Vol. 8, No. 2 (2024) 153-162 ISSN: 2597-4866
Indonesian Journal of Primary Education

Application of articulate storyline media to improve the mathematical problem solving ability of 1st grade students of primary school

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Submitted/Received 24 January 2024; First Revised 7 February 2024; Accepted 9 November 2024
First Available Online 1 December 2024; Publication Date 1 December 2024

Abstract

The purpose of this study is to analyze the application of Articulate Storyline media to improve the mathematical problem-solving ability and learning outcomes of grade 1 students of SD Muhammadiyah 14 Surabaya. The method uses classroom action research (PTK) with a cycle model. The subject is grade 1 students. The data collection technique uses observation, tests in the form of story questions and documentation. The data is then analyzed descriptively. The results reflect that there is an improvement in mathematical problem-solving skills and learning outcomes of students through the application of Articulate Storyline media. This is evidenced by the students' initial ability to solve mathematical problems reaching a score of 47, in the first cycle it became 78, and in the second cycle it became 95. Meanwhile, the average increase in learning outcomes was 66.9 in the pre-cycle stage, to 78.1 in the first cycle and 88.7 in the second cycle.

Keywords: *Articulate Storyline; Mathematics Problem Solving Ability; Mathematics; Primary School; Classroom Action Research.*

INTRODUCTION

Education is a learning process that aims to maximize the potential of each person. It is through education that a person gains insights, skills, values and norms, to the attitudes needed in daily life when interacting with their social environment, and contributes to community development. With education, humans can transform into better individuals (Fadhillah et al., 2024). Through education, students can optimize their abilities, so that they can better face the changing times. (Afiani & Faradita, 2021).

Education in Indonesia also continues to develop to meet the needs of the modern world. Various new innovations have emerged from this advancement. The independent curriculum is one of the innovations that have emerged in the process of educational evolution in Indonesia. The Merdeka Curriculum is a new approach in education in Indonesia initiated by the Ministry of Education, Culture, Research, and Technology (Kemendikbudistek) under the leadership of Nadiem Makarim. The Merdeka Curriculum, also known as the Prototype Curriculum, emphasizes on student competence, character development and essential materials. Interactive and collaborative learning is a learning method emphasized in the Merdeka Curriculum (Lestari et al., 2023).

A quality learning process will give birth to quality education (Putra et al., 2023). When the learning process is successful and efficient in achieving educational goals, the learning is considered quality. According to (Afiani & Putra, 2017) our obligation as teachers is to provide innovative and student-centered learning. In the implementation of the merdeka curriculum, mathematics learning has different learning objectives from the previous curriculum. The purpose of studying mathematics in accordance with the merdeka curriculum is to explore concepts and carry out mathematical procedures in their daily lifestyles and solve mathematical problems (Fianingrum et al., 2023). Therefore, students need to have insight and mastery of mathematical concepts in their academic and

cognitive development. Mastery of basic mathematics and calculation is an ability that is always present in all kinds of daily human activities (Surur & Oktavia, 2019). Utari et al., (2023) explained that problem-solving skills that can be learned through math story problems are so valuable for daily lifestyle activities, for example, when we shop, we need to calculate the money we have to pay and various other problem-solving problems that exist in our daily lifestyle. So, the ability to understand mathematical concepts is one of the goals of mathematics learning (Rivai & Rahmat, 2023).

Learning media is one of the driving factors or facilities in realizing quality learning. In order to improve the teaching and learning process in the classroom, learning media is needed (Dewi & Handayani, 2021). Learning media can help the learning process so that the educational goals or the meaning of the message conveyed are efficient and effective (Yespa Warinta et al., 2024) Learning media, both digital and conventional, offers various features and advantages to be able to encourage students to understand the concept of the material better and enrich the student learning experience (Wardani et al., 2024). Therefore, teachers need to make sure that they have used media that are in harmony with the material they will teach.

Analyzing the needs and character of students is a technique to ensure that the learning media is aligned with the needs, preferences, and level of understanding of their students (Kholifah & Rahma, 2024). The characteristics of students in elementary school are grouped into two parts, namely low-grade students and high-class students. Lower class students are at levels 1-3 while high classes are at levels 4-6. According to Zulvira et al., (2021) elementary school students are in a concrete operational period where they need a medium that can be touched, seen, heard, and tinkered with so that the learning carried out becomes more valuable and meaningful. In order for lower grade students to find the truth when faced with real-world situations, it is very important for teachers to use learning media that suit the needs and character of students.

