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Video Support in Problem-Based Learning to Facilitate of Elementary Students' Numeracy Abilities Improvement

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ABSTRAK

Permasalahan penelitian ini adalah masih lemahnya kemampuan numerasi siswa di kelas V SD. Untuk itu, studi ini bertujuan untuk mengkaji implementasi Problem Based Learning (PBL) berbatuan media video untuk meningkatkan kemampuan numerasi siswa sekolah dasar. Pendekatan yang dilakukan adalah pendekatan kualitatif dengan jenis penelitian tindakan kelas. Subjek penelitian yaitu 18 siswa dan 1 guru kelas V SD. Pendekatan yang dilakukan adalah pendekatan kualitatif dengan jenis penelitian tindakan kelas (PTK). Penelitian ini dilaksanakan dalam dua siklus pada materi penyelesaian soal cerita matematika. Masing-masing siklus diselesaikan dalam dua pertemuan pembelajaran. Data diperoleh dengan teknik observasi, tes dan dokumentasi. Prosedur analisis data yang digunakan adalah kondensasi data, penyajian data, dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa proses belajar dengan menggunakan PBL berbantuan video menunjukkan adanya perubahan pada fokus belajar, aktivitas dan keterlibatan belajar, serta interaksi dan kolaborasi dalam menyelesikan masalah. Kategori kemampuan numerasi siswa telah meningkat dari 61% siswa yang berada pada kategori tinggi dan sedang di Siklus I menjadi 89% siswa. Dengan demikian dapat disimpulkan bahwa implementasi model pembelajaran PBL berbantuan media video dapat meningkatkan proses belajar dan kemampuan numerasi siswa pada materi penyelesaian soal cerita di kelas V. Implikasiya adalah model pembelajaran PBL sebaiknya didukung degan media pembelajaran yang relevan. Implementasi PBL berbantuan media video perlu dapat dijadikan alternatif dalam mengatasi permasalahan rendahnya kemampuan numerasi siswa di sekolah dasar.

ABSTRACT

The problem of this research is the low numeracy skills of the fifth grade students of elementary school. Because of that, this study aims to examine the implementation of Problem-Based Learning (PBL) with video media to improve the numeracy skills of elementary school students. The approach is qualitative with the type of classroom action research (CAR). The research subjects were 18 students and one teacher of the fifth grade of elementary school. This research was conducted in two cycles on the material for solving math word problems. Each cycle is completed in two learning meetings. Research data was obtained through observation techniques, tests, and documentation. The data analysis procedures used are condensation, data presentation, and conclusion. The results showed that the learning process using video-assisted PBL showed changes in learning focus, learning activities, engagement, interaction, and collaboration in solving problems. The students' numerical abilities category has increased from 61% of students in the high and medium categories in Cycle I to 89%.Thus, implementing the PBL learning model assisted by video media can improve the learning process and students' numeracy abilities in solving math word problems in the fifth grade of elementary school. The implication is that relevant learning media should support the PBL learning model. Implementing PBL assisted by video media needs to be used as an alternative to overcoming the problem of low students' numeracy skills in elementary schools.

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1. INTRODUCTION

It has long been believed that mathematical knowledge and skills contribute to efficient and critical solving of everyday problems, so every student needs to be equipped with a variety of mathematical knowledge, skills, understanding, and dispositions to solve problems in real contexts in their living environment, the higher continuation of learning. , future work, and problems in his community (Purpura & Lonigan, 2015; Purpura & Napoli, 2015; Tout et al., 2021). For this reason, numeracy literacy skills are needed in mathematics because mathematics is not only always related to formulas but also requires reasoning or students' critical thinking patterns in answering every problem presented and its application in everyday life. The fact is that only a tiny proportion teach the use of numeracy literacy skills to solve the problems of everyday life. This is because students are considered to have mathematical skills already when they have mastered the ability to count as a basic mathematical concept. At the same time, students' skills in using these concepts in actual conditions or solving real problems in unstructured everyday life should be addressed, even though they should be considered as a follow-up to mastering basic mathematical concepts (Salvia et al., 2022). As a result, when students are assessed for their numeracy abilities, the results are low.

