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Utilizing Smart Ladder Media to Enhance Student Learning Outcomes on Length Units in Third-Grade Elementary School

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ABSTRACT

This study aims to assess the mathematics learning outcomes of third-grade students at MIS Muhammadiyah Darussalam Waioti, Sikka (a private elementary school) on the topic of length units using the "smart ladder" media. This research follows a Classroom Action Research (CAR) approach, employing both qualitative and quantitative methods. It comprises two cycles, each consisting of four stages: planning, implementation, observation, and reflection. The subjects of this study are third-grade students. Data collection methods include tests and observation. Research instruments consist of an observation sheet for assessing student engagement and a test to measure learning outcomes. The findings reveal that mathematics learning using the smart ladder media showed improvement from Cycle I to Cycle II, with the learning outcome mastery level reaching 18% in Cycle I and student engagement observed at 44%. In Cycle II, the mastery level increased to 94%, with student engagement reaching 93%. These results suggest that the use of the smart ladder media for teaching length units effectively enhances the learning outcomes of third-grade students at this school.

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Introduction

Mathematics is a field of study that explores relationships among concepts, shapes, structures, magnitudes, and logic [1]-[3]. It plays a critical role, necessitating a basic understanding by all levels of society [4]. This implies that mathematics is relevant in academic contexts and essential in daily life. Mathematics is one of the subjects taught in primary education, aiming to improve educational quality within the learning process [5],[6]. Mathematics instruction in schools seeks to enable students to understand mathematical concepts concretely and to apply them proficiently in everyday life [7]. Mathematics has distinct characteristics, namely, abstraction, deductiveness, consistency, hierarchy, and logic [8]. Mathematical concepts' abstract nature necessitates specific teaching strategies or techniques, especially for primary school students who tend to think concretely.

A barrier to learning mathematics is the perception that it is difficult and intimidating. Due to this perception, certain topics, such as length measurement, have become challenging for students to understand, as many struggle with converting units of length. The use of educational media aims to facilitate student learning, and the primary criterion for selecting instructional media is to ease students' comprehension of material presented by teachers [9],[10]. Learning media serve as intermediaries that provide instructional learning resources, fostering a conducive learning environment [11]. These media introduce tangible representations of objects that support lesson delivery [12]. They motivate students to learn, encouraging them to write, speak, and imagine more vividly, thus making the teaching and learning process more effective and efficient while fostering positive teacher-student relationships [13].

One effective medium for teaching length measurement in mathematics is the "smart ladder" media, which resembles a three-dimensional ladder [6]. Designed with Styrofoam for engaging visuals, students are given exercises, and with prior instructions on its usage, they utilize the smart ladder to solve problems. According to Novitasari [14], the smart ladder media has several advantages, including enhancing student involvement, capturing attention, and facilitating a concrete learning approach, though it has the drawback of being fragile. Therefore, incorporating the smart ladder media is crucial, as it positively impacts student learning outcomes.

Learning outcomes are competencies or abilities—cognitive, affective, or psychomotor—that students achieve after the learning process [15]. Learning outcomes indicate changes in students in cognitive, affective, and psychomotor aspects as a result of the learning activity [16]. These outcomes serve as indicators to measure students' understanding

of the material after the learning process and are evaluated through final tests to determine the quality of learning achievement [17].

A lack of media usage during lessons negatively impacts student learning outcomes, as evidenced by low test scores. Therefore, mathematics instruction must encourage students to think critically, creatively, and actively. Given these challenges, teachers need to innovate and enhance creativity in teaching to make students more engaged and ensure the material is more accessible. For teaching length measurement, media usage can provide an effective solution.

According to an interview with the homeroom teacher at MIS Muhammadiyah Darussalam Waioti (a private elementary school), lessons are conducted without media due to a lack of available resources, relying instead on the blackboard and stories from students' books. The teacher noted that student outcomes on length measurement were low, as seen from daily test scores where many students did not meet the MMC of 65. During lessons, many students showed signs of boredom, and some were still unable to convert or calculate units of length. This issue underscores the need for teachers to be creative and innovative in creating an enjoyable classroom atmosphere to keep students engaged. Thus, the researcher sought suitable media to facilitate the mathematics lesson on length measurement.

