

IMPROVING STUDENT LEARNING OUTCOMES WITH THE APPLICATION OF PENDIDIKAN MATEMATIKA REALISTIK INDONESIA (PMRI)

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Article History

Received: 12-08-2020

Revision: 07-10-2020

Accepted: 18-10-2020

Published: 30-10-2020

Abstract. Pendidikan Matematika Realistik Indonesia (PMRI) is a learning tool that places students as subjects in learning. The learning process uses real-world contexts as a medium of their learning to help students understand the material being studied. This study aims to determine the application of PMRI in the learning process to improve student learning outcomes in the Social Arithmetic material of students VII of SMP Amanah Bangsa. This research was conducted using Classroom Action Research, which is a study that aims to determine the improvement of student learning outcomes. The subjects used in the study were 30 people, namely the number of all grade VII students at SMP Amanah Bangsa. The instruments used are observation and test. After carrying out the research and going through the data analysis process, the results of the analysis showed that there was an increase in student learning outcomes with the application of PMRI, namely in the pre-test obtained an average score of 44.00 with a percentage of completion of 23.33%, increased in cycle I to 64.00 with a percentage of completion of 56.67% and increased significantly in cycle II to 79.00 with a percentage of completion of 83.33%.

Keywords: Pendidikan Matematika Realistik Indonesia (PMRI), Learning Outcomes, Social Arithmetic

Abstrak. Pendidikan Matematika Realistik Indonesia (PMRI) merupakan suatu pendekatan pembelajaran yang menempatkan siswa sebagai subjek dalam pembelajaran serta proses belajarnya menggunakan konteks dunia nyata sebagai media dalam pembelajarannya sehingga membantu siswa dalam memahami materi-yang dipelajari. Tujuan dilaksanakannya penelitian ini adalah untuk mengetahui penerapan PMRI dalam proses pembelajaran dapat meningkatkan hasil belajar siswa pada materi Aritmatika Sosial siswa VII SMP Amanah Bangsa. Penelitian ini dilakukan dengan menggunakan Penelitian Tindakan Kelas yakni penelitian yang bertujuan untuk mengetahui peningkatan hasil belajar siswa. Subjek yang digunakan dalam penelitian berjumlah 30 orang yakni jumlah seluruh siswa kelas VII pada SMP Amanah Bangsa. Instrumen yang digunakan adalah observasi dan tes. Setelah melaksanakan penelitian dan melalui proses analisis data, hasil analisis tersebut menunjukkan bahwa terdapat peningkatan hasil belajar siswa dengan penerapan PMRI yakni pada tes awal memperoleh nilai rata-rata 44,00 dengan presentase ketuntasan 23,33%, meningkat pada siklus I menjadi 64,00 dengan presentase ketuntasan 56,67% dan meningkat secara signifikan pada siklus II menjadi 79,00 dengan presentase ketuntasan 83,33%.

Kata Kunci: Pendidikan Matematika Realistik Indonesia (PMRI), Hasil Belajar, Aritmatika Sosial

How to Cite: Aprilia, I. S. & Awalia, N. (2020). Improving Student Learning Outcomes with the Application of Pendidikan Matematika Realistik Indonesia (PMRI). *Indo-MathEdu Intellectuals Journal*, 1 (1), 38-49.

INTRODUCTION

In the era of globalization, education is focused on the rapid development of science and technology. The development of science and technology does not escape the influence of intelligence and scientific thinking (Lestari & Surya, 2017). Mathematics is a means of scientific thinking to develop logical, systematic, and critical thinking skills (Riyanto et al., 2019). The current direction of Indonesian education still tends to optimize only one or two intelligence (mathematics and linguistics). Even the credit is still riveted to the two bits of intelligence. That direction became erroneous because of the three basic paradigms that make it up. Namely, intelligence is the value of mathematics and language; the key to intelligence is the values of IQ (report card, achievement index and others) and orientation to problem-solving (Laamena, 2012).