The low ability of numeracy literacy in elementary school children is a problem that must be corrected immediately in the learning process. Because the acquisition of children's early academic competence through the process of learning mathematics is essential in the long-term development of academic success and even their future careers (Purpura & Lonigan, 2015; Purpura & Napoli, 2015). Based on the OECD's Program for International Student Assessment 2018 results, the average 15-year-old in Indonesia scores 379 points in mathematics, compared to 489 points among OECD countries (OECD, 2019). This can also be seen in class V SD Negeri 6 Benteng, Baranti District, Sidrap Regency. The observations and interviews show that when faced with word problems that link the basic concepts of mathematics with their implementation in everyday problems, they still need help and cannot solve them. This shows that the numeracy literacy skills of students in Indonesia still need to improve.

Therefore it is urgent to review the learning models teachers in learning mathematics have used. Teachers must choose innovative models that can facilitate the development of basic math skills to a higher level, namely their implementation in everyday problems, so they have better numeracy skills. It has been emphasized that in learning mathematics, high-quality pedagogy is closely related to improving student learning outcomes (Cohrssen & Niklas, 2019). Based on the literature, the PBL model is relevant for improving mathematics learning quality and results (Crowley, 2015; Merritt et al., 2017; Ronis, 2007). PBL is a pedagogical model focusing on collaborative group work and open problem-solving. This learning model was initially used to teach medical students during their training. However, it is increasingly being developed and adapted for use in various fields with almost every grade level of students (Crowley, 2015; H. Schmidt, 2019; H. G. Schmidt et al., 2011). In the PBL procedure, students are placed into small groups and presented with open problems to solve or questions to answer. These guides are designed to activate and build on prior knowledge and must constantly relate to real-world scenarios. There are at least five main objectives of PBL for students: 1) building a broad and flexible knowledge base; 2) being an effective collaborator; 3) developing practical problem-solving skills; 4) becoming intrinsically motivated to learn; and 5) developing independent learning skills (Loyens et al., 2008). The concept of PBL, which is closely related to solving mathematical problems and utilizing an understanding of basic mathematical concepts to solve various real everyday problems, confirms that this learning model is relevant for improving students' numeracy skills, including at the elementary school level.

To carry out mathematics learning that is oriented towards improving students' numeracy skills in elementary schools more is needed to apply a PBL learning model; it needs the support of appropriate learning media. With learning participants who are digital native characteristics, learning needs to be adapted to their characteristics. One alternative is PBL learning, supported by video media, as has been confirmed in previous literature (Basu Roy & McMahon, 2012; Chan et al., 2010; Kay & Kletskin, 2012; Lajoie et al., 2014). However, these studies have yet to examine the background in elementary schools specifically. Besides that, the video content is not specific to animated videos. For this reason, this research needs to be carried out, besides, of course, to overcome important problems to be resolved immediately, namely the low numeracy skills of students in elementary schools.

The aim of this research is to examine the implementation of Problem-Based Learning (PBL) supported by video media to enhance the numeracy skills of elementary school students. The PBL concept, allowing students to apply their understanding of basic mathematical concepts to solve real-life everyday problems, makes it relevant for improving students' mathematical and numeracy skills, particularly at the elementary school level. By utilizing video media, this study aims to investigate how the use of technology in the learning process can support the development of students' numeracy skills.

2. METHODS

The research was conducted in class V at SDN 6 Benteng Sidrap, South Sulawesi, Indonesia. The research subjects were 18 students. The research design used in this study is the Classroom Action Research model developed by Elliot (Elliott, 2001). Learning improvement is designed through several stages, namely: 1) planning; 2) implementation; 3) action observation; and 4) reflection.

