

## Application Of The M-Apos Learning Model (Modification-Action, Process, Object, Scheme) To Improve Mathematics Outcomes In Class IV State Elementary School 011 Rambah Samo

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**Abstract,** This study aims to find out that the application of M-APOS learning to improve mathematics learning outcomes for fourth grade students at SD Negeri 011 Rambah Samo. The background that underlies this research is the failure to achieve the learning objectives as illustrated by the students' daily test scores in mathematics learning which are still below the KKM score of 75. The subjects in this class action research were 29 students of SD Negeri 011 Rambah Samo, consisting of 14 female students and 15 male students. The data analysis technique used in this study was to use several instruments in the form of question sheets and student activity observation sheets. The results of this study can be seen from the first cycle of students who completed 50% (17 students) and 43% (11 students) did not complete with an average score of 65.30, increased by 60% (19 students) . , then experienced an increase in meeting 2, with 92% (22 students) completing and 8% (7 students) not completing with an average score of 90.5. With an increase in learning outcomes there is an increase in the activity of teachers and students. Based on these learning outcomes it can be said that there was an increase in student learning outcomes from cycle 1 to cycle 2 by 35%. When viewed from the data that has been obtained, it can be seen that those who passed have exceeded the indicators of success. So it can be concluded that the application of M-APOS learning to improve Mathematics learning outcomes for fourth grade students at SD Negeri 011 Rambah Samo has been successful.

**Keywords :** M-APOS, Learning Outcomes, Mathematics

### I. INTRODUCTION

Education is a process that must be taken by every child of the nation. It is said so because education has a very high influence on student development. Education is an absolute necessity that must be met throughout life. Without education, it is impossible for a human group to develop in line with the aspirations to progress, prosper and be happy according to their concept of outlook on life. Ghozi's opinion in Sumarmo (2014) that education

is a community and nation's effort in preparing their generation to face challenges for survival in the future (Noviana, et al, 2018)

In Law Number 20 of 2003 Article 1 concerning the National Education System it is stated that: Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence , noble

character, and skills needed by himself, society, nation and state.

Education aims to create a learning atmosphere and learning process. This means that in education, the process and learning outcomes should be in balance to form fully developed students. All the knowledge obtained certainly does not come by itself. But it is obtained by learning a lot

Learning is a business process carried out by someone to improve knowledge, behavior and skills towards a better direction based on experience from various materials that have been studied. Active learning is a teaching and learning system that emphasizes student activity physically, mentally, intellectually and emotionally. According to Nurhayati, et al, 2013 Learning activities that emphasize student activity greatly influence student learning success (Priyono, 2016). According to Haryanto, there are six things that affect student activity in class, namely: students, teachers, material, place, time, and facilities (Wibowo, 2016). The role of the teacher is very much needed in the learning process in the classroom, therefore the teacher is referred to as a facilitator. In addition, successful learning according to Rohani (2010: 8) Successful learning must go through various kinds of activities, both physical and psychological activities.

Physical activity is when students are active with their limbs, making things, playing or working, not just sitting around. Psychic activity if the mental power works as much as possible or functions a lot in the context of teaching. According to Spiritual, successful learning can be applied to learning Mathematics

Learning mathematics is one of the basic sciences that has an important role in human life, because almost all science and technology is related to mathematics. Mathematics lessons really need to be given to students because with math lessons students can solve problems in everyday life. Once the importance of the role of mathematics, it is necessary to improve student mathematics learning outcomes. Mathematics is also one of the subjects that is very important in the success of educational programs, because mathematics is part of academic education and is a basic science for other sciences, as well as a means for students to be able to think logically, critically and systematically. Therefore, students are required to be able to master mathematical concepts as early as possible completely.

Mathematics is studied at every level of education, from elementary school, middle school, to university. Mathematics is the main science that students must learn at school. However, the fact that exists in

schools is that mathematics is used as a subject that is considered difficult for students and is often ignored by students which results in low student learning outcomes in mathematics.

