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Enhancing Elementary Students' Learning Outcomes on Force Concept through Interactive Learning

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Abstract

This study aims to observe the enhancement of student learning outcomes in Class IV A at SD Negeri Pembina Tolitoli through the implementation of more interactive learning methods. The primary focus of this research lies in comprehending force-related materials. Employing the Kemmis and Mc. Taggart model, the research was carried out in the odd semester of the school year, specifically in October. The study involved 34 students as subjects, with particular emphasis on their grasp of force-related materials. The collected data underwent descriptive analysis and was presented in tabular format. The findings indicated a notable improvement in students' comprehension of the material. In the initial cycle, the average score stood at 44.12, while in the subsequent cycle, it surged to 86.99. This outcome affirms that employing an interactive learning approach centered around educational games in NSS lessons can significantly enhance student understanding in Class IV A at SD Negeri Pembina Tolitoli.

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INTRODUCTION

In the Preamble to the 1945 Law Paragraph IV there is a quote that reads "educating the life of the nation", this effort can be realized with the help of the educational process, preparing future generations to excel to be an important thing in human life. The educational process is felt by every individual throughout his life journey, starting from prebirth to the end of life. Education is a deliberate and planned effort to create a learning environment that allows students to actively develop themselves, both spiritually and intellectually, in order to have strength in the field of religion, self-control, personality development, intelligence, good behavior, and skills that are beneficial to themselves, society, nation, and state (Pristiwanti et al., 2022).

Education has an important role in advancing a country. Superior quality of education will bring positive benefits to the progress of society and the country (Herdiansyah & Kurniati, 2020). One of the signs or clues about the quality of education that can be measured is the academic achievement of students. Students' academic achievement reflects the extent to which students understand and master the subject matter that has been taught (Prananda & Hadiyanto, 2019).

Science education in Indonesia is still very minimal, survey data from the Program for International Student Assessment (PISA) from 2000 to 2022 illustrates that the level of science literacy in Indonesia is included in the poor category. It was noted that the results of the PISA survey in 2015 placed Indonesian students below the average science score of OECD countries (Narut & Supardi, 2019). The data above shows the lack of science knowledge in Indonesia, so it is necessary to make efforts to increase motivation to learn science and improve academic achievement. Science in Class Action Research (CAR) refers to scientific subjects or what in the independent curriculum is referred to as NSS (Natural and Social Sciences).

The Independent Curriculum itself has experienced the latest innovations, especially in science and social studies education which are combined into NSS. There is a technical change where each semester now contains science and social studies learning alternately, namely by applying a pattern of 2 science learning chapters followed by 2 social studies learning chapters, different from the previous format where each semester focuses on science in semester 1 and social studies in semester 2. This aims to avoid saturation in learning for students. In this Independent curriculum, it provides flexibility to educators and students in the teaching and learning process, and the assessment of science and social studies study fields is combined into NSS, as for example in the assessment of report cards (Sugih et al., 2023).

In the learning process, teachers have a crucial role in creating a productive and fun learning environment for students is the main task. Teachers must apply learning methods that can improve student motivation and participation. The learning approach that can be applied is the interactive learning approach (Gunawan et al., 2016). Implementing learning that is not monotonous and passive requires planning as well as appropriate and mature methods and approaches.

Careful planning in education is very important to ensure that the implementation of learning reaches an optimal level. Another important factor is the involvement of students in the classroom that must be considered. When students are actively involved in the learning process, it has greater value than when the role of the teacher dominates. Students' activities in learning play an important role to ensure mutual interaction between teachers and students (Fatmawati, 2020). Two-way communication is a crucial element in the learning process that involves interaction, because without communication it is impossible for interaction to occur. Interaction or in this case interactive learning is learning that actively involves students in the learning process.

Actively engaging students can maintain interest and prevent boredom during learning. The active involvement of students also makes participants enthusiastic about exploring knowledge directly, making the learning process more meaningful (Adnyana & Yudaparmita, 2023). Building meaning in the learning process can be realized through the selection of appropriate learning models. The success of the implementation of learning in the classroom depends on the selection of the right model, therefore, teachers need to consider the learning model

that is in accordance with the characteristics of the students and the curriculum applied. (Mikdar, 2021).