After identifying the issue of low learning outcomes among third-grade students at this school, the researcher employed the smart ladder media to assist students in learning length measurement. This media fosters active student engagement and enhances learning outcomes. It serves as an effective new tool for mathematics instruction, especially for length measurement, and could be adopted by other teachers in various schools. Accordingly, this study aims to improve students' understanding of the concept of length, often considered challenging. By using the smart ladder media, abstract concepts are presented concretely, making them easier to comprehend. It is hoped that this study will enhance student learning outcomes, as using appropriate media can facilitate students' mastery of the material, enabling them to meet the minimum mastery criterion (MMC).

Method

The research design employed in this study is Classroom Action Research (CAR), using the Kemmis and Taggart model. The population for this study consists of third-grade students at MIS Muhammadiyah Darusalam Waioti, Sikka with a sample of 17 students (9 males and 8 females) based on class attendance records. Data collection instruments include a test to evaluate the effectiveness of the learning process at the end of the activity by administering written test questions to measure students' cognitive learning outcomes, and an observation sheet to assess students' active participation.

The research procedure involves structured and systematic stages. The first stage is Cycle I, beginning with the planning phase. In this phase, the researcher designs the learning activities to be conducted, including preparing the "smart ladder" learning media and developing the lesson plan. Following the planning phase, the implementation phase takes place, during which the learning activities are conducted as outlined. During implementation, the researcher observes student engagement and participation to collect data. After the learning activities, a reflection is conducted to evaluate the learning process and outcomes. This reflection aims to identify strengths and weaknesses in Cycle I and to establish improvement steps for the next cycle. Cycle II is carried out following the same stages as Cycle I, with adjustments based on the reflection results from Cycle I.

The data analysis techniques used in this research include both qualitative (for identifying the problems) and quantitative (for learning mastery) analysis. The method for determining the students' learning mastery rate is based on Equation 1.

$$MasteryRate = \frac{\sum IndividualScore}{TotalStudent} \quad (1)$$

For the observation results, the observation sheet has two responses: "yes" and "no." Once all items are completed, each item is scored; "yes" receives a score of 1, and "no" receives a score of 0. The percentage is then calculated using Equation 2 [18].

$$Achievement = \frac{Score}{MaximumScore} x\ 100\% \quad (2)$$

Results and Discussion

This Classroom Action Research (CAR) was conducted over two sessions divided into Cycle I and Cycle II, each lasting 2x35 minutes. Before starting the learning activities, the researcher explained to the students that the lesson would use the "smart ladder" media. The overall results of the student's mathematics learning on length measurement for 3rd grade in Cycle I and Cycle II are shown in Fig. 1.

