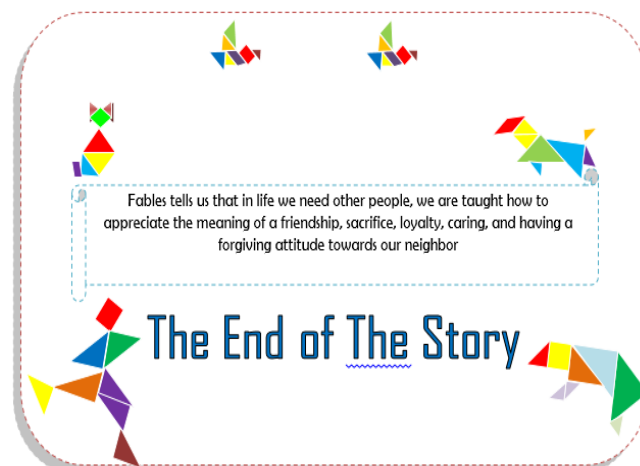


Fig. 3. The moral of the fable.

Figure 3 shows the moral message of the fable is in life we need other people, we were taught how to appreciate the meaning of a friendship, loyalty, caring, and having a forgiving attitude towards our neighbor. Finally, the students did some exercises in order to check their comprehension of plane figure.

IV. CONCLUSION

According to the study results, it is evident that implementing fables using tangram context is likely to develop students' concept understanding and learning motivation. Besides, fables may foster a mathematics learning to become a fun and enjoyable learning.

A fun learning through fables using tangram context is perhaps an alternative solution in learning plane figures when conducive learning environment is created. This fact is demonstrated from the percentage of N-Gain category that the experimental class is higher than the control class. Moreover, the increase in students' concept understanding of the experimental class is higher than the control one.

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