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Implementation of Problem Based Learning to Improve Learning Outcomes of Backhand Stroke Skills in Badminton Games

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Abstract: This study aims to improve the learning outcomes of backhand stroke skills in badminton through the application of the Problem Based Learning (PBL) model in grade VIII students of SMP Negeri 6 Ambon. The study used the Classroom Action Research (CAR) method with the Kemmis and McTaggart model which was implemented in two cycles, each including the planning stage, action implementation, observation, and reflection. The research subjects were 28 students. Data collection was carried out through skills tests, observation, and documentation, while data analysis used quantitative descriptive analysis based on the percentage of learning completion. The results showed that the application of PBL was able to improve the learning outcomes of backhand stroke skills. In cycle I, 19 students (68%) achieved learning completion, while 9 students (32%) had not yet completed it. After improvements were made to learning in cycle II, all students (100%) achieved learning completion. In addition to improving learning outcomes, the application of PBL also encouraged increased active participation, critical thinking skills, cooperation, and student confidence during the learning process. These findings indicate that the Problem Based Learning model is effective in improving learning outcomes of backhand stroke skills in physical education learning at the junior high school level.

Keywords: Problem Based Learning; Learning outcomes; Backhand stroke; Badminton; Physical education.

Introduction

Physical education is an integral part of the education system which is not only oriented towards improving physical fitness, but also plays a role in developing students' cognitive, affective and psychomotor abilities through meaningful learning experiences (Işıkgöz, 2025). "Physical education is the most effective way to provide all children and youth with the skills, attitudes, values, knowledge and understanding for lifelong participation in society"(Gleddie & Morgan, 2021). Physical education (PJ) has become a fundamental element in the modern education system because it contributes to the holistic development of students. Today, physical education is no longer viewed simply as a physical activity-oriented activity, but has evolved into a structured field of study that plays a role in improving students' cognitive, emotional, and social skills. Various studies show that the implementation of physical education in educational settings has a positive impact on academic achievement, mental health, character formation, and the holistic development of students' personalities. Amidst the increasing sedentary lifestyle and the high intensity of digital device use, the presence of physical education in the curriculum is becoming increasingly important for developing healthy and balanced lifestyle habits from school age. Therefore, educational institutions, both schools and universities, are increasingly recognizing that the goal of education is not only focused on

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academic achievement, but also on the development of the whole individual, namely individuals who have physical health, mental resilience, emotional balance, and good social skills (Dhar & Kumar, 2025). Therefore, the learning process is no longer teacher-centered, but is directed towards student-centered learning, thereby increasing the active involvement of students during the learning process (Goodyear & Dudley, 2015; Kleppan Flaat et al., 2025).

One of the important topics in physical education at the junior high school level is badminton. Badminton is a racket sport played by two players (singles) or two pairs (doubles), characterized by a series of short, high-intensity matches. This sport consists of five events: men's singles, women's singles, men's doubles, women's doubles, and mixed doubles. Each event has its own unique demands, requiring mastery of technique, game control, and optimal physical condition. As one of the most popular sports in the world with approximately 200 million fans, badminton's popularity has increased since its official inclusion at the 1992 Barcelona Olympics, contributing to the growth of the number of athletes and public participation. In this game, visual abilities play a crucial role because players must be able to capture, process, and respond to visual information quickly and accurately during matches. Therefore, a comprehensive understanding of the characteristics of badminton can be an important foundation for improving the quality of coaching, training, and playing performance (Phomsoupha & Laffaye, 2015). Therefore, learning basic badminton techniques is the main foundation in developing students' playing abilities.

One of the most complex basic techniques is the backhand. This technique is used when the shuttlecock is on the non-dominant side of the body, requiring coordination between footwork, racket grip, body balance, wrist strength, and precise timing when making contact with the shuttlecock. Unlike the forehand, the backhand requires better neuromuscular control because it is executed in a relatively disadvantageous body position. Biomechanical research shows that the success of a backhand is greatly influenced by the coordination of lower and upper body movements, particularly the synchronization of footwork, shoulder rotation, and wrist acceleration, resulting in an accurate and efficient shot (He et al., 2024).