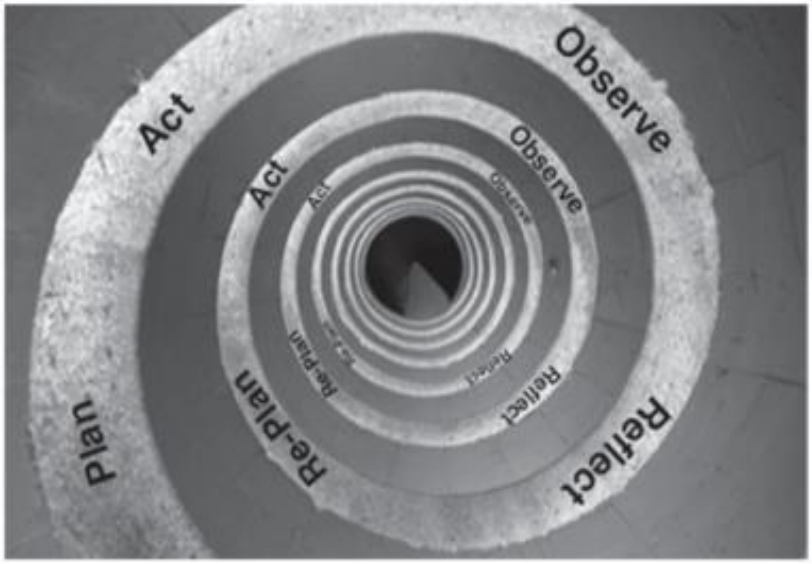

Figure 1. Design of Research (Source: (Kemmis et al., 2014, p. 19)

The implementation of the action refers to the five steps of the problem based learning (Sofyan, H., Wagiran, Kokom, K & Endri, 2017), namely; 1) Orient students to problems, 2) Organize students to learn, 3) Guiding individual and group investigations, 4) Develop and present the work, 5) Analyze and evaluate the problem-solving process. The research data collected were: 1) student and teacher activity data taken using observation sheets. This data is to determine the learning process and the implementation of problem based learning assisted video learning media; 2) data on the results of students' numeracy literacy tests using test instruments made by the teacher. Each student's answer is not only corrected for right or wrong and then given a score, but continued with the analysis in the form of the level of numeracy ability based on predetermined indicators of numerical literacy ability. The instrument has been validated constructively and contented by two mathematics learning experts. As a result, all experts stated that the three instruments: 1) teacher teaching observation instruments, 2) student learning observations, and 3) evaluation questions to measure students' numeracy literacy abilities, were declared valid and suitable for research data collection. The weakness is that empirical validation needs to be carried out, which is this study's weakness. Giving action is stopped if >76% of all students in the research class reach medium and high levels according to the numeracy literacy ability indicators, as shown in Table 1.

Table 1. Indicators of Students' Numerical Literacy Ability

Ability Level	Indicators
High	Able to show five indicators, namely: 1) Be able to use various kinds of numbers and symbols related to mathematics to solve problems in various contexts of everyday life 2) Able to write down precisely what is known and asked from the problem 3) Be able to design steps to solve the problem 4) Able to solve questions correctly 5) Able to write the conclusion of the problem
Medium	Able to show three indicators, namely: 1) Be able to use various kinds of numbers and symbols related to mathematics to solve problems in various contexts of everyday life 2) Able to write down what is known and asked from the problem 3) Able to solve problems

Ability Level	Indicators
Low	Able to show two indicators, namely: 1) Be able to use various kinds of numbers and symbols related to mathematics to solve problems in various contexts of everyday life 2) Able to write down what is known and asked from the problem

Source: Adaptation from (Baharuddin et al., 2021)

The data analysis technique used in this study is a data analysis technique which consists of three paths, namely data condensation, data presentation and conclusion (Kalpokaite & Radivojevic, 2019). Data condensation is done by selecting, focusing, simplifying, abstracting and transferring the data contained in the research results. In qualitative research, the presentation of data is done with brief descriptions, relationships between categories and the like, and what is most often used is with narrative or narrative text. Concluding qualitative research is part of a complete activity. In other words, concluding is taking the essence of an organized data presentation as a short and meaningful statement.

3. RESULT AND DISCUSSION

Results

Implementation of Cycle I Actions

The implementation of the cycle I action is manifested in the form of core learning activities based on Problem-Based Learning steps, namely:The first step, orient students to the problem. The teacher shows a learning video about volume word problems and asks students to write down any problems in the learning video. This video media was made using the kinemaster application, which is divided into three parts: an explanation of the story questions, the procedure for answering incorrect story questions, and an explanation of the steps for answering the right story questions, along with examples. Figure 2 shows an example of a screenshot of learning media in implementing the cycle I action.