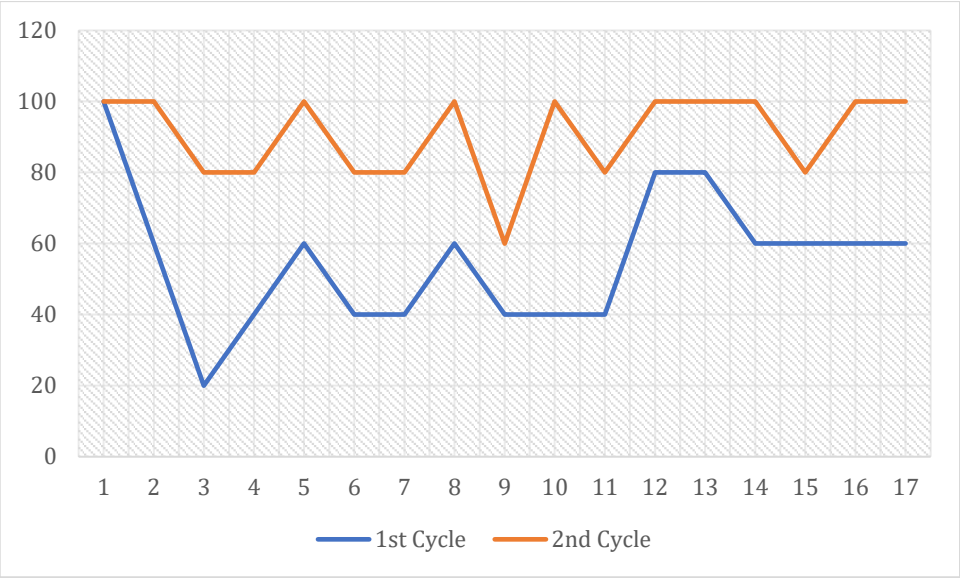


Fig. 1. The student achievement score in each Cycle

Data from Fig. 1 was calculated to find the average score as shown in Table 1.

Table 1. Score Results in Cycle I and Cycle II (n=17)

Average Score	Mastery Level	Number of Students	
		Passed	Not Passed
55	18%	3	14
91	94%	16	1

Based on the analysis in Table 1, three students achieved mastery, while 14 did not meet the required standard. The average score was 55, with a mastery level of only 18%. Observational data showed that only 44% of students were actively engaged in the learning activities. Due to the large number of students who had not reached the mastery standard, the researcher reflected on the learning process and planned improvements for Cycle II. The goal was to enhance students' learning outcomes by addressing areas that could support learning in Cycle II, still utilizing the "smart ladder" media with additional units. Students' performance improved significantly, with 16 out of 17 students achieving mastery and an average score of 91. The mastery level reached 94%. Observations revealed that 93% of students were actively engaged, demonstrating a substantial improvement in understanding the material and skill acquisition. This reflects the effectiveness of using the "smart ladder" media in Cycle II.

The findings across both cycles indicate that the learning process enhanced not only teacher and student activities but also student learning outcomes in cognitive, affective, and psychomotor domains. The improvement in the learning process paralleled the increase in student achievement. In Cycle I, only 18% of the students achieved mastery (3 out of 17, with 8 females and 9 males), while 14 scored below the MMC. Since many students did not meet the MMC in Cycle I, the researcher conducted a reflection and planned actions for Cycle II, which

resulted in a significant increase to 94% mastery in Cycle II. This shows that the "smart ladder" media effectively helped the students meet the mastery criterion (>65). This outcome aligns with another research, which found that learning produces behavioral changes, including abilities, knowledge, skills, habits, motivations, and attitudes, that are conscious and intentional [19]-[21].

Based on the results, using "smart ladder" media in mathematics, specifically for length measurement in 3rd grade, significantly improved student engagement and learning outcomes across both cycles. The smart ladder media supported students in understanding length unit conversions, making learning more interactive, communicative, and engaging. This confirms the positive impact of the "smart ladder" media on enhancing students' skills and aligns with findings by Balaweling et al. [18]. The smart ladder allows students to discover concepts or theories independently, thereby enhancing their skills in converting length units during the learning process.

Conclusion

Based on the research results, it can be concluded that the use of the "smart ladder" learning media for the length measurement topic significantly improved the learning outcomes of 3rd-grade students. The study demonstrated that the use of this media led to a noticeable improvement from Cycle I to Cycle II. While the initial cycle already showed promising results, Cycle II revealed a more substantial increase, highlighting the effectiveness of the smart ladder media in helping students better understand length measurement concepts. The effectiveness of this media was not only evident through improved test scores but also through observations of students' active participation during the learning process. Students appeared more enthusiastic and engaged when using the smart ladder media, which also made it easier for them to retain and understand fundamental concepts related to length measurement. This shows that the smart ladder media effectively supported students in comprehending the material more thoroughly. Thus, applying interactive and engaging learning media, such as the smart ladder, can be an effective strategy to enhance students' learning outcomes, particularly in subjects like length measurement. This approach can serve as an inspiration for other educators to employ creative and innovative teaching aids, ultimately aiming to improve the quality of education and overall student performance.

Conflict of Interest

Penulis menyatakan tidak ada konflik kepentingan dalam kajian ini.

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