PRIMARY: JURNAL PENDIDIKAN GURU SEKOLAH DASAR
VOLUME 12 NOMOR 2 APRIL 2023
ISSN : 2303-1514 | E-ISSN : 2598-5949
DOI : http://dx.doi.org/10.33578/jpfkip.v12i2.9363
https://primary.ejournal.unri.ac.id/index.php/JPFKIP

THE IMPLEMENTATION OF CONCRETE OBJECT MEDIA TO INCREASE ELEMENTARY STUDENTS' LEARNING OUTCOMES ON FRACTION LEARNING MATERIAL

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PENERAPAN MEDIA BENDA KONKRIT UNTUK MENINGKATKAN HASIL BELAJAR PADA MATERI PECAHAN SISWA SEKOLAH DASAR

ARTICLE HISTORY

Submitted:
26 November 2022
26th November 2022

Accepted:
14 Maret 2023
14th March 2023

Published:
27 April 2023
27th April 2023

ABSTRACT

Abstract: *This paper discusses how students in understanding fraction learning material can use concrete objects in the learning process. Hence, this paper describes the use of concrete object media on fraction learning material to enhance the student's learning outcome. The research method used is Classroom Action Research through two cycles. The research subject was the third-grade students at SD Negeri X Palembang. The data were collected by using a test and observation sheet. The result reveals that the student's learning outcomes increased to 40% from the pre-cycle (T_0), 70% in cycle 1 (T_1), and 90% in cycle 2 (T_2). It means that concrete object media on fraction learning material could promote students' learning outcomes.*

Keywords: concrete object media, students' learning outcomes, fraction learning material

Abstrak: Artikel ini membahas bagaimana peserta didik dalam memahami materi pecahan dapat menggunakan media benda konkrit dalam proses pembelajaran. Maka, artikel ini mendeskripsikan penggunaan media benda konkrit pada materi pecahan matematika dalam meningkatkan hasil belajar peserta didik. Metode penelitian yang digunakan yaitu Penelitian Tindakan Kelas (PTK) yang dilakukan sebanyak dua siklus. Subyek penelitian merupakan peserta didik kelas III SD Negeri X Palembang. Teknik Pengumpulan data menggunakan Tes dan lembar observasi. Hasil penelitian menunjukkan terjadinya peningkatan ketuntasan hasil belajar dimulai dari pra siklus (T_0) sebesar 40% yang mana siklus 1 (T_1) sebesar 70% dan siklus 2 (T_2) sebesar 90%. Artinya penggunaan media benda konkrit dalam pembelajaran pecahan dapat meningkatkan hasil belajar peserta didik

Kata kunci: benda konkrit, hasil belajar siswa, materi pecahan

CITATION

Hidayati. (2023). The Implementation Of Concrete Object Media To Increase Elementary Students' Learning Outcomes On Fraction Learning Material. *Primary: Jurnal Pendidikan Guru Sekolah Dasar, 12* (2), 496-509. DOI: http://dx.doi.org/10.33578/jpfkip.v12i2.9363.

INTRODUCTION

Mathematics is a subject where most of the topics are closely related to the daily lives of students. Where this subject is a compulsory subject that is taught to students starting from elementary school to high school. Most of the concepts contained in learning mathematics are abstract. In this regard, educational theorists such as Bruner and Piaget posit the learning of mathematics as a development in the concrete-to-abstract direction. In particular, teaching mathematics should begin by engaging students with concrete manipulatives or real-world examples

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that represent mathematical ideas, followed by using numbers and symbols to represent mathematical ideas. (Huan et al., 2022).

Abstract material will hinder students' understanding of learning material. One of the material in learning mathematics that is abstract in nature is fractional material. Fractions are one of the materials in mathematics learning that are directly related to the real life of students. Fractional material is basic material that must be mastered by students and is a prerequisite material for studying further material. It's just that fractional material is still considered difficult for students to understand (Fuchs et al., 2016; Resnick et al., 2016).