The low learning outcomes in mathematics are also influenced by many factors, including a lack of conceptual understanding of the material being taught. Students are used to memorizing formulas so they don't understand the actual learning concept. In addition, Wahyuningtyas, et al (2014) said that the low student learning outcomes were also caused by monotonous learning, namely only using the lecture method (Priyono, 2016)

According to Masykur, (2007) the public opinion, especially among students, is that mathematics is still a subject that is difficult, confusing and even feared by most of those who study it (Lestari 2015).

Based on observations on August 23, 2022 at SD Negeri 011 Rambah Samo, in the process of learning mathematics children are not encouraged to develop thinking skills and play an active role. In learning mathematics there must be a link between students' previous learning experiences and the concepts to be taught. When the mathematics learning process takes place, the teacher teaches mathematics still using the lecture method, the teacher has not created fun learning, so

that the learning objectives have not been achieved as expected. The non-achievement of the learning objectives is illustrated by the value of student assignments as follows:

Table 1 Data on the Daily Tasks of Class IV Students in Learning Mathematics

<b>KKM determined by the school</b>	<b>Total number of students</b>	<b>Students complete</b>	<b>Percentage of students complete</b>	<b>Students have not finished</b>	<b>Persentase siswa belum tuntas</b>
<b>75</b>	<b>29</b>	<b>10 siswa</b>	<b>34%</b>	<b>19 siswa</b>	<b>66%</b>

In the 2013 curriculum, to teach mathematics teachers must design lessons that encourage students to find out what material will be studied, encourage students to be able to formulate a problem from the material to be studied, train students to think analytically in solving mathematical problems, and emphasize students' about the importance of cooperation and collaboration in solving mathematical problems (Maya, 2014). Therefore innovation is needed in learning mathematics that can increase student activity and learning outcomes. One appropriate learning model to realize this is through the Modification-Action, Process, Object, Schema (M-APOS) learning model.

The M-APOS theory is a learning theory whose application is specifically for students. The philosophical basis of the M-APOS theory is social constructivism. Learning using the M-APOS theory emphasizes the acquisition of knowledge through preliminary activities through computer media, working in groups (cooperative learning) and reflection. Learning begins with activities in the computer laboratory. The purpose of this activity is to provide students with experience regarding a concept to be studied.

According to Dubinsky & McDonald, (2009) M-APOS theory is a learning theory that integrates the use of computers, learning in groups and paying attention to the mental construction carried out by students in understanding a mathematical concept. These mental constructions are actions, processes, objects, and schemes which are abbreviated as M-APOS (Dermawan and Wahyudin, 2018).

The results of Lestari's research (2015) in his journal, The M-APOS learning model is a learning model based on a modified M-APOS (Action-Process-Object-Scheme) theory. M-APOS is a learning model that utilizes worksheets as a guide for student activities. Student activities in the M-APOS learning model

using a computer can be mutated into giving assignments.

The M-APOS learning model goes through several stages. First, in the activity section, namely by giving assignments called Assignment Worksheets (LKT) students can work on them at home or at school. It is intended that students have a readiness understanding of the learning to be studied. The second stage, namely the class discussion section carried out in this group is called the Discussion Worksheet (LKD). In this second stage, students are given the opportunity to discuss and test their understanding of the concepts students have obtained from the previous stage. At the last or third stage is by giving practice questions.

This aims to strengthen and strengthen students' understanding of mathematical concepts. In learning M-APOS students are encouraged to study individually and in groups.

Modifications were made in the activity phase, where activities in the computer laboratory on the APOS model were replaced by giving recitation assignments given before learning was carried out. Recitation assignments are presented in the form of worksheets (LKT) that guide and assist students in studying concepts or solving math problems. The

definition of action, process, object and scheme is explained as follows:

- a. Action, at this stage there is a transformation of objects that are felt by individuals as something necessary, as well as step-by-step instructions on how to carry out operations.
- b. Process, which is a mental construction that occurs internally when a person is able to perform the level of action repeatedly.
- c. Objects, can be interpreted as something that results from the mental construction that has been done at the process stage.
- d. Schema, which is a collection of actions, processes, and objects that are summarized into a schema.

