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Improving Mathematics Learning Outcomes on Fraction Material Using PBL-Based Petis (Automatic Fraction) Media for Elementary School Students

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Abstract: This research aims to improve mathematics learning outcomes, especially fraction material, in grade 4 students at SDN 2 Banaran by using PETIS (Automatic Fractions) media based on problem based learning. This research has three cycles, each cycle consisting of four stages, namely planning, action, observation and reflection in accordance with the classroom action research model of Stephen Kemmis and Robyn McTaggarat. The data collection techniques used are document studies, questionnaires, interviews, observations and tests. Meanwhile, the data analysis techniques used are data reduction, data exposure, and data conclusion. An important finding in this classroom action research is that there was an increase in the percentage of classical completeness and the average class score in each cycle which ultimately reached the indicator of research success. Details of this increase include cognitive diagnostic assessment activities, student learning outcomes have a classical completion percentage of 36.84% which is classified as poor with an average class score of 59.47. In the first cycle, student learning outcomes had a classical completion percentage of 47.36% which was classified as sufficient with an average class score of 67.36. In cycle II, student learning outcomes had a classical completion percentage of 63.15%, which was classified as good, with an average class score of 77.89. In cycle III, student learning outcomes had a classical completion percentage of 84.21% which was classified as very good with an average class score of 84.21.

Keyword: Fractional material, PETIS Media (Automatic Fractions), PBL

PRELIMINARY

According to Ki Hadjar Dewantara in (Pristiwanti et al., 2022) education is guidance that can regulate the nature of children as humans and members of society so that they are able to achieve the highest safety and happiness. According to Law Number 20 of 2003 Article 1 Paragraph 1 concerning the National Education System (Hakim, 2016) education is a conscious and planned effort oriented towards students so that they can actively develop their potential. Meanwhile, according to Ahmad D. Marimba in (Rahman et al., 2022) education is conscious guidance carried out by educators towards

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the physical and spiritual development of students towards the formation of a primary personality. Based on the opinions above, it can be concluded that education is a conscious and planned effort to develop the abilities within a person so that they can benefit themselves and others.

Education is a very important thing in life. Through education we can develop human resources who are reliable, able to compete fairly and have a sense of humanity (Alpian et al., 2019). Every human being has the right to education, as do Indonesian citizens. In fact, because it is very important, the Indonesian government requires its citizens to receive at least basic education. This is reinforced by the 1945 Constitution Article 31 Paragraph 2 in (Herawati, 2016) which explains that every Indonesian citizen is obliged to attend basic education and the government is obliged to finance it. Basic education referred to here is a 12-year compulsory education program consisting of 6 years in elementary school, 3 years in junior secondary school, and 3 years in senior secondary school. Based on the program above, the level of education that must be taken first is elementary school education.

Primary school education is education provided for children aged 7 to 13 years which is adapted to the potential and characteristics of the educational unit (Masitah & Setiawan, 2017). Learning held in elementary schools emphasizes students' literacy and numeracy competencies (Faradiba et al., 2021). Numeracy is the ability to think using concepts, procedures, facts and mathematical tools to solve contextual problems in everyday life (Rohim et al., 2021). Numeracy skills are very important for students because through this ability they can apply their knowledge in social life (Rachman et al., 2021). One of the efforts made by the government to develop students' numeracy skills is through mathematics subjects.

Mathematics is a science that emphasizes human abilities in the field of reasoning based on certain patterns in the form of levels or regularities of things (Siagian, 2016). By studying mathematics subjects in elementary school, students will get used to thinking critically, objectively and logically from an early age. Unfortunately, this subject is considered a frightening threat by students (Mailani, 2013). Many students experience difficulties when studying mathematics subjects so that they have phobias in the form of feelings of nervousness, stress or anxiety. In fact, this also affects student learning outcomes where they tend to get grades below the KKM. A similar incident was also

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experienced by 4th grade students at SDN 2 Banaran. Based on the results of observations using the document study method on class 4 student report cards for semester I of SDN 2 Banaran, it shows that as many as 63% of students still got grades below the KKM (< 80).