The material for fractions that is considered difficult by students is found in both elementary and high school students, namely comparing and sorting fractions, estimating the size of fractions on the number line, performing arithmetic calculations of fractions, and solving word problems involving fractions (Tian & Siegler, 2017). This material is advanced material for fractions, so it is important for students to understand the basic material for fractions. Another opinion (Nanna & Pratiwi, 2020) states that fractions are more complicated than integers, and experiences with integer operations will cause cognitive barriers when individuals try to solve fraction operations.

Several other studies (Alghazo & Alghazo, 2017; Bentley & Bossé, 2018) that students, especially at tertiary institutions, still have misconceptions in solving mathematical problems. Many students do not understand the difference between the concept of fractions and the concept of integers and, make mistakes in applying understanding related to integers when solving fraction problems (Jayanthi et al., 2021). (Fuchs et al., 2016) said that knowledge of fractions, including understanding of fractions and skills in operating fractions, is a source of ongoing difficulty for many students. If these difficulties cannot be overcome by the teacher during the learning process, it will have an impact on student learning outcomes. As the initial findings of researchers indicate thatthere are still many students whose learning outcomes have not reached the Minimum Completeness Criteria (KKM) determined by the school. This can be seen in the pre-cycle learning outcomes test scores which are still low, namely only about 48% of students who are able to achieve the specified KKM. That is, there were only 13 students who achieved the KKM score.

Based on the results of observations, it was shown that during the mathematics learning process the teacher had not used the right learning media, especially in fractional material. So that students are less focused during the mathematics learning process and carry out other activities such as talking with their peers, even creating a noisy atmosphere. This can be caused by students not being directly involved in the learning process so that students are not motivated during the learning process.

From the description of the researchers' findings, it can be seen that the process of learning mathematics has not involved students in understanding the concept. In addition, teachers have not used learning media to help students understand the concept as a whole. Teacher-centered learning is not recommended to be applied in mathematics learning in elementary schools because it limits opportunities to construct knowledge, limits student learning activity, is monotonous, and makes students bored.

Learners need educational practices that are effective and easy to use for learning fractions (Ennis & Losinski, 2019). Where this practice is very important for students to experience as a meaningful thing in getting benefits for further learning (Vessonen et al., 2021). One of them is the use of concrete object media in learning mathematics, especially in fractional material.

Concrete object media used in learning mathematics has many contributions to the

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teaching and learning process. Media concrete objects make learning more successful than using only abstract symbols (Sarama & Clements, 2016), facilitate understanding of mathematical concepts (Kontas, 2016), increase retention (Jones & Tiller, 2017), and provide exploration opportunities for students to solve problems (Rosli et al., 2015).

Several related studies have been conducted (Abarquez, 2020) ound that there is a significant difference in the average gain value in *pretest* and *posttest* students in mathematics that are taught using concrete and conventional media. Where the use of concrete media in learning mathematics is more effective than the use of conventional methods. The same thing was found by (Jones & Tiller, 2017) Physical mathematics teaching aids in the form of concrete object media can involve students' thought processes in valuable ways that result in high information retention.

Furthermore, several studies examined teachers' views regarding the use of concrete media in the learning process, such as (Quigley, 2021) onducted a study to investigate the assumptions and practices of 49 New South Wales (NSW) elementary school teachers regarding their assumptions and practices regarding the use of concrete objects in learning. and teaching numbers and algebra. (Yildiz & Atay, 2019) found that elementary school mathematics teachers thought that the use of concrete materials in learning mathematics was important and effective. Meanwhile (Furner & Worrell, 2017) explains the factors that contribute to teachers' use of concrete media in learning mathematics.

Not only in learning mathematics, concrete object media can also be applied in science learning as has been done (Kejora, 2020) found inquiry learning by utilizing concrete media can significantly improve students' science process skills. (Stull & Hegarty, 2016) developed representation competence in organic chemistry students by using 3D models (concrete and virtual) as a tool to teach students to translate between several 2D diagrams. Therefore, this study will discuss the use of concrete media in learning mathematics, especially in fractional material. As the result that research is expected to find out How to use concrete object media in mathematics fraction material in improving learning outcomes of third grade elementary school students.