The results of the initial observations carried out by the author on grade 1 students of SD Muhammadiyah 14 Surabaya show that the condition of students in general has diverse intelligence abilities, some of them are not fluent in reading and writing. They also still think concretely, making it difficult to understand abstract things. Students' focus is also still short, so it is necessary to have a variety of learning activities so that they can stay focused. The majority of 1st grade students tend to learn more easily through games, movements or songs and other learning media that present audio-visual content. The classroom used by students during the learning process has been facilitated by audio visual devices such as smart TVs and also speakers, but during the implementation of mathematics learning, teachers in the classroom only rely on conventional learning media in explaining mathematical concepts to students, some students seem less interested in participating in learning and choose to be busy with other things or talking to their classmates, When given story questions, it also appears that many students are still struggling to understand the meaning of the problem, choose the right calculation operation, and present the answer logically.

Innovation in teaching strategies is needed to address this problem. One of the other options for learning media that can be maximized is Articulate Storyline. A software-based learning medium called Articulate Storyline can be used for presentation activities that can be adjusted to the needs of its users (Masadah et al., 2019). This media can be used as an interactive learning media because it is equipped with features such as text, images, videos, audio, and quizzes (Susilawati, 2022).

The advantage of the Articulate Storyline media is that it allows students to be able to communicate and actualize the material they learn through existing menus (Daryanes et al., 2023). Another advantage of Articulate Storyline media is that the process of making it is fairly easy because the features in it are

the same as power points so they are quite familiar to teachers.

A number of previous studies have shown how well Articulate Storyline media can improve the level of student learning outcomes, especially in the field of mathematics. According to research from Arrifah & Novitasari (2024), it is stated that when Articulate Storyline media is used in Realistic Mathematic Education (RME)-based learning, students' reasoning skills and confidence increase. It was also found that there was an increase in students' ability to understand mathematical concepts with the application of Articulate Storyline in grade VIII students of MTs Nurul Islam Medan in a study carried out by (Simarmata & Siregar, 2024). Then a study from (Somba et al., 2024) the use of Articulate Storyline media in mathematics teaching has been proven to increase student learning outcomes. According to another study from (Hermansyah & Lutfi, 2024), where the use of interactive learning media Articulate Storyline can help students learn more effectively in learning mathematics. The Articulate Storyline media functions well to raise the level of mathematics learning outcomes of grade X students of SMA Muhammadiyah Surakarta with an attractive visual display and audio so that it is not boring (Nurhayati et al., 2024).

When referring to the elaboration of this phenomenon, the author intends to conduct this study with the aim of describing the application of Articulate Storyline media to improve mathematical problem-solving skills and describe the improvement of learning outcomes of grade 1 students of SD Muhammadiyah 14 Surabaya after the implementation of *Articulate Storyline* media.

RESEARCH METHODS

The research method used in this study is classroom action research (CAR). CAR is carried out in a class to analyze the consequences of actions carried out on a study subject in that class (Istikomah, 2024). This study was carried out using a cycle model which included the following steps: action planning, implementation, observation, and reflection. If the objectives of the study have not been achieved in the first cycle, the study will continue to the next cycle, with re-planning at the beginning of the second cycle (Arikunto, 2019).

These PTK stages can be seen in the following figure:

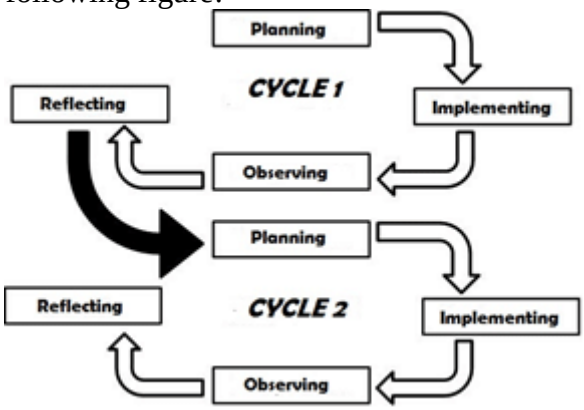


Figure 1
Stages of the PTK Cycle (Arikunto:2019)