Table 1. Mathematics Scores of Class 4 Semester I Students at SDN 2 Banaran

Value Predicate	The number of students	Persentase	Information
A (100-90)	-	-	Complete
B (89-80)	7 student	37%	
C (79-71)	12 student	63%	Not Completed
D (<70)	-	-	

Source: Document study results in the form of student report cards

After conducting interviews with the principal and class 4 homeroom teacher, it was discovered that this condition was also caused by learning loss which was the impact of implementing online learning. Learning loss is a phenomenon where a generation loses the opportunity to gain knowledge due to delays in the learning process (Pratiwi, 2021). The COVID-19 pandemic requires teaching and learning activities to be carried out not face-to-face, but through virtual spaces by utilizing various existing technological facilities. Something like this is something new for the learning system in Indonesia, not to mention that the technological facilities at SDN 2 Banaran can be said to be insufficient to carry out online learning well. As a result, teaching and learning activities are somewhat hampered and do not take place optimally.

On the one hand, the demands for mastering the learning materials in the 2013 curriculum are very tight, where in one day students must master the indicators that have been determined. So if a student has not mastered the concept of the material taught today, the teacher may not repeat it but must continue to the next material. This is very contrary to the concept of teaching mathematics, where to master a concept in a higher class, students are required to master the concept taught in the previous class (Biassari et al., 2021). This condition will also affect students' psychology, where they will become lazy when studying mathematics because they feel they are far behind and do not understand the basic concepts of the material being taught. To find out what material is felt to cause grade 4 students at SDN 2 Banaran to experience difficulties when studying mathematics, the author distributed a questionnaire. Based on the results of filling out the questionnaire, data was obtained in the form of 15 students having difficulty understanding fraction

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material; 11 students had difficulty understanding the KPK and FPB material; 12 students had difficulty understanding approximation material; 8 students had difficulty understanding the flat shape material; and 10 students had difficulty understanding statistics material. Based on this data, it can be concluded that grade 4 students at SDN 2 Banaran need further learning related to fraction material.

Teachers must always come up with creative learning innovations so that students are actively involved in learning activities so that they get a more meaningful learning experience. One innovation that can be applied is the problem based learning model. Problem based learning is a learning model with an authentic problem approach so that students can construct their own knowledge and develop high-level thinking skills (Pramudya et al., 2019). The syntax of the problem based learning model is: a) Problem orientation; b) Organizing students; c) Guiding student investigations; d) Develop and present work results; e) Analyze and evaluate the problem solving process (Suhendar & Ekayanti, 2018). Then, to make it easier for students to understand the material, teachers must also prepare relevant learning media. One of the learning media that can be used is PETIS (Automatic Fractions). PETIS (Automatic Fractions) is a technology-based learning media that integrates various applications to produce the creation of new learning media. The advantages of this media are: 1) It can make learning more interesting, 2) It can be used at any time, and 3) It can get used to using technology at SDN 2 Banaran (Ziveria & Purwandari, 2020).

Based on the background above, the author decided to conduct classroom action research entitled "Improving Mathematics Learning Outcomes in Fraction Material Using PBL-Based PETIS (Automatic Fractions) Media in Elementary School Students" which is expected to be able to improve mathematics learning outcomes, especially fraction material in grade 4 elementary school students. 2 Banar.

METHOD

This research uses the classroom action research method modeled by Stephen Kemmis and Robyn McTaggarat which classifies the process into four stages, namely: planning (plan), action (act), observation (observe), and reflection (Prihantoro & Hidayat, 2019) . In general, this research is divided into three cycles. In cycle I, the research focused on the sub-material of basic concepts of fractional numbers. In cycle II the research focuses on the sub-material of the basic concept of equivalent fractions. In cycle

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III the research focuses on the sub-material of simplifying and comparing fractions. This research was conducted in class 4 of SDN 2 Banaran, Pace District, Nganjuk Regency for the 2022/2023 academic year, consisting of 17 male students and 2 female students for approximately 1 month from February 6 2023 to March 13 2023.