METHOD

The research method used is Classroom Action Research (CAR). According to Hopkins in (Kunandar, 2016) defines Classroom Action Research is research to help someone practically overcome problems faced in emergency situations and help achieve social science goals by working together within a mutually agreed upon ethical framework. Classroom Action Research can also be interpreted as a scientific activity carried out by the teacher in his own class by designing, implementing, observing, and reflecting on actions through several cycles in a collaborative and participatory manner which aims to improve or improve the quality of the learning process in his class (Juanda, 2016).

The PTK model put forward by Kemmis and Mc Taggart is a development model of Kurt Lewin's model. It is said so, because in a cycle consists of four components, the four components, include: (1) planning, (2) action/action, (3) observation, and (4) reflection. After a cycle has been implemented, especially after reflection, it is then followed by re-planning which is carried out in the form of a separate cycle as illustrated in Figure 1.

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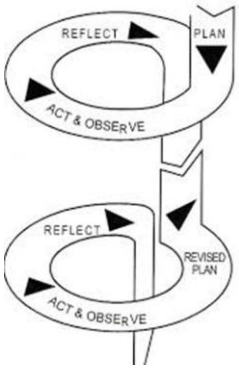

Figure 1. PTK Procedure

From Figure 1, we can describe the steps of the activities carried out in PTK activities as shown in Table 1.

Table 1. Details of PTK Activities

Level	Detail of Activities
1. The initial reflection	The initial reflection is part of the pre-cycle stage, held on Wednesday, October 27, 2022, the researcher collects observational data on the results of learning Mathematics in fraction material which discusses determining the position of simple fractions in an image illustrated by the teacher.
2. Cycle I Learning Improvement Stage	a. Planning Stage Preparing matters related to the learning process, such as: sources of materials to be used in the implementation of cycle I learning improvements, Cycle I Learning Implementation Plans (RPP), learning materials, learning media in the form of concrete media (such as white bread and mangosteen paper, Student Worksheets, Cycle 1 Test Questions, tools for documenting during the learning process, and teacher and student observation sheets b. Level of Action Implementation The implementation carried out in cycle I was carried out on Thursday 27 October 2022. At this stage the researchers made observations from 09.30 WIB to 10.30 WIB. Implementation activities are adjusted to the Learning Implementation Plan (RPP) that has been prepared. c. Observation This stage is carried out and runs simultaneously at the time of implementation of the action. Observations were made during the

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first cycle of learning taking place using Student Worksheets (LKPD) that had been made during the action planning. Observations were made to find out the strengths and weaknesses of the teacher in carrying out teaching and learning activities. So that it can become a separate understanding in carrying out subsequent teaching and learning activities.

d. Reflection stage

After seeing the results of observations and notes during the implementation of the first cycle of learning, the teacher held a reflection to find out the weaknesses, constraints and obstacles as well as the strengths during the learning process.

3. Cycle II Learning Improvement Stage

a. Planning Stage

The improvement stage of planning for cycle II was carried out from the results of reflection on the early learning of Mathematics in class III fraction material. Based on the results obtained from cycle I, it is known that the level of mastery in learning is quite good, but in the process of learning activities there are still students who have not been actively involved in the learning process. This is because students still do not understand the implementation of the activity steps contained in the LKPD. In addition, the teacher was not satisfied with the evaluation results from the value analysis found.

b. Level of Action Implementation

Implementation carried out in cycle II, carried out on Tuesday, November 8 2022. Implementation activities are adjusted to the Learning Implementation Plan (RPP) that has been prepared

c. Observation

Pengamatan atau observasi dilakukan oleh Observation or observation is carried out by the teacher using an observation sheet that contains teacher activities. From the results of observations on the implementation of learning cycle II, the scores were better and had met the standards of learning completeness and there was an increase compared to cycle I.

d. Reflection Stage

From the results of the review on learning cycle II as a reflection, that in that learning there is progress and good development in the learning situation that takes place quite significantly,

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because in that learning students are already disciplined and actively involved in the learning process which is shown through an increase in the percentage of student activity

The subjects of this study were third grade students at Elementary School Palembang consisting of 17 female students and 13 male students. Data collection techniques that will be used in this study are tests and observation sheets.