The creation of learning tools, learning media, and observation sheets are some of the activities carried out in the early stages of the cycle. The second stage is the implementation stage, namely applying Articulate Storyline media in the learning process. Using the observation sheet that has been provided, the examiner carried out his observations on the application of Articulate Storyline media in each cycle. At the end of each learning cycle, the last step carried out is reflection to assess the application of Articulate Storyline media in the learning process, both its advantages and disadvantages. To determine whether students have met the learning objectives, the researcher ends the session with an assessment test after all stages have been completed. The classroom action research carried out will be terminated if it has been found that there is an increase in learning outcomes with the number of class completeness and the achievement of students' mathematical problem-solving ability indicator scores reaching 80%.

This research was carried out at SD Muhammadiyah 14 Surabaya, which is addressed at JL. Manukan Kulon No. 1, Manukan Kulon, Tandes District, Surabaya. The subject is students in grades I-B at SD Muhammadiyah 14 Surabaya for the

2024/2025 school year. The number of students consists of 27 children.

The data collection technique uses observation, tests and documentation. Observation is used to collect data related to students' mathematical problem-solving abilities based on various indicators. Meanwhile, tests are given in each learning cycle to obtain data related to student learning outcomes after actions are taken. To provide evidence and sources of information in this study, the researcher documented the CAR process with photos and videos. The results of the documentation are also used as instructions and considerations for the implementation of further learning.

The data will be evaluated using a descriptive percentage approach to determine student learning outcomes after one PTK cycle. The acquisition of tests from before and after the action, and the observation of student activity during the learning process, are all included in the data collected.

The following are indicators used to measure the level of students' mathematical problem-solving abilities:

Table 1
Indicators of mathematical problem-solving ability

No	Tahapan Pemecahan Masalah	Indicators
1.	Understanding the problem	Students can correctly state numbers and keywords in the questions
2.	Planning the solution	Students can write the right math sentences according to the information in the question
3.	Resolve issues as planned	Students can complete the process of calculating addition and subtraction correctly according to the mathematical sentences they have made
4.	Double-check	Students double-check the problem solving steps used

Furthermore, the percentage of students' mathematical problem-solving skills will be calculated using the following formula:

$$\text{KPMM Precentage} = \left(\frac{Students' score}{maximum\ score}\right) x100\%$$

Meanwhile, to calculate the percentage of completeness of student learning outcomes, the researcher uses the following formula:

$$Completion\ Percentage = \left(\frac{Students\ who\ \ compeleted}{Number\ of\ \ students}\right) x100\%$$

The criteria for the level of achievement of student learning outcomes can be described by the following table:

Table 2
Criteria for student learning achievement levels

Achievement	Criterion
85%-100%	Excellent
70%-84%	Good
55%-69%	Fair
0%-54%	Poor

RESULT AND DISCUSSION

Pre-Cycle Observation Results

The researcher started by running a pre-cycle to explore the initial state of students before implementing learning improvements. In pre-cycle activities, the delivery of material was carried out without using any media and only relying on the lecture method.

Table 3
Pre-cycle mathematical problem-solving ability score

Code	Indicator				Result
	1	2	3	4	
Score	16	14	11	0	47
Precentage	59%	52%	41%	0%	44%

Based on the results of the pre-cycle actions in table 3, it was found that only 59% of students could be said to be able to understand the story problems given by mentioning the numbers and keywords contained in the questions. However, 52% of

them or only 14 students could write mathematical sentences that were in accordance with the given story problems, and only 41% or 11 of the 27 students could complete the calculation operations that they had written while the rest were still wrong in writing the final result of the existing calculation process. This is because all students do not check the results of their work so that there are still errors found.

Table 4
Data on pre-cycle learning result

No	Description	Result
1	Completion Precentage	48%
2	Non-completion Precentage	52%
3	Average score	66,9
4	Students who completed	13
5	Students who did not complete	14

The level of students' mathematical problem-solving ability at this pre-cycle stage is also in line with their learning outcomes. Based on table 4, the average learning outcome in the pre-cycle of students reached 66.9. Only 13 students scored above the standard and others there were 14 students who scored below the standars, namely 75. Looking at the results of the pre-cycle scores, it can be reflected that the average student learning outcome is relatively low.