Based on the problems that have been raised, the title of this study is "Application of the M-APOS Learning Model (Modification-Action, Process, Object, Scheme) to Improve Mathematics Learning Outcomes for Grade IV SD Negeri 011 Rambah Samo".

## **II. RESEARCH METHODS**

### **Research subject**

The subjects in this classroom action research were fourth grade students at SD Negeri 011 Rambah Samo, the total number of fourth grade students was 29 consisting of male and female students.

### **Time and Place of Research**

- a. Research time

This classroom action research was conducted in the even semester of the 2023/2024 school year, for 3 months.

- b. Research Place

This classroom action research was conducted at SD Negeri 011 Rambah Samo, Rokan Hulu Regency. The reason I chose to do research here was because I was interested in the problems I found at this school

### **Research Design and Procedures**

The research method used in this research is Classroom Action Research. According to Hopkins (1993) in the thesis D.N. Kerling (2020), classroom action research begins with planning action (Planning), implementing action (action), observing and evaluating the process and results of action (Observation and evaluation). This research was conducted to improve the quality of learning practices in the classroom. This study also aims to improve student learning outcomes in mathematics in the application of the M-APOS learning model. According to Kemmis & Taggart (1988) action research is a study conducted to improve oneself, one's own work experience, but carried out in a systematic, planned, and introspective manner. The research design adopted in designing this research is Classroom Action Research. Definition of research according

to experts. Each model has a different implementation procedure, the following are the steps for classroom action research according to Arikunto (in Baringin 2021)

1. Planning

Planning is the initial plan to determine the process of the learning journey so that it is carried out properly.

2. Action

Action is the treatment carried out by the researcher in accordance with the plan that has been prepared by the researcher

3. Observation

Observations are observations made by researchers to determine the effectiveness of actions or collect information about various weaknesses (shortcomings) of actions that have been taken

4. Reflection

Reflection is an analysis of the results of observations to bring up a new program or plan.

The relationship between the four components is seen as a cycle which can be described as follows:

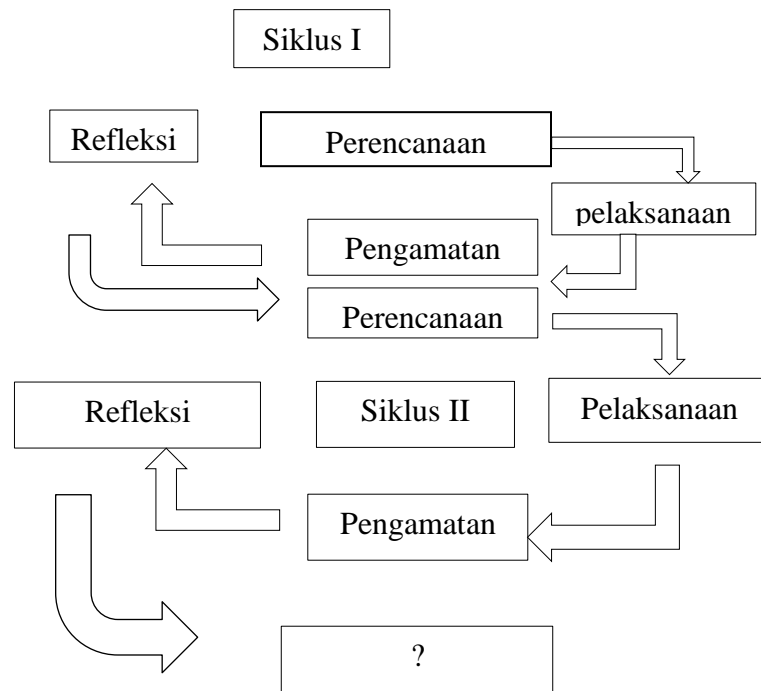


Figure 1 PTK Design (Arikunto, 2017:24)

Based on the picture above, the implementation of Classroom Action Research consists of several stages. The research phase used consisted of four action research components, namely: 1. Planning, 2. Action, 3. Observation, 4. Reflection. The stages of this action research are carried out in a cycle path which can be described as follows:

1. Planning

At this planning stage the researcher did several things related to the research, namely:

- a. Make a learning syllabus
- b. Developing Learning Implementation Plans (RPP)
- c. Prepare student test question sheets for cycles I and II.