The interactive learning approach allows for active involvement of students in the learning process (Buckley & Doyle, 2016). In this approach, students are given the opportunity to actively participate through discussions, questions and answers, and other interactive activities. It is hoped that through the interaction between teachers and students, students will more easily understand and master the subject matter (Heru & Yuliani, 2020). Game-based interactive learning can also increase students' motivation and enthusiasm for learning (Wasono, 2020)

Interactive learning was chosen because the learning applied by teachers, especially in grade IV A SD Negeri Pembina Tolitoli is still monotonous and conservative, the majority of the learning uses the lecture method. When the researcher asked the students, the majority of students answered that they rarely do learning activities using varied learning methods, only monotonous using lectures. The lecture method is an approach in the teaching-learning process that focuses on conveying information from a teacher to students in one direction. Of course, the lecture method has several disadvantages, including: limited opportunities for discussion, limiting the development of opinion and problem-solving skills, the one-way focused knowledge absorption process hinders the development of creativity and makes it difficult to develop a dynamic classroom, the teacher's lack of creativity results in a monotonous classroom atmosphere and causes student boredom, the teacher's lack of oration ability makes students quickly lose interest, it is difficult to detect students' understanding comprehensively, and stimulating students' interest in reading is difficult to realize (Wirabumi, 2020).

Meanwhile, in interactive learning activities, not only the final goal is emphasized, but also the learning process itself. A teacher plays a role in guiding students not only to rely on memorization methods, but also through hands-on experience or more real learning experiences, this provides an opportunity for students to gain a deeper understanding, because they learn from the practical experience they experience, not just relying on memorized knowledge alone. Thus, teachers have an important role in building students' ability to master subject matter through a more memorable learning process (Mulyati et al., 2021).

Based on this presentation, the researcher chose to implement interactive learning. Interactive learning is very appropriate if applied in the classroom because the students are very active so an interactive approach or communication involving both parties between students and teachers is needed (Inah, 2015).

The interactive learning that the researcher uses is based on educational games, quizzes, and also practice (Magdalena, et al., 2022). Educational games using teaching media or props snakes and ladders, Using teaching media or props in teaching can support learning and create a fun environment for students, keeping them motivated all the time (Junge, et al., 2021; Vuk, 2023).

The learning activity began by opening the class by greeting, greeting students, asking questions about how they were doing, inviting students to pray and singing the national anthem, which was then continued by providing verbal reinforcement. In the core activities, students are invited by the teacher to reflect on the material that has been taught by their teachers, followed by the presentation of the material accompanied by learning songs and continued with the presentation of material of various types of styles, participants are also invited to move forward to practice the type of style in question. This class action research activity is carried out with more

than one cycle, when the student's learning achievement has reached a satisfactory level or has an average above the Minimum Mastery Criteria (MMC) (score of 75), then the research cycle is declared successful and completed.

In the initial observation when the researcher came to the school, it was found that the students had not mastered the style material in the science and science subject, this was proven when asked about the style material in chapter III, none of the students mastered and were able to explain the material again. It was also found that students very rarely understand and listen to the material delivered by the teacher, this is proven when the teacher opens and starts learning, students do not pay attention to the teacher, are less enthusiastic in participating in learning, and play and disturb their friends more often. The results of the final evaluation at the time of initial observation the majority of students have not been able to get satisfactory scores, many of the students get scores below MMC or 75. Looking at the results of the initial observations, it can be concluded that; (1) Students are less enthusiastic in participating in learning, (2) students prefer to play when learning takes place, (3) lack of learning variations applied by teachers or homeroom teachers, (4) low scores of learning evaluation results, especially in the Science Science Chapter II material on force. The problems found in the initial observation make it important to conduct classroom action research to improve the quality of learning. One form of evaluation is a meeting held and guided by the school where teachers can express all the obstacles experienced and hope to find a solution together (Mustakim & Linda, 2022). To assess how far each student can develop knowledge, assessment is necessary in every learning process (Rudini & Khasanah, 2022).

Based on the above explanation, it is necessary to conduct classroom action research to improve the academic achievement of students in class IV A SD Negeri Pembina Tolitoli in the force material of chapter III of the science and technology subject by using an interactive learning approach, educational games, and the provision of verbal reinforcement and rewards (rewards).

METHOD

This type of research is a Class Action Research (CAR) that applies a research design based on the Kemmis and Mc. Taggart models (Qodir, 2021). The research participants were 34 students in class IV A at SD Negeri Pembina Tolitoli. The focus of the research is the academic achievement of the students. The data collection process utilizes a number of methods including interviews, observations, and the application of multiple-choice questions. The data analysis approach was adopted to describe the collected information so that it could be understood not only by the researcher, but also by other parties interested in the results of this study. The data collected includes statements and activities that occur between teachers and students, which are then rearranged in a more systematic sentence format in accordance with scientific norms. This data analysis process goes hand in hand with the data collection process, while considering the relevance of learning for the next steps. Data collection methods include observation, interviews, and multiple-choice questions. The data is analyzed descriptively and then presented in the form of tables. This classroom action research consists of four series of repetitive activities that form a cycle, and in this study, the researcher carried out two cycles. This research process is organized into four steps of activities carried out in each cycle, namely planning, implementation, observation, and reflection.