This shows that mathematical intelligence is essential. However, not all students have perfect mathematical intelligence (Novferma, 2016). Some students have less intelligence in mathematics but have more intelligence in the intelligence of others (Subaidi, 2016). Indeed, children's intelligence is influenced by genetic factors. However, in addition to those factors, the child's intelligence is influenced by external factors, such as good nutrition and stimulus or stimuli (Kurnia et al., 2018). Proper and continuous stimulation in a child will affect the development of his brain. Thus, it is hoped that the development of his physical, mental and intellectual development will also surpass his basic abilities or genetic potential.

In the learning process in school, teachers should pay attention to this, with the hope that in the future, every student can develop every potential he has (Amalia et al., 2018). However, in reality, almost every teacher in school tends to think that every smart student depends on genetic factors and vice versa. Meanwhile, in every educational activity, teachers are strongly required to develop creativity in every learning, aiming for each student to absorb later the material provided (Yetim Karaca & Özkaya, 2017). This greatly affects activities in the classroom, teachers who tend to be monotonous and lack teacher creativity, so student interest in learning is very low, ultimately affecting student learning outcomes (Budinski & Milinkovic, 2017).

Mathematics teaching is generally dominated by the verbal introduction of formulas and concepts without sufficient attention to students' understanding (Nizar et al., 2018). In addition, the teaching and learning process almost always takes place with a mechanistic method of lectures, with the teacher being the centre of all activities in the classroom, students listening, imitating or modelling the same way that the teacher gives without initiative (Riyanto et al., 2019). Students are not allowed or encouraged to optimize their

potential and develop their reasoning or creativity. Mathematics learning also seems to be considered loose to develop students' personalities. Mathematics learning emphasizes only cognitive factors, even though the development of personality as part of life skills is the task of all subjects in school (Ambrus et al., 2019; Muttaqin et al., 2017). Mathematics learning must change its image from mechanistic to pleasant humanistic learning (Saleh et al., 2018)

In line with the above, the same condition also occurs in one of the private schools in the city of Jakarta, namely SMP Amanah Bangsa. From the results of a brief interview with one of the students, information was obtained that it was very boring to learn Mathematics. This is because the delivery of the material presented by the teacher is very uninteresting and tends to be boring, the lack of creativity in delivering the subject matter plus the absence of models or the method used in developing the process of giving material is the initial trigger for the lack of interest in student learning, and in the end, the scores obtained by students are very low.

One of the mathematics learning that is oriented toward the mathematics of daily experience (mathematize of every day) and applies mathematics in everyday life and can improve students' thinking skills is the Pendidikan Matematika Realistik Indonesia (PMRI) (Budinski & Milinkovic, 2017; Kamsurya, 2019; Nuraida & Putri, 2019). The characteristic of PMRI is to use "real-world" contexts, student models, production and construction, interactive, and interrelationships (Fauziah et al., 2019; Yetim Karaca & Özkaya, 2017). Realistic mathematics learning allows students to reinvent or construct mathematical concepts. Thus, realistic mathematics learning will significantly contribute to the student learning process (Siregar & Ahmad, 2018).

Social arithmetic is one of the essential materials in learning mathematics because by studying social arithmetic, students can learn about economic activities, in this case, the trade process that occurs within their environment. In addition, by studying social arithmetic, the student can apply the knowledge he has learned in the learning process in the classroom. That way, students will be able to relate and apply their knowledge so that the thoughts that arise in students are not only abstract, but mathematics is a science that is closely related to daily life (Fadlilah, 2015; Yulianti & Fauzan, 2019). This research aims to determine the application of PMRI in the learning process to improve student learning outcomes of social arithmetic material for grade VII students of SMP Amanah Bangsa.