## 2. Implementation

This study uses the M-APOS model in an effort to improve student learning outcomes

## 3. Observation/observation

Observations of this study used the observation sheet and the M-APOS model teacher activity sheet to correct the deficiencies of the cycle that had been implemented

## 4. Reflection

Reflection is an attempt to examine what has happened or did not happen. The reflection results are used to determine further steps in an effort to achieve the objectives of classroom action research. If the problem in learning has not been completed, it becomes a consideration for designing the next cycle. The activities carried out at this stage are:

- a. Analyzing observational data.
- b. Make an assessment or observation.
- c. Analyze the results of observations.

## **Research Instruments**

1. Teacher Activity Observation Sheet
2. Student Activity Observation Sheet

## **Data collection technique**

### 1. Learning Implementation Plan (RPP)

Making lesson plans is the first step that must be prepared to carry out learning in class

### 2. Observation

Observation is used to observe how learning takes place. Observations were used by researchers to see an increase in student learning outcomes in learning mathematics. Observations made are observations of all activities and changes that occur when the action is given. The observation results are analyzed descriptively and the learning process is said to be effective if the implementation can be concluded well.

### Question Sheet

Test to measure learning completeness. The completeness of student learning using the test instrument, the test that will be given is in the form of a question sheet. The test is a tool or procedure used to find out or measure in accordance with the methods and rules that have been determined. The test used in the form of a description of 5 questions for each cycle. This test is used to determine whether students' mathematical abilities have increased or not. This is known through the level of completeness of student learning through the administration of tests.

## **Data analysis technique**

The steps taken in data analysis are by reducing and applying data, namely choosing, simplifying, and communicating raw data in the field.

Grade point average

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$X = (\sum f X) / N$  (Suharsimi Arikunto, 2013)

Information :

$N$  = Many students

$\sum f X$  = Total student scores

Learning completeness level

Kindergarten =  $(\text{student score} / (\text{maximum score})) \times 100\%$

The percentage of completeness scores is as follows:

$0\% \leq TK \leq 74\% = \text{Incomplete}$

$75\% \leq TK \leq 100\% = \text{Completed}$

Furthermore, whether classical learning mastery has been achieved, then can be proven by the formula:

$D = X / N \times 100\%$

Information :

$D$  = Percentage of classes that have achieved absorption of  $\geq 75\%$

$X$  = Number of students who have achieved absorption power  $\geq 75\%$

$N$  = Number of students

The criteria for completeness are as follows:

$86\% - 100\% = \text{Very Good}$

$75\% - 85\% = \text{Good}$

$60\% - 74\% = \text{Less}$

$< 40\% = \text{Very Less}$

### Indicator

The indicator of success in this study is that students complete the classical 75% KKM for Mathematics.

## III. RESEARCH RESULTS AND DISCUSSION

### 1. Research Results

This research was conducted in two cycles, where each cycle was held in two meetings.