Tests are used to measure the success of learning outcomes in action research, a comparison of the average value of each cycle is carried out. To find the average value of all students used the formula:

$$M_X = \frac{\sum x}{N}$$ (Sudijono, 2010)

Learning completeness at SD Negeri X Palembang, that is, mastery occurs when in the class there are at least 85% of students who have received a score greater than 65, to calculate the percentage of learning completeness the following formula is used:

$$P = \frac{\sum siswa\ yang\ tuntas\ belajar}{\sum Siswa} x \ 100\%$$

(Daryanto, 2011)

To find out the completeness of student learning outcomes, school assessment curriculum standards can be used. For a more detailed explanation of the criteria can be seen in Table 2

Table 1. Elementary School Curriculum Palembang

Minimum Completeness Criteria (KKM)	Score
Completed	≥ 65
Not Completed	< 65

Observation of student activity is used to assess the activeness of students presented in the list*chek list* (√). Each aspect observed was given a good, sufficient and poor value. The steps taken in processing the student activity observation sheet data are as follows:

Calculates the average score of each student for all aspects of the assessment.

$$\% = \frac{rata - rata\ aktifitas\ siswa}{jumlah\ siswa\ dikelas} x\ 100\%$$

The percentage of student activity can be categorized based on the criteria shown in table 3.

Table 2. Student Activity Criteria

Percentage	Category
76 ≤ score ≤ 90	Good
56 ≤ score ≤ 75	Average
40 ≤ score ≤ 55	Poor

Modifikasi dan adaptasi (Widayanto, 2009)

RESULTS AND DISCUSSION

a. Student Learning Outcomes Before Given Action (T_0)

The test data before the action was taken from students' daily test scores on the subject of determining the position of simple fractions in the picture and writing down the fractional value based on the picture correctly. Student learning outcomes before being given action (T_0) is shown in Table 4. The

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completeness of the participants' mathematics learning outcomes was still low, out of 30 students, there were 12 students or 40% of students who scored ≥65. This means that it has not achieved classical learning mastery, which is 85%. Therefore, it is necessary to improve the learning process so that student learning outcomes increase

Table 3. Frequency Distribution of Student Learning Outcomes After Action (T_0)

Score	The number of Students	Completeness	Total Completeness	Percentage	Amount
≥ 90	0	Completed	12	0%	40%
65 – 89	12	Completed		40%	
50 – 64	18	Not Completed	18	0%	60%
≤ 50	0	Not Completed		60%	
Amount		30	30	100%	100%

b. Student Learning Outcomes After Action (T_1)

The test data before the action was taken from students' daily test scores on the subject of determining the position of simple fractions in the picture and writing down the fractional value based on the picture correctly. Student learning outcomes before being given action (T_0) is shown in Table 4. The completeness of the participants' mathematics learning outcomes was still low, out of 30 students, there were 12 students or 40% of students who scored ≥65. This means that it has not achieved classical learning mastery, which is 85%. Therefore, it is necessary to improve the learning process so that student learning outcomes increase.

Table 4. Frequency Distribution of Student Learning Outcomes Cycle I (T_I)

Score	The number of students	Completeness	Total Completeness	Percentage	Amount
≥ 90	0	Completed	12	0%	40%
65 – 89	12	Completed		40%	
50 – 64	18	Not Completed	18	0%	60%
≤ 50	0	Not Completed		60%	
Amount		30	30	100%	100%

c. Student Learning Outcomes After Action (T_2)

Action improvements in the second cycle led to an increase in student learning outcomes. The percentage of class completeness is 90% or 23 students who are declared to have completed their studies with an average learning achievement score of 85.17. Classically, this class has been declared to have completed learning, because it has met the percentage requirements for classes that have been declared to have completed learning, which is equal to 85%. Frequency Distribution of Student Learning Outcomes After Action (T_2) can be seen in Table 6.