METHOD

This research is a classroom action research conducted to improve student learning outcomes. Implementing this action is carried out in stages until the study is successful. The action procedure starts from (1) action planning, (2) Implementation of actions, (3) observation or evaluation, and (4) analysis or reflection (Cohen et al., 2018), which can be described as follows:

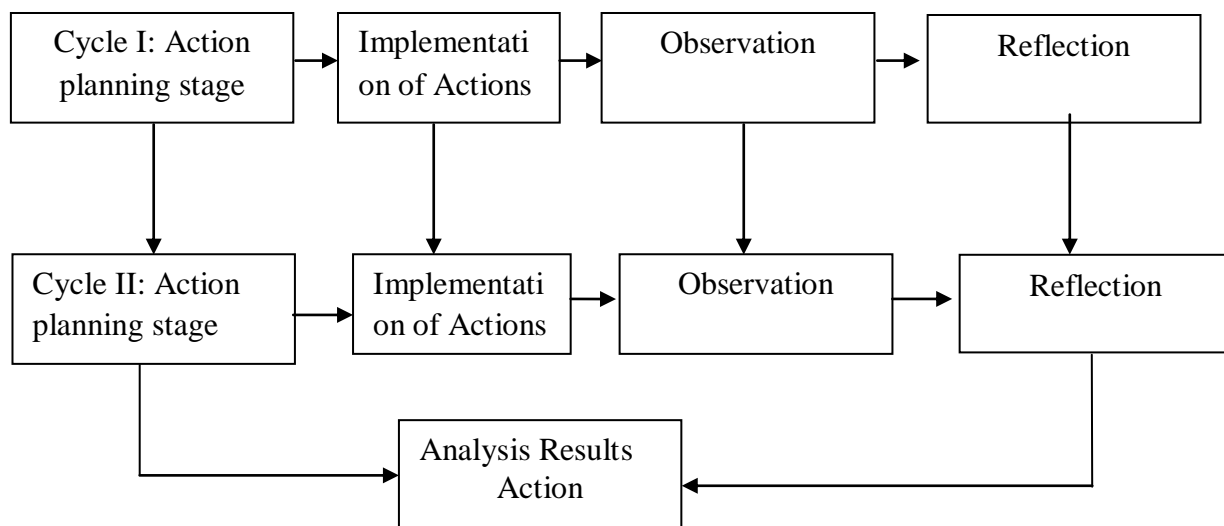


Figure 1. Class action research cycle according to MC. Niff (1988)

The subjects in this study were 30 students of grade VII of SMP Amanah Bangsa. The procedures in this study are (1) action planning; preparation of learning tools, preparing observation guideline sheets during the teaching and learning process, preparing evaluation tools for each cycle, and determining completion criteria. (2) the implementation of the Act; At this stage, the researcher carries out class actions using learning by applying PMRI by the learning tools that have been prepared, and at the end of the meeting, an evaluation /test is carried out (Arikunto, 2012) (3) (3) observation/observation of actions; observations are made on student activities, and student's ability to answer each question/evaluation material provided by the teacher (Arifin, 2016), and (4) researchers with subject teachers reflect on any deficiencies that occur during the learning process and from student learning outcomes.

The instruments in this study consisted of (1) observation, carried out to determine the learning conditions objectively at the research site, and (2) tests; done to find out student learning outcomes. An indicator of success in this class action research for each cycle is if at least 75% of students have obtained a minimum score of 64 (provision from the school). A student is said to have achieved individual learning completion if the student has scored ≥ 64

(minimum learning completion standard). For the data of the test results of the analysis, students use the following formula.

1. Determine the average value

$$\bar{x} = \frac{\sum x_i}{N} \times 100\%$$

2. Determine the percentage of learning outcomes

$$\% \text{ Completeness} = \frac{\sum x}{N} \times 100\%$$

RESULTS

Pre-test Results

To find out the initial ability of students in the learning process, an pre-test is carried out. This is intended to be able to compare student test results between learning and PMRI. The results of the students' pre-tests can be seen in the following table.