The data included in this research was taken using several techniques, namely: 1) Document study techniques were used to collect data on students' mathematics learning outcomes through report cards; 2) Questionnaire techniques are used to collect data on students' learning needs regarding material that must be studied further; 3) Interview techniques were used to obtain research supporting information from school principals and tutors; 4) Observation techniques are used to find information related to student characteristics, learning implementation plans, learning implementation, school management, and the school learning environment; 5) Test techniques are used to collect data on students' mathematics learning outcomes. Meanwhile, the data analysis techniques used are: 1) Data reduction where the data obtained will be selected according to the researcher's needs; 2) Data exposure where the data will be processed in such a way that it can be translated; and 3) Data conclusion where the researcher formulates conclusions from the data obtained. To determine the level of student ability obtained from individual learning results, use a formula:

$$KB = \frac{B}{N} \times 100$$

Information
KB = Learning Completeness (Grades)
B = Score Obtained (Raw Score)
N = Total Score (Ideal Maximum Score)

Source: (Hutauruk & Simbolon, 2018)

Figure 1. Formula for calculating student learning completeness

Next, individual student ability data is processed using the following formula to determine the percentage of classical completeness:

$$PKK = \frac{T}{N} \times 100\%$$

Information
PKK = Classical Completion Percentage
T = Many students are KB ≥ 80
N = Many Research Subjects

Figure 2. Formula for calculating the percentage of classical completion

Source: (Hutauruk & Simbolon, 2018)

Classical completeness criteria can be grouped according to the following table:

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Table 2. Classification of Classical Completion Criteria

Level of success (%)	Desc
≥80%	Very good
60% - 79%	Good
40% - 59%	Fair
20% - 39%	Poor
<20%	Very Poor

Source: (Yanti & Abdullah, 2017)

Meanwhile, to find out the class average value, use the following formula:

$$\text{Class Average} = \frac{Total\ of\ all\ student\ grades}{The\ number\ of\ students}$$

Source: (Hutauruk & Simbolon, 2018)

Figure 3. Student Average Score Formula

The indicator of success in this research is if the student's classical completion percentage is ≥ 80% and the class average score is at least 80 in accordance with the KKM set by SDN 2 Banaran.

RESULT

A. Analysis of Cognitive Diagnostic Assessment Learning Results

Based on the cognitive diagnostic assessment learning results of 19 students, 7 students scored above the KKM while 12 other students did not reach the KKM. The percentage of classical completeness obtained was 36.84% which was classified as poor. The highest score a student can achieve is 90 and the lowest score is 0 with a class average score of 59.47 which has not yet reached the KKM. These results can be displayed in the following graph:

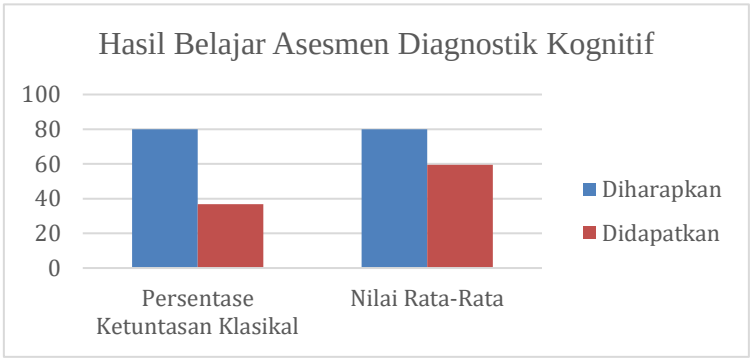

Figure 4. Comparison of Ideal Learning Results with Cognitive Diagnostic Assessment

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2. Analysis of Cycle I Learning Results

Based on the first cycle learning results of 19 students, 9 students got scores above the KKM while 10 other students did not reach the KKM. The percentage of classical completeness obtained was 47.36% which was classified as sufficient. The highest score a student can achieve is 100 and the lowest score is 20 with a class average score of 67.36 which has not yet reached the KKM. These results can be displayed in the following graph:

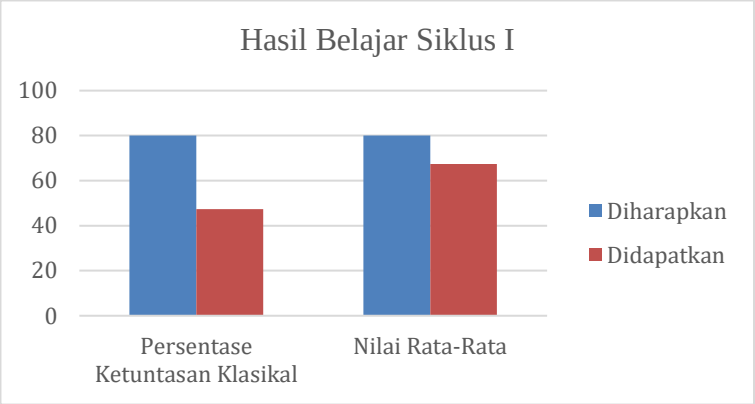

Figure 5. Comparison of Ideal Learning Results with Cycle I

3. Analysis of Cycle II Learning Results

Based on the second cycle learning results of 19 students, 12 students got scores above the KKM while 7 other students did not reach the KKM. The percentage of classical completeness obtained was 63.15% which was classified as good. The highest score a student can achieve is 100 and the lowest score is 40 with a class average score of 77.89 which has not yet reached the KKM. These results can be displayed in the following graph:

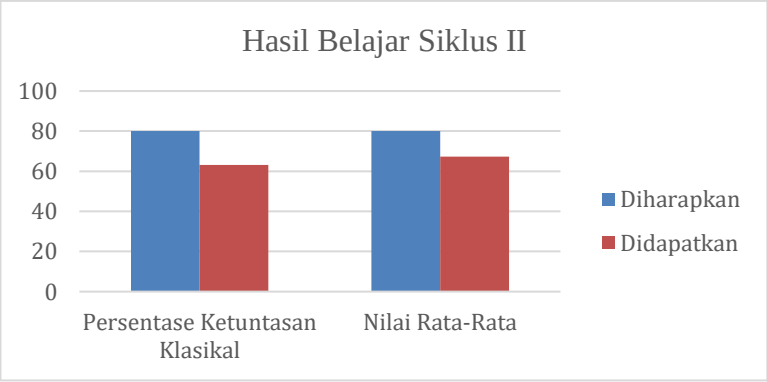

Figure 6. Comparison of Ideal Learning Results with Cycle II

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4. Analysis of Learning Outcomes Cycle III

Based on the learning results of cycle III of 19 students, 16 students got scores above the KKM while 3 other students did not reach the KKM. The percentage of classical completeness obtained was 84.21% which was classified as very good. The highest score a student can achieve is 100 and the lowest score is 60 with a class average score of 84.21 which has reached the KKM. These results can be displayed in the following graph:

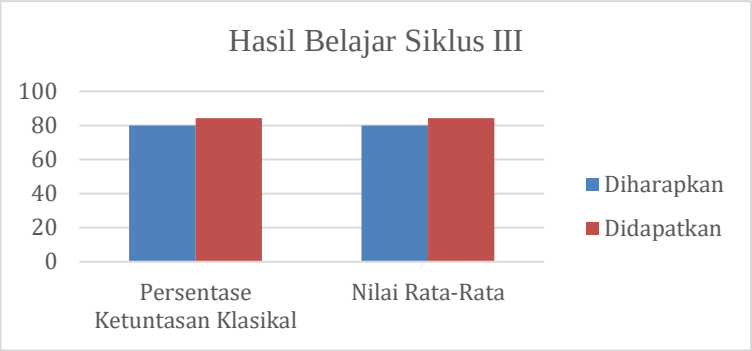

Figure 7. Comparison of Ideal Learning Results with Cycle III

DISCUSSION

The focus of this research is aimed at improving mathematics learning outcomes, especially fraction material, after using learning media in the form of PETIS (Automatic Fractions). According to Yusufhadi Miarso in (Nurrita, 2018), learning media is anything that is used to channel messages to someone so that it can stimulate that individual to carry out the learning process. Meanwhile, according to Ahmad Rohani in (Fadilah et al., 2023), learning media can be defined as anything that can be sensed which functions as a tool/intermediary/means in conveying learning material. On the other hand, learning media can also be interpreted as a tool that is a way for someone to teach/deliver learning material in an interesting way (Fatria & Listari, 2017). Based on the opinions above, it can be concluded that learning media is anything that is used by someone to convey learning material so that it can stimulate individuals to learn the material.

The use of media in implementing learning is very important. This is reinforced by the opinion which states that in the teaching and learning process the five components that are very influential are objectives, materials, methods, media and learning evaluation (Falahudin, 2014). By using learning media, there are several benefits that will be obtained according to Arief S. Sadiman in (Munawarah, 2019), including: 1) Can

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overcome the limitations of the senses, space and time; 2) Can make students actively involved in learning activities; and 3) Can equalize students' experiences and perceptions regarding learning material. The learning media used in this research is technology-based learning media that integrates various applications resulting in the creation of a new learning media called PETIS (Automatic Fractions). In general, there are two applications that are integrated in this learning media, namely the Microsoft Power Point application and the Baamboozle application. The Microsoft Power Point application is software used to design presentation materials in slide form (Hasanah, 2020). Meanwhile, the baamboozle application is a fun game to play in groups (Fitriani et al., 2022).

