Mathematics learning through *Pendidikan Matematika Realistik Indonesia* (PMRI) approach and Adobe Flash CS6

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**Abstract.** This research based on low cognitive learning outcomes of students and less interesting mathematics learning for students as the result of learning centered on teachers, and many teachers who have not used readable media. This research aims to find out to what extent the influence of PMRI approach assisted media Adobe Flash CS6 to result of learning mathematics at Grade V. It is quasi-experiment research. It was conducted at SDN 2 Marapalam Padang City. It used purposive sampling, Grade V-A as the control group and Grade V-B as the experiment group. The instrument used in this research is the multiple-choice type. Inferential statistical test with a t-test is used to analyze the data. The result shows that the PMRI approach media assisted Adobe Flash CS6 influences the results of mathematics learning Grade V SDN 23 Marapalam, Padang City in the academic year of 2017/2018.

1. **Introduction**

Mathematics is one of the disciplines studied in educational institutions and offered to students from the primary school level up to the higher levels [1, 2]. Mathematics is the numbers and calculations that are part of human life [3-5]. It indicates that mathematics as a subject has an important role, both scientific mindset in shaping the quality of the students and its usefulness in everyday life. Using the concepts and principles of mathematics can help students to present something logically, creatively, and systematically [6, 7]. Students are invited to use various sources and learning media that can improve students’ interaction, logical thinking, creativity and systematic to support in learning mathematics.

The Indonesian realistic mathematics education approach (PMRI) is a mathematical approach developed in mathematics learning which is one of the theories commonly known as the realistic approach [8-10]. The PMRI approach is an approach that places students' reality and experience as the starting point of learning [8]. It is an approach that provides the widest opportunity for students to be active in the learning process in which students are required to build their understanding and understanding of newly learned concepts [9]. PMRI helps for better teaching and learning process where students are more active and creative such as teachers no longer use the chalk and talk method [11-13]. The teacher's role changes from the center of the teaching and learning process to the mentors and resource persons [8].

The learning model and method are not the only supports in the learning process such as instructional media must also be used to achieve better learning [14-16]. The instructional media is constructive for
teachers in delivering material to students [15]. It is as an intermediary to read messages from the sender to the recipient to achieve learning objectives to get more satisfactory learning results [17].

One of ICT-based learning media is learning media which use adobe flash CS6 application [16]. Adobe Flash is a program to create 2D vector based animation. A variety of features and its straightforward use of Adobe Flash CS6 application make it a favorite animation program, and it is quite popular. The various plate functions and options, as well as a collection of complete tools, are beneficial in doing interesting animated works. The other benefits of Adobe Flash CS6 are animated graphics software that can create graphical and animated objects so we can directly create object design without having to use graphics software support such as Illustrator or Photoshop. The adobe flash CS6 can make animations that can help us in making learning media interesting [18].

The ICT learning media, especially Adobe Flash CS6 program can be used as a reference for the use of ICT in learning especially the use of Adobe Flash CS6 program on abstract mathematics learning following the material taught in Elementary School. The results of the interviews with the classroom teachers of Grade V-A, V-B, and V-C at SDN 23, Marapalan, Padang city reveal that teachers are less able to use the ICT based learning media with so that children are not interested in learning. Monotonous learning cannot help the teacher to enable students to understand learning materials well. Teachers as one of the main elements in learning are expected to be able to use appropriate learning media and to pay attention to the cognitive developmental stages of students to motivate students to be more active in learning. Innovation in teaching and learning process is needed to improve student achievement as expected.

2. Method
This research is experimental research. The research design used was the non-equivalent control group design. The difference between the students in the experimental group treated with PMRI approach assisted adobe flash CS6 media and control group students treated with PMRI approach can be seen. The population in this research is all students of Grade V SDN 23 Marapalam Padang City. The total number of students in the community is 92 students. The V-B class students were used as the experimental group and the V-A class as the control group. Purposive sampling technique was used in this research that is sampling based on individual consideration [19].