In addition, based on the results of observations by researchers and observers, the low learning outcomes and students' ability to solve mathematical problems are due to the lack of interest in the media used by teachers so that the students are not so enthusiastic and focused on participating in learning. Most students do not follow the teacher's instructions to write down math sentences when answering questions. Then it was also found that there were several errors in the calculation results made by students.

Judging from the results of pre-cycle actions where the level of achievement of the mathematical problem-solving ability indicators of students is only 44% and out of 27 students only 13 people have scores above the standard or only 48%, it is necessary to implement learning improvements by applying Articulate Storyline media during the first cycle of learning.

Results of Cycle I Implementation

The first cycle of CAR was carried out including the planning stages, namely preparing the lesson plan, preparing the worksheet and learning media using the Articulate Storyline, then the implementation as well as observation, as well as reflection with the class teacher and the shadow teacher of class 1-B.

Table 5
Students' mathematical problem solving ability score in Cycle 1

Code	Indicator				Counts
	1	2	3	4	
Counts	24	23	17	14	78
Precentage	89%	85%	63%	52%	72%

Based on table 5, it can be concluded that there is an increase in the score of students' mathematical problem-solving ability to 72% where 24 students have been able to understand the given questions. 23 students have been able to plan problem solving in story problems by writing appropriate math sentences. But only 17 students were able to complete the calculations correctly according to the math sentences that had been written. And only 14 students have re-checked the results of their work so that there are still some errors in the results of the students' work.

Table 6.
Students' learning outcomes cycle 1

No	Description	Result
1	Completion Precentage	78%
2	Non-completion percentage	22%
3	Average score	78,1
4	Students who completed	21
5	Students who did not complete	6

Based on the learning results of students, it was also found that there was an increase in the percentage of student completeness reaching 78% where there were 21 students

who had scored above the KKM and only 6 students who did not complete.

Looking at the results of the first cycle of learning where the student's mathematical problem-solving score obtained a percentage of 72% and the completeness of student learning outcomes reached 78%, it can be concluded that the use of Articulate Storyline media can increase the ability to solve mathematical problems and students' learning outcomes in solving story problems. Even so, with the achievement of the 72% indicator and the completeness of 78%, it still lacks the standards that have been set at the beginning, so it is necessary to improve the shortcomings in the learning process in the second cycle.

Results of Cycle II Implementation

In the 2nd cycle of the research process, improvements were made to how many learning components were carried out by maximizing the use of Articulate Storyline media in learning.

Table 7
Students' mathematical problem solving ability score in Cycle II

Code	Indicator				Counts
	1	2	3	4	
Counts	27	24	24	20	95
Precentage	100%	89%	89%	74%	88%

In the results of the implementation of the second cycle, it was found that there was an increase in the students' mathematical problem solving scores to 88% where all students were considered able to understand the given story problems. Meanwhile, as many as 24 students are considered to be able to write and complete the calculation process of the mathematical sentences they wrote. In addition, 20 students are considered to have been able to re-check the results of their work so that the results are more accurate.

Table 8
Students' learning result in Cycle II

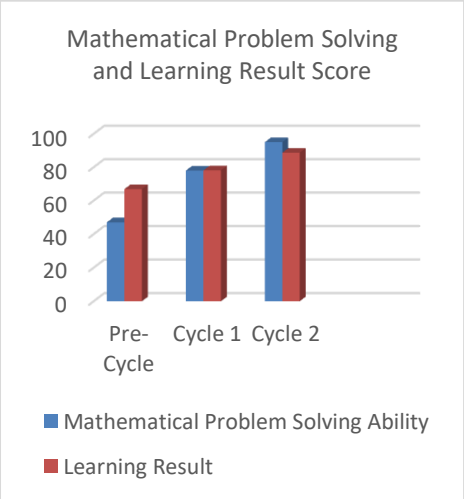
No	Description	Result
1	Completion Precentage	89%
2	Non-completion Precentage	11%
3	Average score	88,7
4	Students who completed	24
5	Students who did not complete	3

Based on table 8, it can be reflected that the average student learning outcome has increased again to 88.7 where there are 24 students who get a score above the KKM and only 3 students who do not get a complete score.