#### a. Cycle 1

Cycle 1 was held on Saturday, October 1, 2022 in class IV SD Negeri 011 Rambah Samo, totaling 29 students with a series of teaching and learning activities that had been contained in the RPP (Learning Implementation Plan) starting from the initial activities the author gave apperception, gave encouragement and motivated students, singing the national anthem and conveying the learning objectives. Then go to the core activities, namely discussing material in Mathematics, Fractions. Before entering into the material, the researcher first conveyed the steps of the M-APOS model. The M-APOS learning model went through several stages. First, in the activity section, namely by giving assignments called Assignment Worksheets (LKT) students can work on them at home or at school. It is intended that students have a readiness understanding of the learning to be studied. The second stage, namely the class discussion section carried out in this group is called the Discussion Worksheet (LKD). In this second stage, students are given the opportunity to discuss and test their understanding of the concepts students

have obtained from the previous stage. At the last or third stage is by giving practice questions. This aims to strengthen and strengthen students' understanding of mathematical concepts. In learning M-APOS students are encouraged to study individually and in groups.

The student learning outcomes in cycle 1 can be seen in table 2 below.

Table 2.

Nama Siswa	Nilai Siswa
AH	65
AIN	75
AH	70
AB	75
AT	60
AAR	75
AS	65
AN	75
AMP	80
CRR	70
DAM	65
FON	75
FRP	70
MFA	70
MCF	75
MCF	75
MA	70
NEM	75
MAF	65
RAR	70
RA	70

RS	70
SAM	65
SS	70
SAL	75
US	75
WR	70
YA	65
ZS	75

Source: 2022 Data Processed Results

Based on table 2 above, the number of student evaluation results in cycle 1 who completed were 17 students, namely 57% with an average value of 65.30 while those who did not complete were 11 students, namely 43%. The results of student evaluations increased at the second meeting, with 22 students completing, namely 92% with an average score of 90.5 and 8% incomplete. The number of students who did not complete in cycle 1 was caused by several obstacles including the M-APOS model being used for the first time in class IV SD Negeri 011 Rambah Samo, so students still don't understand it. When viewed from learning outcomes, there has been an increase of 12%.

#### b. Cycle 2

Cycle 2 was held on Monday, October 10 2022 in class IV of SD Negeri 011 Rambah Samo with a total of 29 students with an allotted time of 2 X 35 minutes. In the 1st and 2nd cycles of

research, the researcher was directly accompanied by a class IV teacher. At the time of teaching and learning activities researchers act like a teacher. Learning activities begin with opening the class, checking students' attendance and readiness to learn, delivering apperceptions and conveying learning objectives. Entering the main activity the teacher conveys the material to be studied, namely in learning mathematics about fractions. In learning the teacher uses the M-APOS learning model then the first stage is that students are given a material by the teacher and students are asked by the teacher to understand it themselves first, then after that students are formed in groups and then given a discussion sheet by the teacher, then students are given an assignment worksheet to find out what level of understanding students have in understanding the material. Researchers supervise and assist students in doing group assignments. Furthermore, students presented the results of their respective group discussions and then other students commented and gave their opinions. To find out how far the students' understanding of the material they just learned, the researcher gave 20 evaluation questions. Closing activity the researcher gave a reflection then together with the students concluded the lesson, provided follow-up so that the students remained

enthusiastic and diligent in studying at home. Cycle 1 meeting 2 was held on Monday, September 13 2022 in class IV SD Negeri 011 Rambah Samo with a series of learning activities that were not much different from meeting 1, only with different material and core activities. At meeting 2 discussed the material Theme 3 Healthy Food, Sub-theme 2 The Importance of Healthy food for the Body, learning 4. In the closing activity the researcher also provided test questions as material for evaluating students' understanding of the learning material they had just studied using the M- method APOS. The results of student evaluations in cycle 2 meetings 1 and 2 can be seen in table 3 below.

**Table 3.**

Nama	Nilai Siswa
AH	86
AIN	100
AH	65
AB	75
AT	95
AAR	85
AS	85
AN	55
AMP	85
CRR	95
DAM	90
FON	95
FRP	85

MFA	100
MCF	95
MCF	65
MA	90
NEM	85
MAF	90
RAR	85
RA	70
RS	80
SAM	85
SS	85
SAL	70
US	85
WR	95
YA	90
ZS	90

Based on table 3 above, the number of student learning outcomes in cycle 2 which were completed were 24 students, namely 90%, while those that were incomplete were 5 students, namely 10%. Student learning outcomes increased at the second meeting, with 22 students completing, namely 92% and 8% not completing. The number of students who did not complete in cycle 1 was due to several obstacles including the M-APOS model being used for the first time in class IV SD Negeri 011 Rambah Samo, so students still did not understand it. When viewed from the learning outcomes of meetings 1 and 2, at meeting 2 there was an increase of 12%, because at meeting 2 the students understood a little more.