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Table 5. Frequency Distribution of Cycle II Student Learning Outcomes (T_{II})

Score	The number of students	Completeness	Total Completeness	Percentage	Amount
≥ 90	17	Completed	27	57%	90%
70 – 89	10	Completed		33%	
50 – 69	3	Not Completed	3	10%	10%
≤ 50	0	Not Completed		0%	
Amount		30	30	100%	100%

Student learning outcomes have increased from cycle one to cycle two. Recapitulation of student learning outcomes from cycle one to cycle two can be seen in Table 7.

Table 6. Recapitulation of the Frequency Distribution of Student Learning Outcomes

	Average Value of Learning Outcomes	The number of students Complete Study	Completeness Student Learning (%)	Achievement Learning outcomes
T_0	61	12	40	Not Completed
T_1	70	21	70	Completed
T_2	85	27	90	Completed

Data recapitulation of the frequency distribution of student learning outcomes in each cycle shows that there is an increase in the average learning outcomes and completeness of student learning outcomes. A significant increase between student learning outcomes and completeness of student learning outcomes can be seen in Figure 2.

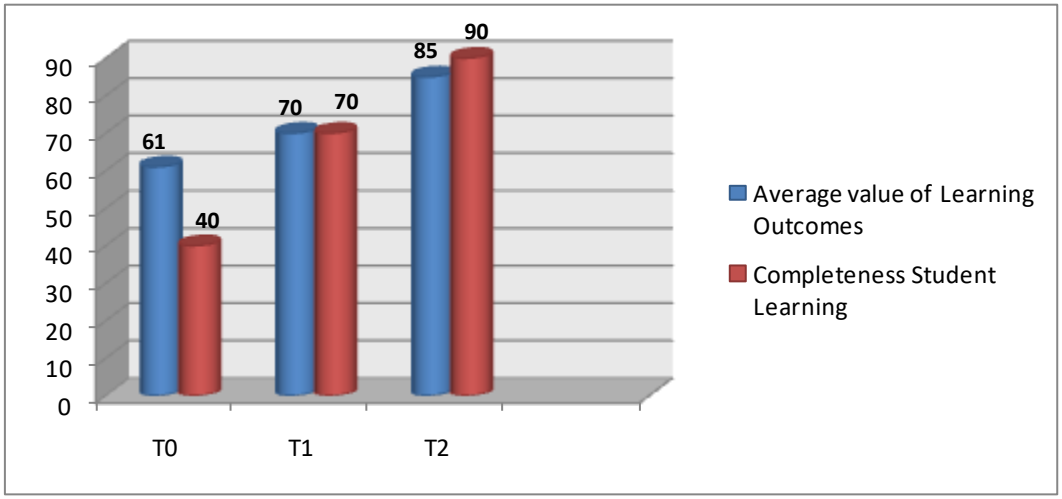

Figure 1. Bar Chart of Student Mastery Learning

Student activity was obtained from the observation sheet used at each meeting which aims to see student activity during the learning process. Recapitulation of the frequency

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distribution of student activity from cycle one to cycle two can be seen in Table 8.

Table 7. Recapitulation of Student Activity Frequency Distribution

No	Aspect	Good	Average	Poor
	% Activity of cycle I			
1	Student attention when receiving lessons	23%	40%	37%
2	Seriousness in carrying out the assigned tasks	57%	43%	0
3	Activeness in group discussions	30%	50%	20%
4	Responsibility in working on problems found in LKPD	23%	50%	27%
5	Collaboration in activities contained in LKPD	37&	43%	20%
	% Activity of cycle II			
1	Student attention when receiving lessons	60%	40%	0
2	Seriousness in carrying out the assigned tasks	67%	33%	0
3	Activeness in group discussions	47%	43%	13%
4	Responsibility in working on problems found in LKPD	60%	27%	13%
5	Collaboration in activities contained in LKPD	53%	37%	10%

Based on the results of the pre-cycle test, namely on material related to determining the position of simple fractions in the picture and writing down the value of the fraction based on the picture correctly, it is known that the completeness of student learning outcomes is 40% with an average value of 61. The frequency of the number of students who get a score of 50 is 0 students, the value range of 50 – 64 is 18 students and the value range is 65 – 89 is 12 students. At the pre-cycle stage, the completeness of student learning outcomes is still low. This is because the learning process that the teacher uses is one-way learning. This means that the teacher only focuses on delivering material without actively involving students in the learning process. This will have an impact on student motivation and student learning outcomes. As it is known that mathematics is a subject where most of the material contains abstract concepts, especially fractional material. In the pre – cycle learning outcomes, it can be seen that there are still many students who have difficulty understanding fractional material. So that in the process of learning mathematics, especially in fraction material, a media is needed that can help students to be able to understand the concept of fractions well.