Intensive reading skill test was used to collect the data. The validity test (validity of the grains), reliability test utilizing the Product Moment Correlation formula with rough numbers, the difficulty level of questions and the different questions were used to try out the instrument. Data analysis used a prerequisite test and hypothesis test. The prerequisite analysis test used was the normality test and homogeneity test. Lilifors method was used to test the normality and Fisher method was used to test the homogeneity. T-test (t-test) was used to test the hypothesis.

3. Results and discussion
3.1. Results
Pre-test was given to both control and experimental group before the treatment as shown in Table 1.

| Variable    | Experiment group | Control group |
|-------------|------------------|---------------|
| N           | 31               | 30            |
| Highest Mark| 70               | 75            |
| Lowest Mark | 25               | 30            |
| Mean        | 52,58            | 54,17         |
| SD          | 12,02            | 12,80         |
| SD²         | 155,7849         | 163,9368      |
Table 1 shows that the experimental class with the number of 31 students obtained the highest score of 70 and the lowest score of 25. The experimental group achieved an average rating of 52.58, the standard deviation of 12.02 and the value of variance 155.7849. While the control class with the number of 30 students obtained the highest score of 75 and the lowest score of 30. The average rating for the control group is 54.17, standard deviation 12.80 and the value of variance 163.9368. The description of pre-test results in the above table revealed the cognitive learning outcomes of flash class CS6 treatment using PMRI approach assisted media. Both group then were and then given post-test in where the results can be seen in Table 2.

| Variable      | Post-test | Experiment group | Control group |
|---------------|-----------|------------------|---------------|
| N             | 31        | 30               |
| Highest Score | 100       | 95               |
| Lowest Score  | 55        | 40               |
| Mean          | 80.16     | 71.33            |
| SD            | 13.15     | 13.13            |
| SD²           | 173.0389  | 172.2989         |

Table 2 shows that the experimental group with the number of 31 students got the highest score of 100 and the lowest score of 55. The average rating of the experimental group is 80.16 with the standard deviation of 13.15 and the value of variance 173.0389. While the control class with the number of 30 students obtained the highest score of 95 and the lowest score of 40. The average rating of the control group is 71.33 with the standard deviation, and variance value is 172.2989. Based on the description of post-test results in the table above, it can be concluded that cognitive learning outcomes of the experimental group are higher than the control group. The hypothesis needs to be tested to know the effect of PMRI approach assisted Adobe Flash CS6 media to the result of mathematics learning in Grade V SDN 23 Marapalam, Padang city. Previously, tested prerequisite analysis that is by using normality test and homogeneity test was done. The normality test of the pre-test score can be seen in Table 3.

| Group      | L₀   | L_table | n  | α  | Description |
|------------|------|---------|----|----|-------------|
| Experiment | 0.0735 | 0.159   | 31 | 0.05 | Normal     |
| Control    | 0.09753 | 0.161  | 30 | 0.05 | Normal     |

Table 3 shows that the sample based on the pre-test score has the normal distribution where it can also be seen L₀ < L_table. Furthermore, the homogeneity test of pre-test can be seen in Table 4.

| No | Group     | N  | α   | f_count | f_table | Description |
|----|-----------|----|-----|---------|---------|-------------|
| 1  | Experiment| 31 | 0.05| 1.13    | 1.85    | Homogeneity |
| 2  | Control   | 30 | 0.05|         |         |             |

Based on the homogeneity test in Table 4, F value can be calculated with real level α = 0.05. From the F distribution table, it can be seen that the f_count ≤ f_table is 1.13 ≤ 1.85. It can be concluded that the data of the final test result of both groups have a homogeneous variance at 95%.

| Group      | L₀   | L_table | n  | α  | Description |
|------------|------|---------|----|----|-------------|
| Experiment | 0.10198 | 0.159  | 31 | 0.05 | Normal     |
| Control    | 0.012067 | 0.161 | 30 | 0.05 | Normal     |
Table 5 reveals that the sample based on the post-test score has normal distribution is normal in which it also explains the value of \( L_0 \leq L_{\text{table}} \). Furthermore, the result of homogeneity tests of post-test seen in Table 6.