Table 1. Student learning outcomes on the pre-test

Value Minimal Completeness	Mastery Level	Frequency	Average Value	Persentase
≥ 64	achieved	7		23,33%
< 64	not achieved	23	44,00	76,67%

Source: Student pre-test results

From the test results in table 1 above, it is known that in the pre-test process where researchers have not applied learning with PMRI, the learning outcomes obtained by students are the number of students who achieve completion as many as seven people with a percentage of 23.33%. The number of students who have not completed the completion is 23, and the percentage who have not completed the pre-test is 76.67%. While the average score of the grade obtained is 44.00. After completing the pre-test to find out the initial ability, then in the next learning, the researcher summarizes PMRI in the learning process, namely on social arithmetic material, with to improve student learning outcomes.

Cycle I End Test Results

In the first cycle of research, after carrying out learning by applying The PMRI, the researcher carried out the final test. The test aims to determine students' ability and understanding of the social arithmetic material learned by students with PMRI. The final test results of students in cycle I can be seen in the following table:

Table 2. Student learning outcomes on the end-of-cycle test I

Value Minimal Completeness	Mastery Level	Frequency	Average Value	Persentase
≥ 64	achieved	17		56,67%
< 64	not achieved	13	64,00	43,33%

Source: Preliminary test results at the end of the cycle I

Based on the test results contained in table 2. above, it is known that in the final process of the first cycle where researchers have applied learning with PMRI, the learning outcomes obtained by students are the number of students who reached completion as many as 17 people with a percentage of 56.67%. The number of students who have not yet completed completion is 13 people, and the percentage who have not completed the pre-test is 43.33%. At the same time, the average score of the class obtained is 64.00. The test results students achieved during the cycle's final test process seem to have improved. The increase almost occurred in all students, but the learning outcomes did not meet the classically used completion of 75% of the total number of students. So this research continues in cycle II.

Before continuing the research in cycle II, the researcher first held a reflection with the subject teacher and observer. The purpose of the reflection is to evaluate the various shortcomings in the learning process in cycle I, both from teachers and students. So that later, the research carried out in cycle II can get maximum results. As for the results of the reflection, several shortcomings and errors were obtained that occurred in the first cycle of learning, namely (1) the role of researchers still looks active according to observers and subject teachers so that students are still slightly based on the results of researchers' thoughts, (2) researchers still feel a little difficulty in directing students, (3) the media used in trade activities is still minimal, (4) students who are in charge of carrying out trade activities do not fully tell their experiences to their peers, and (5) sometimes students still feel confused about learning activities that apply PMRI.

Cycle II End Test Results

In cycle II learning, researchers began to correct the role in the learning process and some of the shortcomings in cycle I. Student learning outcomes at the end of cycle II tests, it can be seen in the following table:

Table 3. Student learning outcomes on the end-of-cycle II test

Value Minimal Completeness	Mastery Level	Frequency	Average Value	Persentase
≥ 64	achieved	25		83,33%
< 64	not achieved	5	79,00	16,67%

Based on the test results contained in table 3. above, it is known that in the final process of cycle II, where researchers have applied and corrected various deficiencies contained in cycle I in the learning process with PMRI, the learning outcomes obtained by students are the number of students who reach completion as many as 25 people with a percentage of 83.33%. The number of students who have not reached completion is five people, and the percentage who have not completed the pre-test is 16.67%. At the same time, the average score of the class obtained is 79.00. The test results obtained in the learning process by applying PMRI in cycle II were excellent, and there was a fairly maximum increase. This can be seen from the student's learning outcomes in the pre-test, the end test of the cycle I and the final test of cycle II. In the second cycle test process, the number of student completions has reached 25 people. However, the results obtained are still five students. Because the learning results achieved have achieved classical completion, this study has met the requirements by the success indicators, namely the minimum individual completion for each individual/student, namely 64, and the classical completion of students must reach 75% of students who obtain completeness.