Seeing an increase in students' mathematical problem-solving ability, 78 students with an indicator achievement of 71% in the first cycle, and 95 with an indicator achievement percentage of 88% in the second cycle. Meanwhile, in learning outcomes, there was also an increase in the average learning outcomes of students from 78.1 in the first cycle to 88.7 in the second cycle. As many as 89% of the students obtained a score above the KKM. Therefore, it is stated that the implementation of Articulate Storyline learning media on mathematics story material has succeeded in improving the ability to solve mathematical problems of grade 1 students.

The CAR which is run in grade 1 at SD Muhammadiyah 14 Surabaya aims to improve the ability to solve mathematical problems by applying Articulate Storyline media. The following is a graph of the improvement of mathematical problem-solving ability scores and student learning outcomes:

Graph 1
Graph of Improvement of Mathematical Problem Solving Ability Score and Student Learning Outcomes



The results of the classroom action research are shown in the graph above. This graph reflects that in each cycle there is an

increase in the score of mathematical problem-solving ability and the learning outcomes of grade 1 students who study addition and subtraction story problems. This was strengthened by the mathematical problem-solving ability score obtained in the pre-cycle without Articulate Storyline media, the percentage of achievement of indicators was 47% with a score of 44 and the average learning outcome was 66.9. Through the use of Articulate Storyline media in cycle I, it was found that the score of students' mathematical problem-solving ability was 78 with a percentage of 72% and an average learning outcome of 78.1. In the second cycle, there was an increase in the score of students' mathematical problem-solving ability to 95 with a percentage of 88% or only 3 students who did not meet 3 of the 4 indicators set and the average learning outcome was 88.9. The three students have not met the indicators and have not received a score above the KKM because they are among the students who need special assistance during learning because they are not fluent in reading, writing, and arithmetic. These findings show that the learning outcomes of students have increased when the Articulate Storyline media is applied in cycles I and II. Success indicators in the form of grade 1 students of SD Muhammadiyah 14 Surabaya getting a percentage of achievement of mathematical problem solving indicators and the results of completeness of learning outcomes reached ≥80% at the end of cycle II have been met.

The acquisition of this study is in line with a study from Habuke et al (2022) where it was found that there was an increase from cycle I with a completion percentage of 70% where there were 14 students who got a score above 70 to 80% with 20 students who got a complete score. The study carried out by Rahayu et al., (2023) also reflects similar results, namely classes that are given actions by applying Articulate Storyline media have a higher average score of mathematical problem-solving skills (71.97) compared to classes that use conventional methods (63.55). In addition, according to a study from Adiastuty et al., (2024) there was an increase in pre-test results, namely 37.58 to 56.64 in the post-test after the application of Articulate Storyline media in learning. Nurdiansah et al. (2023) in their study also found an increase of 45% in the results of the pre-test and post-test of problem-solving abilitymathematical students after the researcher applied the Articulate Storyline media. Meanwhile, referring to a study from Soraya & Ningtias (2023), there was an increase in pre-test results, namely 56.82 to 84.09 in the post-test after the application of Articulate Storyline media in mathematics learning. Pratiwi et al. (2024) in their study found that the average pretest and posttest scores of students increased from 36.08 to 80.00, showing the positive effect of the application of Articulate Storyline interactive media in increasing student engagement and understanding. A study from Mayoza et al., (2024) explained that the use of Articulate Storyline media caused a significant increase in student learning outcomes from only 10 students to 24 students who were considered capable of solving mathematical problems.

CONCLUSION

According to the results of this study, the use of Articulate Storyline media has improved mathematical problem-solving skills and student learning outcomes. The score of the pre-cycle mathematical problem-solving ability was 47 or only 44% of students whose aspects were fulfilled rose to 78 with a percentage of 72% in the first cycle and 95 with an indicator achievement percentage of 88% in the second cycle. In line with this, student learning outcomes were also found to have improved. In the pre-cycle, the student learning outcomes were only 66.9 with a completion percentage of 48%, then rose to 78.1 with a completion percentage of 78% in the first cycle and 88.7 with a completion percentage of 89% in the second cycle. Therefore, it can be concluded that the application of Articulate Storyline media in mathematics learning can increase the level of mathematical problem-solving ability and learning outcomes of grade 1 students of SD Muhammadiyah 14 Surabaya.

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