Figure 2. Screenshot Example of Learning Media in The Implementation of the Cycle I Action

The second step is organizing students to learn. The teacher divides students into four heterogeneous groups, each consisting of 4-5 students. After that, the teacher gives assignments to students to complete LKPD in group discussions, and the teacher asks students to prepare their writing instruments and sit with their group mates. Student worksheets contain activities that reflect the six steps of PBL learning. Figure 3 shows an example of a student worksheet in cycle I learning.

The third step is guiding individual and group investigations. The teacher asks students to re-watch the learning video containing how to answer the right story questions. After that, the teacher asks students to carry out problem-solving activities based on activities in LKPD in group discussions, and the teacher provides guidance to each group that finds problems. The fourth step is developing and presenting the work. The teacher guides the students to present the results of the problems in the LKPD, and the teacher asks the group of students who do not present to listen carefully to their friends' presentations. The fifth step, analyze and evaluate the problem-solving process. The teacher provides an opportunity for other groups to respond to the results of the group discussion that is currently appearing, after which the teacher reinforces the reports submitted by students. At the end of the second cycle I learning meetings, they were given eight evaluation questions in the form of story questions that had to be completed individually. The results of their work are then analyzed and used in determining the categories of their numeracy literacy abilities.

Figure 3. Example of Student Worksheets on the Implementation of the Cycle I Actions

Learning Improvement Results After Cycle I Actions

Changes that occurred after the Problem-Based Learning (PBL) learning model, assisted by video media, were applied in cycle I, namely an increase in focus, involvement, and student learning activities. This change can be seen when the teacher shows a learning video about the volume of space story questions; students seem to focus on observing and learning the learning material through the information on the learning video show. Students begin to pay close attention step by step in answering story questions correctly. Changes that occur next are in the learning interactions seen in working together in groups when solving problems through math story questions given by the teacher through student worksheets. In this problem, the teacher relates the basic mathematical concepts of geometric material to everyday problems, such as calculating the volume of a fish pond, the amount of water needed to fill it, and so on. Through these problems, the teacher presents real-world situations in the classroom and encourages students to make connections between students' knowledge so that students can solve various problems that exist in everyday life.

Based on observing the learning process, the teacher aspect is in a suitable category, scoring 76.19. Meanwhile, the aspect of new students reached the pretty good category with a score percentage of 75.13. Thus there is still a need for improvement in the implementation of the learning process, whether carried out by the teacher or the learning activities followed by students. Some of the deficiencies during the implementation of the action in cycle I are: 1) The need for students' attention when the teacher shows material in the learning video, 2) Most students still have weaknesses in understanding existing data and problems in story problems, 3) not all students show learning involvement and activeness, visible during class learning or group activities, 4) from the teacher's point of view, class mastery still needs to be improved so that increased learning can be more optimal. For this reason, there needs to be improvement in the next cycle, namely: 1) The teacher must focus more on guiding students in each group so that students can examine and understand the data and problems that must be solved in word problems, 2) look for strategies to increase the activity of some students who not yet active and engaged in learning. 3) Increase student motivation in learning, especially in discussions and communicating problem-solving results. Changes that occur in increasing students' numeracy abilities can be seen in the results of student evaluation tests which appear to be starting to increase. After implementing the PBL learning model assisted by video media in cycle I, it can be seen from 18 students that four students (22%) are in the high ability category, seven students (39%) are in the medium ability category, while the other

seven students (39%) are still are in the low ability category. In other words, only 61% of students are in the high and medium categories. In this standard research, implementing the action is said to be successful if > 76% of students are already in the medium and high categories. Figure 4 shows an example of student completion results along with an analysis of their numeracy skills. Based on the observations of the learning process and the results of students' ability tests in cycle I, which still needed to be at the expected standard, the research continued to cycle II.