In cycle I, the material taught is about determining the depiction of simple fractions ($\frac{1}{2}$, $\frac{1}{3}$, dan $\frac{1}{4}$) and define images with corresponding simple fractional values ($\frac{1}{2}$, $\frac{1}{3}$,dan $\frac{1}{4}$). In the main activity, the teacher uses concrete objects (bread) to help students learn simple fractions. During the learning process, students seemed enthusiastic about listening to the teacher's explanation of simple fractions. In addition, some students were actively involved in question and answer activities. After the

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teacher explains about simple fractions, the teacher asks students to carry out group discussion activities. In group discussion activities, students carry out several activities contained in the LKPD, the purpose of this activity is to learn about how to find fractions through the activity of splitting bread and cutting paper and demonstrating simple fractions with food or other materials provided.

After students carry out the activities contained in the LKPD, students work on practice questions as a form of strengthening students' concepts. During the group discussion activities, some students were able to understand fractional material well. Students are able to determine the position of simple fractions in the picture and write down the value of the fraction based on the picture correctly. This can be seen from the analysis of student activities where the aspect of seriousness in carrying out the task is given in the good category of 57% and the aspect is average category of 43%. For the aspect of activeness in group discussions, the good category is 30% and the average category is 50%. At the end of the learning activity, the teacher reflects in the form of question and answer activities. After that, the teacher gave cycle I test questions as a form of evaluation of students' understanding of fractional material. From the first cycle test, it was obtained that the average score of students was 70 with a learning completeness percentage of 70%. Increasing learning outcomes is caused by students being able to find abstract material into something real because it involves objects related to the daily lives of students.

Cycle II, the teacher carries out teaching based on improvements to the weaknesses of cycle I. In the preliminary activities the teacher conducts apperception by asking questions to students related to material that has been previously studied. In this activity, students seemed enthusiastic in answering questions from the teacher. This is because some students have understood the concept of simple fractions well. Where there were 28 (93%) students who raised their hands to answer questions from the teacher regarding simple fractions.

In the core activity, the teacher asks students to sit in groups according to predetermined group members. The purpose of this activity is so that students do not make noise during the process of group discussion activities. Furthermore, the teacher explains about equivalent fractions by providing illustrations through the media of concrete objects in the form of white bread. At this stage, students are very focused on paying attention to the teacher's explanation and have high enthusiasm in answering questions from the teacher. This can be seen from the results of the recapitulation of student observation sheets on the attention aspect of students when receiving lessons with the good category of 60% and the average category of 40%.

After that, students carry out the activities contained in the LKPD. The purpose of this activity is to learn about how to find equivalent fractions through the activity of splitting bread and cutting paper and demonstrating simple fractions with food or other materials provided. Before the activity took place, there were two things of reinforcement provided by the teacher, namely: first, the teacher asked students not to make noise. If there are students who are not orderly in the learning process, these students are not allowed to participate in learning activities. Second, the teacher asks students to be actively involved during the process of group discussion activities and asks students to be responsible for solving problems and working on practice questions found in LKPD. From the two reinforcements given by the teacher, the learning process takes place in an orderly manner and the participants are actively involved and work together in group discussion activities and have a sense of responsibility in completing the practice questions found in the LKPD.

This can be seen from the results of the recapitulation of student activity observation

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sheets. Where in the aspect of seriousness in carrying out the task given to the good category of 67% while the category is average of 33%. In the aspect of activeness in group discussions, namely the good category of 47%, the category is average of 43% and the category is poor of 13%. In the aspect of student responsibility in working on the problems contained in the LKPD, namely the good caregory of 60%, the category is average category of 20% and the category is poor of 13%. For the Cooperation aspect in the activities contained in the LKPD, namely the good category of 53%, the average category of 37% and the poor category of 10%.