Learning by applying PMRI to grade VII students of SMP Amanah Bangsa social arithmetic material produces quite good results. In general, the students' test results in this entire series of studies can be seen in the following graph.

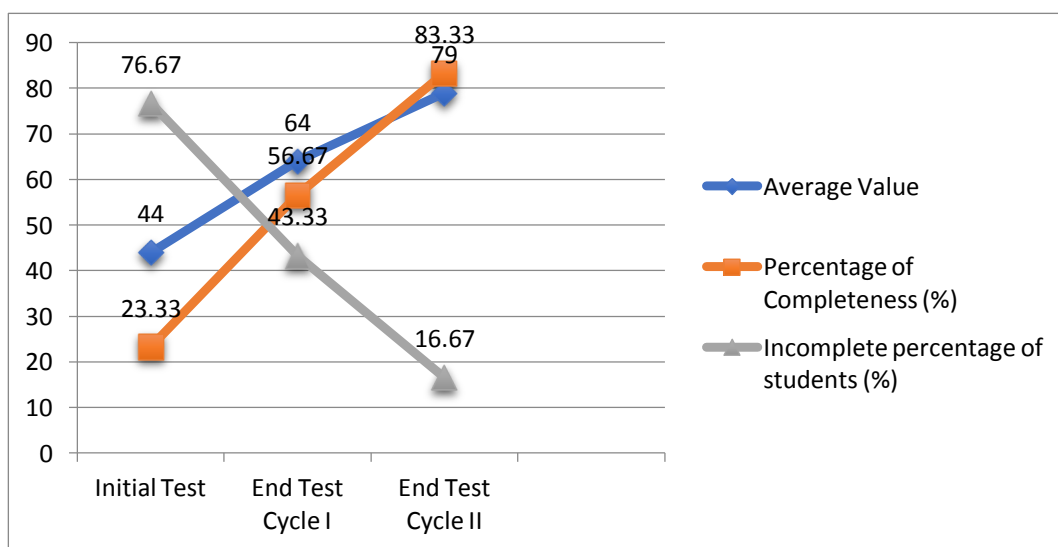


Figure 2. Graph of student learning outcomes

Based on the graphic image above, it can be seen that student learning outcomes have improved from the pre-test to the end of the cycle II test. The picture above shows that the average student score in the pre-test results, which is 44.00, has increased in the final test series of the cycle I, which is 64.00, and in the final test of cycle II, the average score

achieved by students is 79.00. The same thing also happened to the percentage of student completion. In the pre-test, the number of students who passed or reached the Minimum Completion Certificate was only seven. This figure increased after applying PMRI in learning to 17 people and again increased the number of completed students by 25 from the total number of students, namely 30 people. In contrast, the number of incomplete students experienced a decrease in the incomplete pre-tests of students by 23 people, decreased in the final test of the cycle I to 13 people, and decreased again in the final test of cycle II, namely to 5 people.

DISCUSSION

Learning using the application of PMRI is a learning process that emphasizes students as subjects in learning (Kamsurya, 2019; Pramudiani et al., 2017). The learning process places the real-world context as a medium in learning, and students construct their thoughts on a problem at hand to obtain a conclusion about the problem or material they are studying (Yulianti & Fauzan, 2019). PMRI is a learning approach where the learning process takes place students bring their thoughts to the surrounding environment. The purpose of the activity is so that the abstractness of mathematics can be lost and students can understand the material well according to their experiences. Because mathematics learning, so far, which teachers in general apply, always brings up the abstract nature of mathematics, students tend to think that mathematics is a difficult material to learn (Sopia & Wutsqa, 2015). This is in line with what was revealed by Soedjadi that a mathematics teacher must try to reduce the abstract nature of mathematical objects to make it easier for students to capture mathematics lessons (Soedjadi, 2014).