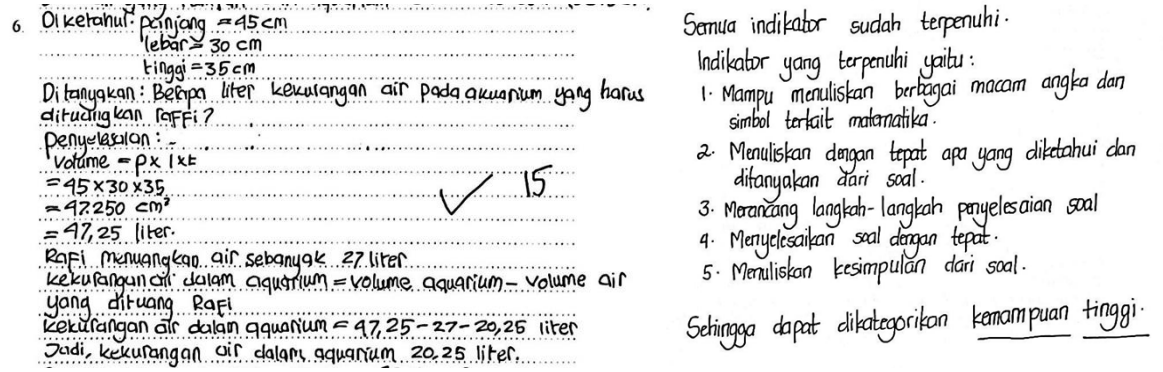

Figure 4. Example of Student Completion Results and the Analysis of Their Numeracy Skills

Results of Improved Learning Cycle II

The steps for implementing cycle II actions are still the same as those for cycle I, namely implementing the five steps or PBL syntax. The difference is the topic of the material being studied, the learning videos presented to students, and various efforts to improve the learning process as a follow-up to the reflection results in cycle I.

Learning Improvement Results After Action Cycle II

Based on the results of teacher and student observations after carrying out cycle II which was carried out by implementing the steps of the Problem-Based Learning (PBL) learning model, it showed a significant increase compared to the previous cycle. The changes occur because students are increasingly focused on learning videos at the problem orientation stage and the investigation stage. They seemed to focus on paying attention to the video content to solve problems that had to be done in groups about solving surface area story problems of geometric shapes. By observing the video at this learning stage, students get to try to find information on their own through learning videos and think critically and creatively in solving problems that must be solved. Apart from that, it looks even better.

Interactive learning is seen in the process of cooperation in groups in solving story problems. In addition, the teacher relates the material to everyday life so that the teacher can present real-world situations in class and encourage students to make connections between students' knowledge so that students can solve various problems that exist in everyday life. Students tell orally objects that exist in everyday life that resemble geometric shapes, for example, books, cupboards, refrigerators, and so on. Based on the observations of the learning process, the teacher aspect is in a suitable category, as well as the student aspect, which has achieved a good category with a score of 90.47 each. Changes in improving students' numeracy skills can be seen in the results of evaluation tests that have experienced an increase. After implementing the PBL learning model assisted by video media in cycle II, it can be seen from 18 students that 11 students (61%) are in the high ability category, five students (28%) are in the medium ability category, while two students (11%) are still are in the low ability category. In other words, 89% of students are in the high and medium categories. Based on observing the learning process, which has reached a suitable category, and the results of increasing students' numeracy skills which are > 76% in the high and medium categories, this action research was stopped in cycle II.

Discussion

The research results described in this section present the findings obtained by implementing the PBL learning model assisted by video media to improve students' mathematical numeracy skills in solving story problems. This classroom action research was conducted in two cycles, with two meetings. The implementation of the action has been reflected in the learning process, which has implemented the five steps of PBL, namely 1) orienting students towards problems, 2) organizing students for learning, 3) guiding individual and group investigations, 4) developing and presenting works, 5) analyzing and evaluating the problem-solving process (Sofyan, H., Wagiran, Kokom, K & Endri, 2017). Furthermore, the