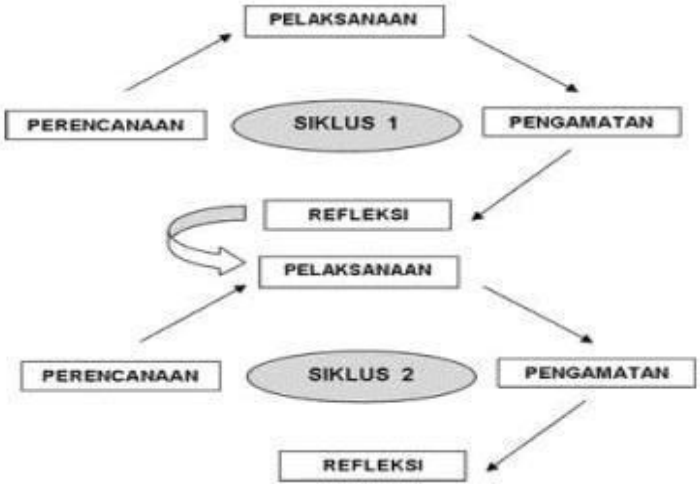

Figure 1. Flow of Implementation of Classroom Action Research

First Cycle

1. Planning

Before starting Classroom Action Research (PTK), a teacher makes a comprehensive preparation in the teaching process. Planning is the main foundation in determining the necessary steps and strategies to implement them. In order to clearly describe and formulate a series of activities that are considered essential to achieve the best results, planning includes a selective process of choosing, linking relevant facts, and making and using assumptions related to the future. There are several stages that can be carried out in this process, including: 1) Designing a complete lesson plan, 2) Preparing all the required learning materials such as teaching materials, worksheets, and other resources, 3) Preparing appropriate evaluation tools to measure student development and understanding.

2. Implementation of actions

The implementation of corrective actions occurs in an actual context after thorough preparation.

3. Observation

In the planning phase, the observation sheet is an important element of the activity. As concrete evidence, each observation session must include a pre-prepared observation sheet.

4. Reflection

The purpose of the reflection process is to evaluate the progress that has been achieved and recognize weaknesses or obstacles that need to be overcome for the next cycle. (Alam, 2022). The researchers adopted the results of the reflection as a basis to adjust the structure in the future cycle. In this phase, evaluation and analysis of observation results are carried out. Teachers together with observers and students are also involved in the reflection process, examining the data of observation results to determine whether the activities carried out are able to improve the quality of learning, especially in achieving the goals that want to be improved in the research, such as learning outcomes.

Second Cycle

1. Planning

Plans for the next cycle are made based on the issues identified from the previous cycle. There are a series of steps carried out in this phase, including: 1) Creating an appropriate learning plan, 2) Preparing all necessary learning equipment, such as teaching materials, worksheets, and so on, 3) Preparing relevant evaluation instruments.

2. Implementation of actions

After going through a careful and careful planning stage, corrective actions are then applied directly in the actual situation or reality at that time. This indicates that the improvement efforts are not only an idea or plan, but are actually carried out and tested in a real context.

3. Observation

After the learning stage in cycle two ends, observations will be made by individuals who have been selected to support the teacher in the observation process.

4. Reflection

At this stage, the data obtained from the observation will be assessed and analyzed. After that, researchers and students will conduct self-reflection using the observation data to assess whether the activities carried out succeed in improving learning outcomes or not is a determining factor. If proven successful, then PTK is considered successful and completed.

RESULTS AND DISCUSSION

Result

The results of the initial observation found that if students do not know the style material and even have low grades or learning outcomes. The results of the initial interview also found that teachers or homeroom teachers rarely apply variations in learning methods so that the learning process becomes monotonous. Classroom Action Research conducted in two cycles with four meetings showed an improvement in student academic achievement. Cycle I activities used quiz-based interactive learning and style material practice. In this learning, students are very enthusiastic in participating in the practice, examples of practices used such as the panco practice for muscle force, pushing the table for swipe force, playing rubber catapults for spring force, playing throwing balls for gravity force. After conducting practice-based learning, it was followed by giving quizzes accompanied by strengthening the giving of prizes to increase students' enthusiasm in taking quizzes. The strengthening of the giving of prizes has been proven to be able to increase enthusiasm, This fact can be substantiated by the number of students who participated after being given reinforcement with prizes compared to quizzes without prizes. After conducting the evaluation of the first cycle, there are still many students who have not completed or have not reached (MMC). In SD Negeri Pembina Tolitoli, the MMC was set at 75, out of 34 participants none completed or achieved the MMC, with these results, the researcher continued the second cycle.

