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The Implementation of APIQ Creative Mathematics Game Method in the Subject Matter of Greatest Common Factor and Least Common Multiple in Elementary School

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Abstract. One of causal factors for uninterested feeling of the students in learning mathematics is a monotonous learning method, like in traditional learning method. One of the ways for motivating students to learn mathematics is by implementing APIQ (Aritmetika Plus Intelegensi Quantum) creative mathematics game method. The purposes of this research are (1) to describe students' responses toward the implementation of APIQ creative mathematics game method on the subject matter of Greatest Common Factor (GCF) and Least Common Multiple (LCM) and (2) to find out whether by implementing this method, the student's learning completeness will improve or not. Based on the results of this research, it is shown that the responses of the students toward the implementation of APIQ creative mathematics game method in the subject matters of GCF and LCM were good. It is seen in the percentage of the responses were between 76-100%. (2) The implementation of APIQ creative mathematics game method on the subject matters of GCF and LCM improved the students' learning.

1. Introduction

Mathematics is one of subjects which are important relating to the development of science and technology. Mathematics has been learned since Elementary School until University. So, it is not wonder if mathematics is considered as the king of sciences. However, that king becomes a specter that makes the students terrified. Just imagine. Students of Elementary School until Senior High School assume that mathematics is a difficult and scary subject. It is worsened by killer teacher. It causes the students not interested in learning mathematics. Education in this era, it is important to support the future. A good future will be obtained if someone have a good education and skills. To reach a higher education it is necessary that the name of learning. Mathematics learning, students need many adaptations before mastering an advance cognitive skill [1][2]. Learning styles Affect the students' learning process so that it can be used as consideration in designing learning [3][4].

This feeling has been felt since they were in elementary school until they were in Senior High School. Due to uninterested feeling has existed since Elementary School is the beginning of the stage of mathematics concept understanding, so if since elementary school this feeling is allowed, it will



have negative impact on the student's future. Another factor causing uninterested feeling on the students in learning mathematics is monotonous learning method like on traditional learning method.

The reform movement of the past two decades in mathematics education has consistently emphasized problem solving as a focus of school mathematics (NCTM cited in [5]). Furthermore, Dias said recent research studies also indicates that elementary school students and even prospective elementary teachers have difficulties recognizing multiplicative relations between whole numbers [6].

Game-based learning is one of the ways to improve the interest of elementary school students to learn mathematics. This is in line with Ruseffendi that the benefit of mathematics game is for raising and improve the students' interests to learn mathematics [7]. Game-based and dramatic practices can help student to better learning and the students have a good perception about mathematicals concept [8]. Hussain, Tan & Idris said that many researchers use digital games as a learning medium that can give positive results on motivation to learn and learning achievement of students [9]. Game-based learning can also be applied in the form of Android media. Development of Android-based learning media has been discussed by Ahmar and Rahman in 2017. The results of this study indicate that 90% of students more quickly understand if using Android-based learning media [10].

By game learning method, this research will focus on the implementation of APIQ (Aritmetika Plus Intelegensi Quantum) creative mathematics game. This method is a learning method which uses Quantum Quotient & Quantum Learning method as well as game-based creative mathematics. Based on the explanation above, the problems in this research are : (1) what are the students' responses on the implementation of APIQ creative mathematics game method in the subject matter of GCF and LCM? (2) Is there any improvement due to the implementation of APIQ creative mathematics game method on the subject matter of GCF and LCM and is there any improvement on the students' learning completeness? The purposes of this research are (1) to describe the students' responses toward the implementation of APIQ creative mathematics game method on the subject matters of GCF and LCM and (2) to find out whether by implementing this method, the students' learning completeness is improved or not [11].

2. Literature Review

According to Offenholley, game based learning is an interactive pedagogy that has as its foundation the tenet that games, by their very nature, increase learning through positive emotional experience [12]. Games do not merely entertain; rather, they can deepen connections and allow for greater learning. While educational video games are gaining currency, old-fashioned board games, card games, etc., can also offer pedagogically rich opportunities for learning mathematics. This article introduces readers to what games can do, then connects the theory to practice, providing examples of (non-computer) games in introductory college mathematics classes and how they work. The article ends with a look at some currently available middle, high school, and college video games. Furthermore, Cody, Rule, & Forsyth said that the students reached the same levels of mathematical achievement by practicing concepts through creating and playing games as with more conventional solving of practice problems [13]. Although students found the topics of the games units more difficult initially (as evidenced by pretest scores) and less interesting (as acknowledged on the attitude survey), they reported much less frustration and confusion along with more ease of learning and more fun during the units in which students practiced with games. These findings indicate that allowing students the time to create and play each other's games is at least as effective as more conventional group practice and seems to have additional benefits of less frustration and greater student clarity of concepts.