implementation of PBL is supported by learning media in the form of videos. The video's content structure is also arranged based on the five steps of PBL learning. Student learning activities while participating in PBL learning are also guided by student worksheets that follow the flow and steps of PBL learning so that students can quickly and structuredly follow the PBL learning steps. Giving actions carried out in class V elementary school on mathematics content encourages changes in the learning process and improves students' abilities after learning mathematics. This follows some literature confirming that PBL is a relevant learning model for improving mathematics learning quality and results (Crowley, 2015; Merritt et al., 2017; Ronis, 2007). Various changes have occurred in the process and learning outcomes in the material about the story of the spatial structure in class V UPT SD Negeri 6 Benteng. Regarding the PBL learning process, the support of learning videos has fostered various process skills and directed student learning involvement. For example, skills in observing problems, associating problems with existing knowledge and discussing and collaborating to solve problems in groups. This is in line with the assertion that PBL involves students developing various soft skills, active, collaborative, student-centered learning, encouraging independent learning, focusing on realistic problems, and authentic assessment, leading to increased student engagement (Allen et al., 2011). Other changes appear in student learning activities in obtaining information from learning videos. They can understand the steps to answer the story questions correctly. This is in line with various literature which confirms that PBL with video support can complete the gap between textual PBL being more visual and connecting with students' real-life problem solving so that it is more realistic and students are much more involved, more motivated in learning (Chan et al., 2010). This is also in line with previous studies, which concluded that the Problem-Based Learning model assisted by audio-visual media encourages students to be directly and actively involved so that students can find facts and concepts and build their knowledge (Novitasari, R., Anggaraito, Y, U., Ngabekti, 2015).

The following change is that students are facilitated to practice and be able to relate the basic mathematical concepts they are learning with everyday life because, in learning, the teacher presents real-world situations in class regarding the concept of volume being studied. This encourages students to make connections between the knowledge they have and learn to solve various problems that exist in everyday life. This is also in line with the opinion that PBL is a learning model that facilitates students to find a complex problem, work in groups and collaborate to present problems that are closely related to everyday life, thus triggering students to be able to carry out discussions as an alternative problem solving with groups (Aulia, L. N., Susilo, S., & Subali, 2019) Introducing and facilitating learning by providing examples of Everyday problems will encourage students to be able to apply the fundamental mathematical concepts learned in everyday life. This aligns with Camille Catlett's opinion that integrating math content into routines allows children to see mathematics in context, provides situationally relevant learning opportunities, and supports the everyday use of mathematics (Catlett, 2020). This is also an essential concept in improving students' numeracy skills.

Various changes in the learning process, as described above, then lead to an increase in students' mathematical numeracy literacy skills. This can be seen in the category of students' numeracy abilities. Of the 18 students, four students (22%) were in the high ability category, seven students (39%) were in the medium ability category, while the other seven students (39%) were still in the low ability category. In other words, only 61% of students are in the high and medium categories. In cycle II, there was an increase. Namely, there were 11 students (61%) who were in the high ability category, five students (28%) were in the medium ability category, while the other two students (11%) were still in the low ability category. In other words, 89% of students are in the high and medium categories.

Based on the previous description, it can be concluded that implementing the PBL learning model assisted by video media improved students' mathematical numeration processes and skills in word problems in class V SD Negeri 6 Benteng, Sidrap Regency, South Sulawesi. This aligns with previous research, which concluded that implementing the Problem-Based Learning learning model influenced students' numeracy abilities (Mawarsari, N. & Krisma W., 2022). More specifically, other studies have concluded that PBL can improve numeracy skills in grade VI elementary school students (Atiqoh, C., 2023; Sri, 2022). The limitations of this study include a restricted sample size involving only 18 students from one class at SD Negeri 6 Benteng Sidrap and a brief research duration spanning two cycles. These constraints hinder the generalization of research outcomes to a larger population and fail to fully evaluate the long-term effects of implementing PBL supported by video media. Additionally, the study focused solely on one school location, potentially neglecting variations in learning contexts and conditions across other schools. To address these limitations, recommendations include broadening the sample size by involving more classes or schools and extending the research duration to track long-term changes. Conducting research across diverse school locations with different backgrounds could offer a more comprehensive understanding. Furthermore, conducting in-depth analyses of specific aspects in implementing PBL with video media is advised to gain a more detailed understanding of its impact on

student learning outcomes. These steps aim to enhance future research, providing a deeper and broader understanding of the impact of implementing PBL with video media in enhancing students' numeracy skills.

4. CONCLUSION

Two conclusions can be formulated based on the results of improving learning through research data presentation and discussion of research results. First, implementing the PBL learning model assisted by video media can improve students' mathematics learning processes in solving word problems in class V SD Negeri 6 Benteng, Sidrap Regency, South Sulawesi. Second, these actions can improve students' mathematical numeracy skills in that class.

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