In the second cycle, interactive learning based on educational games was applied, games used in the game of snakes and ladders (introduction of style material), In the second cycle, there was

progress in the achievement of student learning outcomes. (Rachmavita, 2020). The results of the research on the application of this learning method are presented in the table below:

Table 1. Student Achievement Evaluation Information in Cycle I and Cycle II

No.	Information	Cycle I Values	Cycle II Grades
1.	Sum	3.000	5.915
2.	Average	44,42	86,99
3.	Highest Scores	80	100
4.	Complete MMC	9	34
5.	Not Completed MMC	34	0
6.	MMC Percentage	0%	100%

Based on the data recorded in the table, it can be seen that the Classroom Action Research shows a significant improvement in student learning outcomes using an interactive learning approach. In the first cycle, the average increase was 28.82, while in the second cycle, there was a more significant increase with an average of 82.65. The results of this study highlight that the interactive learning approach has succeeded in optimizing students' achievement in understanding force material from the first cycle to the second cycle.

Table 2. MMC Presentation (75) Cycle I and Cycle II

Cycle I	Cycle II
Meeting I: 0%	Meeting I: 100%
Meeting II: 26.47%	Meeting II: 100%

The learning achievement at the first meeting of the first cycle showed an average score of 28.82, while in the second meeting it reached 59.41. The average score of the two meetings in the first cycle was 44.12, which did not meet the Minimum Completeness Criteria (MMC). A total of 11 students reached the MMC. In the second cycle, the average score at the first meeting was 82.65, and in the second meeting was 91.32, which has exceeded the MMC. The average score of the two meetings in cycle II was 86.99. From these results, it is evident that the interactive learning approach in grade IV A SD Negeri Pembina Tolitoli has succeeded in improving student learning outcomes.

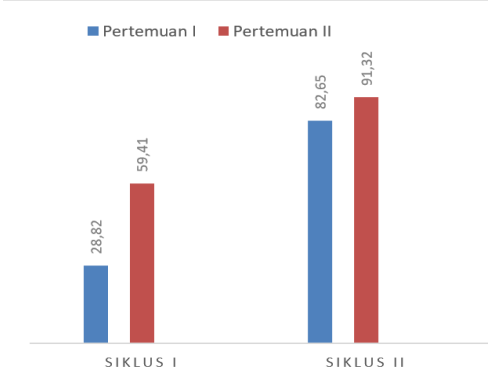

Figure 2. Comparison of Average Scores of Cycle I and Cycle II

Discussion

The interactive learning approach in the learning process, especially on style materials, makes the learning atmosphere more enjoyable because this interactive learning approach can build students' interest and enthusiasm and increase student participation in the learning process, so that the learning atmosphere looks more fun, not passive and not monotonous. The interactive learning approach can be a new way for teachers to create a fun learning environment.

The interactive learning used is practice-based learning and educational games. In the initial observation, many students did not know about style material, participants did not even know the definition of style, types of styles and examples of these types of styles. When interviewed regarding the methods that teachers have been applying in learning, especially in the field of science and science in the Style section, the majority of students stated that in learning, teachers only use a lecture approach in the sense that they do not vary learning methods and models.

The results of the interview showed that teachers are more likely to use the lecture approach in the learning process which is less interesting for students and make students passive because learning focuses on the teacher. Therefore, researchers present interactive learning so that students become more active, this comes from the application of an interactive approach that focuses on students. (Haley et al., 2021).

First Cycle Learning Action (I)

In cycle I, the learning applied is the practice of force material, while the types of forces practiced include: gravitational force, friction force, spring force, and muscle force. The application of practice in the first cycle of students is enthusiastic in participating in practice because it is accompanied by reinforcement with prizes. This can be an innovative way to increase students' enthusiasm for learning in the educational process. in addition to through a game-based interactive approach. However, in this case, reinforcement with prizes is still rarely used by teachers so that the learning process becomes passive.

The application of the first cycle on the first day, the researcher provided material on the definition of force, types of force, and examples of types of force, after the provision of material continued with practice on examples of types of force such as frictional force, muscle force, spring force, magnetic force, and gravitational pull force. In carrying out the practice, the team first gave an example of the type of style, then the students were asked to come forward to demonstrate an example of the type of style that had been demonstrated by the research team. The practices used include; pushing the table for swipe force, panco fight for muscle force, playing rubber catapult for spring force, throwing a pen for gravity force, and playing magnet. In carrying out the practice, the researcher also gives explanations related to the style such as, what is a style, why it happens, and how it can happen.