The learning process that takes place in grade VII students of SMP Amanah Bangsa by applying PMRI is active and motivates students in the learning process. Because, unlike the usual learning, in this learning, students are directly involved in learning activities, they are immediately introduced to the real world and construct their thoughts. In the social arithmetic material, the activity carried out by students is trading activities, where the learning process of students is directed to carry out buying and selling activities as occurred in a market. The process is very interesting for students, after which representatives of those who tell their experiences when carrying out the buying and selling process.

As a result of such activities, students can make their conclusions. For example, students can distinguish when we will experience a profit and when a trader experiences a loss. The process of these activities greatly affects students' understanding in understanding the

material and how to apply the knowledge they have gained. Because the mathematics learning process used by teachers is more oriented towards the teacher himself, students are only used as objects in learning which ultimately results in low student learning skills, especially in mathematics subjects (Güler, 2018).

The conventional learning process where the teacher applies the lecture method is very ineffective for the ability and understanding of students. Because of the learning process that takes place, students only sit and listen to explanations from the teacher. Student activities are passive, while the teacher plays a more active role in learning activities (Muttaqin et al., 2017). Such a learning method or approach is essential to student learning outcomes because students' understanding of the concepts of the material being studied is very weak, and students' memory is shallow because students are not directly involved in learning activities. Students only act as listeners to what the teacher conveys in the classroom (Jordaan et al., 2017; Putri et al., 2019).

Based on the results of research conducted on grade VII students of SMP Amanah Bangsa with Realistic Mathematics Education, obtaining learning results is excellent and significant. This is evidenced by the improvement in student learning outcomes, namely in the pre-test, the end test of the cycle I, and the final test of cycle II. In the initial student test process, where researchers have not applied a realistic mathematical approach, student learning outcomes are very low, namely, from 30 students who took the pre-test process, only seven students achieved minimal completion, namely, if presented, the completed student only reached 23.33% with the average class score obtained in the pre-test was 44.00.

Different things happen in learning after the application of PMRI. Student learning outcomes achieve quite good results in the first cycle, although these results have not achieved the results targeted during the learning process. From the final test results carried out in the first cycle, student learning outcomes have improved compared to the pre-test results, namely from 30 students, 17 of them obtained graduation. In other words, the 17 people have reached the minimum completion standards set. The percentage of passes in the first cycle was 56.67, with an average score of 64.00. The final test results achieved in cycle I have not reached the classical completion standard of 75%. This is because, in ongoing learning, there are still various shortcomings based on the results of the reflection of the cycle I. Therefore, the research that takes place is continued in the next cycle. Namely, cycle II, to obtain learning outcomes by the targeted. However, before the second cycle of learning takes place, researchers correct the shortcomings contained in cycle I, so that later the results achieved in cycle II learning can be maximized.

The process of implementing the final test of cycle II obtained a very significant increase in learning outcomes. This can be seen from students' average score on the cycle II final test, which is 79. The percentage of completion also increased, namely in the first cycle of students who were completed only reached 56.67%, while in cycle II. The percentage of completion reached 83.33%. These results show that if PMRI can be applied properly by teachers in the classroom, then it is not impossible that the learning outcomes achieved by students will get maximum results (Haji et al., 2019; Putri et al., 2019).

CONCLUSION

Based on the results of research conducted on grade VII students of SMP Amanah Bangsa, it can be concluded that learning using Realistic Mathematics Education can improve student learning outcomes. This is shown by the increase in the average score of students, namely in the pre-test of 44.00 with a percentage of completion of 23.33%, an increase in the first cycle to 64.00 with a percentage of completion of 56.67%. Meanwhile, in the results of the second cycle test, the average score was 79.00 with a percentage of completion of 83.33%.

RECOMMENDATIONS

Based on the conclusions above, the researcher conveyed several suggestions, namely (1) because mathematics learning with Pendidikan Matematika Realistik Indonesia (PMRI) can improve student learning outcomes, teachers should be able to apply the learning in the classroom, and (2) for schools should be able to socialize PMRI to every mathematics teacher to apply and develop this approach in the classroom.

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