3. Method

Method in this research is experimental research and descriptive research. Descriptive research is a type of research done to find out the value of a variable, in this case is independent variable, either one variable or more without making comparison or relating to other variables [14].

The steps done in this learning method are as follows: (1) giving pretest to the students to find out the initial ability of the students about the subject matters of GCF and LCM, (2) conveying learning indicators, (3) motivating the students, (4) delivering materials on GCF and LCM concepts by implementing APIQ creative mathematics game method, (5) giving posttest to the students, (6) helping the students in summarizing the materials, (7) giving the students response questionnaires.

The subjects of this research are 23 students in Grade IV of SDN Galesong II. The period of research implementation was in odd semester of the academic year 2011/2012. The data collecting method is by using test method to obtain the students' learning results and questionnaire method to obtain the students' responses data.

To get the students' responses data, questionnaires are used. It is aimed to find out the students' responses toward learning activity through the implementation of APIQ creative mathematics game method, and this questionnaire is given after test is taken. To find out the percentage, it can be found by applying this formula:

$$R = \frac{n}{N} \times 100\% \quad (1)$$

Description :

R	=	percentage of the students
n	=	total number of the students who give responses
N	=	total number of the students with Likert-scale determination.

The test is done twice, before learning (pretest) and after learning (posttest). This test is used to find out the students' learning results by referring to minimum learning completeness that is 65% and level students' responses can be shown in Table 1.

Table 1 Level Students' Responses

No	Scale	Predicate
1	76 – 100%	Excellent
2	56 – 75%	Good
3	40 – 55%	Fair
4	< 40%	Poor

4. Result and Discussion

According to (Polya, 1973), the process of mathematics problem solving are generally divided into four stages, (1) understanding the problem, (2) devising problem solving, (3) carrying out problem solving according to a set plan, and (4) re-examining the solutions that have been obtained. Each stage has an indicator and hierarchy implementation. However, the process of mathematics problem solving can't be separated from two important factors, namely (1) problem characteristics, and (2) cognitive maturity. Therefore, the process of mathematics problem solving posed by Polya haven't to be absolutely followed by every student in sequence.

From the results of this research, it can be found that there are some improvements in the mathematics learning results. Results of statistics relating to the initial value (Pretest) of students in learning by APIQ Creative Mathematics Game Method is presented in Table 2.

From the table 2, we can shows that pretest score of students taught using APIQ Creative Mathematics Game Method, there are 23 sample size by an average score (mean) is the score of 37,2174 of 100 and the median score of 36 with a standard of deviation of 11.78195 and variance 138,814. The minimum score obtained is 16 and the maximum score obtained is 72. If the pretest math scores of students in the experimental class is divided into five categories, the obtained frequency distribution of scores and percentages as shown in Table 3 below.

Tabel 2 Description of Pretest Score of Students Taught by APIQ Creative Mathematics Game Method

Statistic	Value
Sample Size	23
Mean	37,2174
Median	36
Mode	32
Std. Deviation	11,78195
Variance	138,814
Minimum	16
Maximum	72

Tabel 3 Distribution and Percentage of Pretest Score of Students Taught by APIQ Creative Mathematics Game Method

No.	Category	F	Percentage (%)
1	Very Good	0	0,00
2	Good	1	4,35
3	Pair	1	4,35
4	Poor	6	30,43
5	Very Poor	12	60,87
Jumlah		30	100%

Percentage of students' mathematics scores of pretest the experimental class can further be observed in the image histogram below (figure 1).

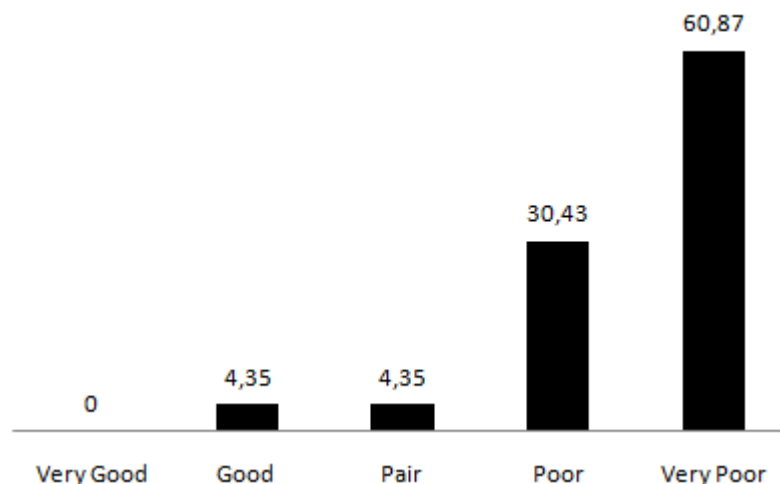


Figure 1 Scores of Pretest the Experimental Class

Based on table 3 and figure 1 above shows that students who very poor as many as 14 students (60,87%), poor category as many as 7 students (30,43%), pair and good category as many as 1

students (4,35 %). Results of statistics relating to the posttest of students in learning by APIQ Creative Mathematics Game Method is presented in Table 4 below.