After the cycle II learning process was completed, the teacher gave a cycle II test to determine students' understanding of equivalent fractional material. From the second cycle test, it was obtained that the completeness of student learning outcomes was 90% with an average learning achievement score of 85.71. From the completeness of learning outcomes, it can be seen that there is an increase in the percentage of passing learning outcomes, namely 20% from the first cycle. The improvement in the completeness of the second cycle of learning outcomes has met the completeness requirements of the learning outcomes, namely 85% of students get a score of 65, so that this research stops in the second cycle because it has achieved the desired mastery of learning outcomes.

From the results of observations made in cycles one and two, it can be seen that during the teaching and learning activities, the students were very enthusiastic and actively involved in the learning process. This is in line with the advantages found in the use of concrete media in explaining fractional material. (Wahab et al., 2021) explains the advantages of using concrete object media, namely increasing students' interest in learning the subject matter and providing real experiences that stimulate self-activity for learning.

The learning process by using concrete objects in learning mathematics, especially in fractional material can help students understand learning material well. This is because the use of concrete objects is related to the cognitive development of students. According to the cognitive development put forward by Jean Piaget that third grade elementary school students are in the concrete operational phase. Cognitive development of each child is an important factor that influences the formation of both concrete and abstract concepts. At the concrete operational level, effective learning objects depend on concrete and direct experiences. Based on Piaget's theory, it can be concluded that the use of concrete materials is very important in the early stages of teaching (Rusiman et al., 2017).

The use of concrete objects in the mathematics learning process has a positive impact on students' mastery of concepts regarding the topic of fractions. This can be seen from the research results which show that the learning outcomes of students have increased starting from the pre-cycle to the second cycle. The same thing was also found by (Vessonen et al., 2021) who said that concrete or manipulative concrete objects were very effective in teaching fractions. Not only does it have a positive impact on student learning outcomes, concrete object media also helps the teaching process carried out by the teacher. In line with the findings (Yildiz & Atay, 2019) states that teachers think that the use of concrete material in mathematics class facilitates understanding of mathematical concepts, concretizes abstract concepts, provides permanent learning and arouses curiosity among students.

Learning by using concrete object media can also increase students' motivation in learning fraction material. This can be seen from the percentage of student activity sheets. That is, through the use of concrete media objects in learning indirectly involve students in teaching and learning activities. As stated by (Kontas, 2016) learning by using concrete

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ISSN : 2303-1514 | E-ISSN : 2598-5949
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https://primary.ejournal.unri.ac.id/index.php/JPFKIP

media can increase their motivation and allow students to learn while having fun. Such positive feedback is an indicator of positive attitudes towards mathematics learning and the use of manipulatives in mathematics learning. In addition, (Cope, 2015) manipulative not only contributes to the cognitive aspects of the learner, but also enhances the development of psychomotor skills.

CONCLUSIONS AND RECOMMENDATIONS

The use of concrete learning media in the process of learning mathematics, especially in fractional material, can improve student learning outcomes. Where students are actively involved during the learning process. Students are motivated in participating in discussion activities that involve the use of concrete media objects. The increase in student learning outcomes can be seen from the percentage of student learning completeness classically before being given action (Pre-cycle) has increased

Based on the research that has been done, the researchers provide advice to third-grade elementary school teachers in teaching and learning activities (KBM) in class, especially in the process of learning mathematics on the topic of fractions can use concrete media as an alternative to improve learning outcomes and students' understanding of the material taught. This is because concrete object media has advantages, namely increasing students' interest in learning the subject matter and providing real experiences that stimulate self-activity for learning.

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PRIMARY: JURNAL PENDIDIKAN GURU SEKOLAH DASAR
VOLUME 12 NOMOR 2 APRIL 2023
ISSN : 2303-1514 | E-ISSN : 2598-5949
DOI : http://dx.doi.org/10.33578/jpfkip.v12i2.9363
https://primary.ejournal.unri.ac.id/index.php/JPFKIP

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