**Table 6. The results of homogeneity test of pretest**

| No | Group   | N  | \( \alpha \) | \( t_{\text{count}} \) | \( t_{\text{table}} \) | Description |
|----|---------|----|--------------|----------------|----------------|-------------|
| 1  | Experiment | 31 | 0.05         | 1.02           | 1.85           | Homogeneity |
| 2  | Control   | 30 | 0.05         |                |                |             |

Based on homogeneity test in Table 6, it can be seen the value of \( F \) calculation with the real level \( \alpha = 0.05 \). From \( F \) distribution table, it was obtained the value of \( F_{\text{count}} \leq F_{\text{table}} \) is \( 1.02 \leq 1.85 \). It can be concluded that the data of the final test result of the sample has a homogeneous variance at 95%.

**Table 7. The results of hypothesis testing**

| No | Group   | Numbers | Real level | \( t_{\text{count}} \) | \( t_{\text{table}} \) | Description     |
|----|---------|---------|------------|----------------|----------------|----------------|
| 1  | Experiment | 31      | 0.05       | 2.803          | 2.000          | Significantly different |
| 2  | Control   | 30      | 0.05       |                |                |                |

Based on the hypothesis test in Table 7, it can be seen that at 5% significance level, the result of hypothesis testing of both groups is \( t_{\text{count}} \) > \( t_{\text{table}} \) \( (2.803 > 2.000) \) means \( H_0 \) is rejected. It means that there is an influence of PMRI approach assisted Adobe Flash CS6 media to the results of mathematics learning of Grade V students of SDN 23 Marapalam city of Padang.

3.2. Discussion

The research results show that there is a difference results between the use of PMRI approaches assisted adobe flash cs6 media with traditional learning using PMRI approach only. It is evidenced by the results of hypothesis testing which result in rejecting the \( H_0 \) at a significance level of 5%.

Based on the results of research done in Grade V SDN 23 Marapalam, learning in the experimental group was treated using PMRI approach with the help of media adobe flash cs6 media reveal that the students were more active and interested in studying [11, 12, 15, 20]. While in the control group students were not motivated to study. So there is an effect of PMRI approach assisted adobe flash CS6 media to student cognitive learning outcomes in identifying the characteristics of shape [16]. They were significant differences in student learning outcomes whose were taught using PMRI approach assisted with adobe flash CS6 media with cognitive learning outcomes of students who were trained using PMRI approach done without adobe flash CS6 media [21]. It can be seen in the final test of the students given to the experimental group and the control group. Using the PMRI approach assisted of adobe flash CS6 media in the experimental class, the level of the students' learning outcomes increase.

Based on the result of the post-test in identifying characteristic shapes the average score for the experimental class was 80.16, while the average rating for the control group was 71.33. Based on data analysis \( t_{\text{count}} \) > \( t_{\text{table}} \) with \( 2.803 > 2.000 \) then rejected the \( H_0 \) and accepted the \( H_1 \). So, it can be concluded that the hypothesis in this study was accepted that there is an influence of PMRI approach assisted with adobe flash CS6 learning media to cognitive learning outcomes in identifying the characteristic shape in Grade V SDN 23 Marapalam, Padang City.

4. Conclusion

The average score of post-test of the experimental group applying the PMRI approach with the help of adobe flash CS6 media is 80.16, and the average score of post-test control group applying PMRI approach is 71.33. Based on the result of hypothesis test using t-test (t-test), it can be concluded that at significant level = 0.05 PMRI approach assisted with adobe flash CS6 media is significantly affected the cognitive learning outcomes in identifying the characteristic of bola in Grade V SDN 23 Marapalam, Padang City in the academic year of 2017/2018.
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