Tabel 4 Description of Posttest Score of Students Taught by APIQ Creative Mathematics Game Method

Statistic	Value
Sample Size	23
Mean	80
Median	80
Mode	80
Std. Deviation	11,87817
Variance	141,091
Minimum	56
Maximum	100

Table 4 above shows that posttest score of students taught using APIQ Creative Mathematics Game Method, there are 23 sample size by an average score (mean), median, and mode is the score of 80 of 100 with a standard of deviation of 11.87817 and variance 141,091. The minimum score obtained is 16 and the maximum score obtained is 72. Percentage of students' mathematics scores of posttest the experimental class can further be observed in the image histogram below (figure 2).

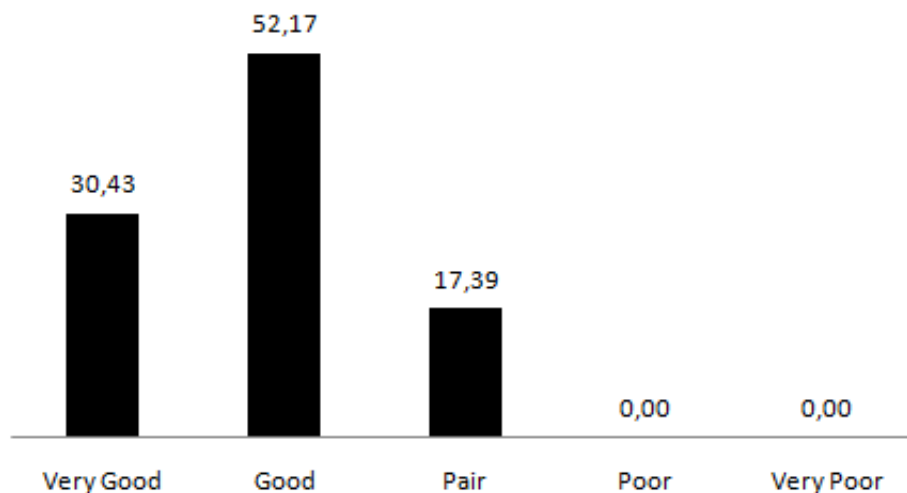


Figure 2 Scores of Posttest the Experimental Class

Based on table 4 and figure 2 above shows that students who pair as many as 4 students (17,39%), good category as many as 12 students (52,17%), and very good category as many as 7 students (30,43 %).

Table 5 Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	37,2174	23	11,78195	2,45671
	Posttes	80,0000	23	11,87817	2,47677

Table 6 Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pretest & Posttest	23	0,530	0,009

Table 7 Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
Pair	Pretest- Posttest	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest- Posttest	-42,78261	11,46915	2,39148	-47,74224	-37,82297	-17,890	22	<0,01

Based on table 5, we can see Mean, Standard of Deviation, and Standard of Error Mean from Pretest Group lower to Posttest. It shown that statistically statistics, there are enhancement form pretest to posttest. Based on table 6, there is a positive relationship between the before and after learning. This is indicated by the correlation value is 0.56. This means that learning to use APIQ method can improve students' learning ability. Value of Sig. (2-tailed) of Paired Samples Test showed results = 0.000 < 0.05 (confidence interval: 95%), this means that there is difference between before and after treatment or in other words there is difference before and after the learning process by using APIQ. The difference can we see the value Mean: -42.78261 (Negative), which means there is increasing trend after the study results do use methods APIQ with the average increase is 42.78261. The students' responses toward the implementation of APIQ creative mathematics game method in the subject matters of GCF and LCM are also found. The students who gave responses consist of (1) 18 students (78.26%) who stated that they liked this kind of learning activity, (2) 19 students (82.60%) who liked learning by using APIQ creative mathematics method, (3) 22 students (95.65%) liked if this method is always used in learning. From this calculation and the data of the students' responses, it can be seen that the application of this method was good (with the scale of 76-100%). Therefore, according to Cody, Rule, & Forsyth (2015), it can be concluded that this method is good to improve the students' interests on mathematics subject. Therefore, the student may perform at higher levels with the support of the game, allowing the student to practice and gain more mathematical proficiency. The metacognitive aspects of choosing problems for games and the motivational impact of choosing a game theme that includes interesting characters or ideas related to favorite leisure activities will have a positive effect on learning.

5. Conclusion

Based on the findings of this research and the discussion, it can be concluded that: (1) The students' responses toward the application of APIQ creative mathematics game method in the subject matters of GCF and LCM were good. The percentages of the students' responses were between 76-100%. (2) The application of APIQ creative mathematics game method in the subject matters of GCF and LCM improved the students' learning. There is increasing trend after the study results do use methods APIQ with the average increase is 42,78261.

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