## 2. Discussion

Researchers conducted this research in two cycles with each cycle consisting of two meetings. Each meeting consists of several stages, namely planning, implementation, observation and reflection. The stages of cycle 2 are an improvement from the stages of cycle 1. After carrying out the Thematic learning activities using Classroom then giving evaluation questions to find out the learning outcomes obtained. The results of the two cycles are used to determine the increase in student learning outcomes at SD Negeri 011 Rambah Samo.

The first observation made by the researcher during the thematic learning of the 2013 curriculum in class IV of SD Negeri 011 Rambah Samo is not ideal, there are still many obstacles faced by teachers in developing learning according to the 2013 curriculum. Many students are still not active, daily test scores are still below average and the teacher should only be a facilitator not a teacher center. Cycle 1 and cycle 2 discussed healthy food so that researchers had no difficulty in linking the learning process. The data obtained before and after the action was carried out showed an increase in learning outcomes. Prior to the action by implementing M-APOS learning in Mathematics learning, student learning outcomes were still below the average KKM score of 75. The results of

cycle 1 tests obtained as many as 67% or 16 students who completed and 33% or 8 students did not complete. Then in cycle 2 test results obtained learning outcomes of 92% or 22 people who completed and 8% or 2 people who did not complete.

Based on these learning outcomes it can be said that there was an increase in student learning outcomes by 25%. When viewed from the data that has been obtained, it can be seen that those who passed have exceeded the indicators of success. So it can be stated that the application of the M-APOS model to improve student learning outcomes in mathematics learning class IV SD 011 Rambah Samo has been successful

#### **Quotations and References**

According to Komalasari (2013) learning is a system or process of teaching students that is planned, implemented and evaluated systematically so that students can achieve learning goals effectively and efficiently. Riyanto (2010) said the nature of cooperative learning is a learning method designed to train academic skills, social skills and interpersonal skills. The definition of e-learning according to Sutanta (2014) is a type of learning system that allows the achievement of teaching materials to students using internet media, intranets or other computer network media.

According to Dimiyati and Mudjiono (2013), learning outcomes are processes for determining student learning values through assessment activities or measuring learning outcomes, aiming to determine the level of success achieved by students. Learning outcomes are very important for teachers and students alike, because from learning outcomes a value will emerge which will be a measure of success in the learning process that has been passed. According to Trianto (2011) Thematic Learning is integrated learning that uses themes to link several subjects so as to provide meaningful learning experiences to students.

#### **IV. CONCLUSION**

Application of M-APOS learning to improve thematic learning outcomes for fourth grade students at SD Negeri 011 Rambah Samo. Increased achievement of learning outcomes can be seen from student learning outcomes as follows: There is an increase in student mathematics learning outcomes in each cycle. This is evidenced by the existence of data from 2 cycles where each cycle consists of two meetings. Test results in cycle 1 of students who completed 57% (17 students) and 43% (11 students) did not complete with an average score of 66.30, increasing in that is the number of students who completed as much as 92% (22 students) and those who incomplete

amounted to 8% (6 students) with an average value of 90.5. In cycle 2, 83% (20 students) completed and 17% (4 students) did not complete with an average score of 85.4, then experienced an increase, with 92% (22 students) completing and those not complete as much as 8% (2 students) with an average value of 90.6. With an increase in learning outcomes, there is an increase in teacher and student activity. Conclusions present a summary of the description of the results and discussion, referring to the research objectives. Based on these two things, new main ideas are developed which are the essence of the research findings.

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