This activity can foster students' enthusiasm and interest in participating in learning through practice and their involvement in the learning process. Directly participate in learning activities so that not only the dominant role of teachers in the learning process, but also the active involvement of students in these learning activities. Learning that is often used in schools is a type of learning that prioritizes the role of teachers as the center. A learning method that focuses on the

active role of students is a method that emphasizes the active participation and involvement of students in the learning process. This method places emphasis on the role of students as key subjects in the learning experience, where they are actively involved in activities that stimulate critical thinking, collaboration, and exploration of lesson concepts. In this context, the role of teachers is more as a facilitator who supports and guides students in gaining a deeper understanding through their own learning experiences (Larosa & Lami, 2022). At the beginning of the first cycle, the average score of the first meeting was 28.82, which is included in the low category. Therefore, a second meeting is needed for the first cycle.

Using the first cycle on the second day, the researcher conducted a quiz accompanied by reinforcement with prizes, students were given questions about style material as a continuation of the material at the first meeting, after being given a quiz of students who were able to give the right response to the questions asked, they would be given a prize as an appreciation to the participants that the students had understood the style material that had been taught. When conducting quizzes accompanied by reinforcement with prizes (*rewards*), students are very enthusiastic and active in participating in these activities so that participants are motivated to learn. Based on previous research, it shows that there is a strong indication that giving awards or prizes has a significant impact on students' performance and motivation to learn. These facts underline that awards not only affect academic achievement, but are also able to provide a substantial boost in shaping students' attitudes, passions, and desires to learn more vigorously and effectively (Jovanovic & Matejevic, 2014).

The facts mentioned above show that practice-based interactive learning accompanied by prize reinforcement can increase students' enthusiasm for learning which has the potential to have an impact on improving learning outcomes, this is evident from the increase in the average score from 28.82 at the first meeting to 59.41. The learning that has been implemented can also be applied by teachers who still use methods that are less varied, in this case only using the lecture method which of course is teacher-centered, the impact is that students can feel quickly bored and bored in following the learning process, which ultimately affects their learning outcomes. In the early stages of the first cycle, researchers have not managed to achieve optimal results in improving students' understanding of force materials. This is due to limited participation, only a few students are able to correctly answer the quiz along with the worksheets given by the researcher. Therefore, the researcher continued the study to cycle II where quizzes were conducted using game media, namely snake and ladder pamaya (introduction of force material).

Figure 3. Presentation for Preparation for Force Material Practice

Second Cycle Learning Act (II)

In the second cycle, in the first meeting learning, the researcher applied snake and ladder game-based learning called pamaya (introduction of force material), in this snake and ladder pamaya is filled with questions about force material, not only there are questions but also punishment if the student's pawn is right on the snake's head. Participants were very enthusiastic in participating in the game, the fact was revealed from the improvement in learning performance when completing the Student Worksheet. The average score at the first meeting in cycle II was 82.65. Most students have managed to achieve the Minimum Completeness Criteria (MMC) score with an achievement rate of 100%.

In the second cycle of the second meeting, the researcher continued to implement interactive learning centered on students based on educational games (pamaya), but what distinguishes the first meeting and the second meeting is the implementation of reinforcement with rewards *or rewards* (Lubis, 2018), as an appreciation if students answer the questions correctly, the application of educational games accompanied by reinforcement with prizes is proven to be able to increase learning achievement for class students IV A at SD Negeri Pembina Tolitoli. In the second meeting, the average score obtained was 91.32 with all students achieving MMC of 100%.

In the second stage, there was an increase in the learning achievement of students in this activity in answering questions correctly, in the results of the research there was an increase. The presentation of the development or improvement of learning displayed through a table format, from the average score of 28.82 increased to 82.65, this means that there has been an increase with an average of around 53.83.

Figure 4. Interactive Learning Using Pamaya Snake and Ladder Media

CONCLUSION

The findings of this study indicate that the application of interactive learning methods is able to increase students' learning achievement in lessons about style, as evidenced by the increase in average scores in each cycle. In this study, the use of educational practices and games in the learning process has been proven to be successful in increasing students' enthusiasm and learning achievement. In addition, reinforcement with prizes has also proven successful in increasing students' enthusiasm for learning. Therefore, it is recommended that teachers adopt a more diverse and interesting learning approach for students so that they become more active and involved in

learning activities. An effective method for teaching is an interactive approach that involves active participation from students as well as student-centered, the selection of educational games can also be applied. In addition, reinforcement with gifts can also be applied as a method to increase student enthusiasm in the learning process.

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