In cycle I, the learning media used was only the Microsoft Power Point application as a means to convey sub-material on basic concepts of fractions which can be accessed via the following link: https://bit.ly/3XW18ra.

Figure 8. PETIS Media (Automatic Fraction) Cycle I

Cycle I was carried out from 22 February 2023 to 28 February 2023 where the percentage of classical completeness which was originally in the cognitive diagnostic assessment activity was in the inadequate category and increased to sufficient. Likewise, the class average score which was originally only 59.47 for cognitive diagnostic assessment activities has increased to 67.36. Although student learning outcomes have increased, they have not yet reached the predetermined indicators of success. This can be caused by a lack of meaningfulness in the delivery of learning material. Therefore, researchers will implement follow-up action in the form of integrating technology-based educational games in the implementation of subsequent teaching practices.

Figure 9. Cycle I Teaching Practices

In cycle II, the learning media used integrated the Microsoft Power Point application as a means of conveying sub-material on basic concepts of equivalent

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fractions and the Baamboozle application as a means of checking students' understanding regarding this sub-material. The use of the baamboozle application is packaged in the form of a game played in groups where each group must work together to answer questions related to the basic concept of equivalent fractions in order to get the highest score. This game contains 10 questions with different consequences such as getting additional points, getting points deducted, stealing your opponent's points, and so on. This learning media can be accessed via the following link: https://bit.ly/3rlrpCN.

Figure 10. PETIS Media (Automatic Fraction) Cycle II

Cycle II was held from March 1 2023 to March 5 2023 where the percentage of classical completeness which was originally in cycle I was in the moderate category has increased to good. Likewise, the average class score which was originally in cycle I was only 67.36 has increased to 77.89. Although student learning outcomes have increased, they have not yet reached the predetermined indicators of success. This can be caused by a lack of consolidation of the material provided by the teacher. Therefore, researchers will implement follow-up in the form of providing discussions related to the questions displayed on the baamboozle application.

Figure 11. Teaching Practices Cycle II

In cycle III the learning media used integrates the Microsoft Power Point application and the Baamboozle application. The Microsoft Power Point application is used as a means to convey sub-material on simplifying and comparing fractions and discussing 5 questions that arise in the baamboozle application. Meanwhile, the baamboozle application is used as a means to check students' understanding of the sub-material. The use of the baamboozle application in cycle III is almost the same as cycle II, the difference lies in the sub-material tested and the number of questions listed is only 5 questions. This learning media can be accessed via the following link: https://bit.ly/44L5G5V.

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Figure 12. PETIS Media (Automatic Fraction) Cycle III

Cycle III was held from March 6 2023 to March 12 2023 where the percentage of classical completion which was originally in the good category increased to very good. Likewise, the class average score which was originally only 77.89 in cycle II has increased to 84.21. Based on this data, it can be seen that the results of mathematics learning, especially fraction material for grade 4 students at SDN 2 Banaran, have achieved the specified indicators of success. Therefore, classroom action research can be stopped in cycle III.

Figure 13. Teaching Practices Cycle III

CONCLUSION

Based on the research above, it can be concluded that the use of PETIS (Automatic Fractions) media based on problem based learning can improve mathematics learning outcomes, especially fraction material in grade 4 students at SDN 2 Banaran. This is proven by an increase in the percentage of classical completion and the average class score in each cycle which ultimately reaches the research success indicator. The details of this increase are that in cognitive diagnostic assessment activities, student learning outcomes had a classical completion percentage of 36.84%, which was classified as poor, with a class average score of 59.47. In the first cycle, student learning outcomes had a classical completion percentage of 47.36% which was classified as sufficient with an average class score of 67.36. In cycle II, student learning outcomes had a classical completeness percentage of 63.15%, which was classified as good, with an average class score of 77.89. In cycle III, student learning outcomes had a classical completeness percentage of 84.21%, which was classified as good, with an average class score of 84.21.

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