Despite this, various studies have shown that mastering the backhand technique remains one of the main difficulties experienced by students in badminton lessons at school. This low skill is generally caused by inaccurate foot position when moving towards the shuttlecock, errors in racket holding technique, poor hand-eye coordination, and suboptimal concentration when executing a shot. These conditions result in inaccurate shots, low power output, and frequent misses over the net or out of bounds. Similar findings were also found in initial observations at SMP Negeri 6 Ambon, where the majority of students were unable to execute the backhand technique according to the expected skill indicators. This problem is reflected in low student learning outcomes, particularly in psychomotor aspects such as movement execution technique, body position, and shuttlecock direction accuracy.

These issues indicate that low learning outcomes are not solely due to students' physical abilities, but are also influenced by the learning strategies used by teachers. Physical education instruction in schools still largely uses a conventional approach, consisting of one-way lectures and demonstrations, which severely limits students' opportunities to explore, discuss, solve problems, and receive feedback from peers (Fenanlampir et al., 2024). As a result, students tend to simply imitate movements without understanding biomechanical principles or the reasons why a technique must be performed in a certain way. This condition makes learning less meaningful and impacts low learning outcomes in sports skills (Fenanlampir et al., 2021).

One learning model considered capable of addressing these issues is Problem-Based Learning (PBL). PBL is a learning model that uses authentic problems as a starting point for learning, encouraging students to develop critical thinking skills, conduct investigations, discuss, collaborate, and find solutions to the problems they face (Saleh et al., 2022). In the context of physical education, the application of PBL allows students to analyze the causes of their technique errors and then develop solutions through collaborative practice, observation, reflection, and evaluation. Thus, learning not only enhances conceptual understanding but also improves motor skills through a more active learning experience (Leasa et al., 2021). Several studies report that PBL has a positive impact on improving learning outcomes, critical thinking skills, learning motivation, creativity, and collaboration skills at various levels of education (Batlolona et al., 2019; Batlolona et al., 2020). In the field of physical education, the application of PBL has also been proven to improve decision-making skills, game skills, and active participation of students during the learning process (Heinrichs, 2002;Hushman et al., 2013). However, most of these studies have been conducted on learning big ball games or on general problem-solving aspects, while studies that specifically examine the effectiveness of PBL on improving badminton backhand technique skills in junior high school students are still relatively limited.

Furthermore, most previous studies have focused more on improving cognitive abilities or learning motivation than on mastering specific motor skills that require complex motor coordination. However, the

success of sports technique learning is not only measured through conceptual understanding, but also through students' ability to perform movements correctly, effectively, and consistently. Therefore, research is still needed that tests the effectiveness of PBL in improving backhand skill learning outcomes through a Classroom Action Research (CAR) approach, so that it can provide practical recommendations for physical education teachers in improving the quality of the learning process. Based on this description, this study aims to analyze the effectiveness of the application of the Problem Based Learning (PBL) model in improving backhand stroke skill learning outcomes in students' badminton games.

Method

This study used the Classroom Action Research (CAR) method with a collaborative approach between the researcher and the Physical Education, Sports, and Health (PJOK) subject teacher. The study aimed to improve learning outcomes in backhand stroke skills in badminton through the application of the Problem-Based Learning (PBL) model. The research design refers to the CAR cycle model. Kemmis et al. (2014) which consists of four stages: planning, action, observation, and reflection. The research was conducted in two cycles, with each cycle serving as the basis for improvements to the learning process in the following cycle until the research success indicators were achieved.

The study was conducted at SMP Negeri 6 Ambon in the even semester of the 2025/2026 academic year, with 28 eighth-grade students, consisting of both male and female, as subjects. Subjects were selected based on initial observations, which showed that most students still had difficulty mastering the basic techniques of the backhand stroke, particularly in foot position, racket grip, motor coordination, and accuracy when making contact with the shuttlecock.

The implementation of the action is carried out through the application of Problem Based Learning syntax, namely orienting students to problems related to backhand stroke techniques, organizing students into study groups, guiding the process of investigating the causes of movement errors, developing and presenting the solutions obtained, then reflecting on the process and results of learning. During this process the teacher acts as a facilitator who provides guidance, while students are encouraged to actively discuss, analyze technical problems, try various alternative solutions, and practice backhand stroke techniques according to the results of group discussions. The reflection process at the end of each cycle is used to evaluate learning weaknesses so that improvements can be made in the next cycle.

Data collection was conducted using testing, observation, and documentation techniques. Tests were used to measure backhand stroke learning outcomes through practical assessments based on a psychomotor rubric covering initial stance, movement execution, and follow-through. A knowledge test was used to measure students' understanding of basic backhand stroke techniques. Observations were conducted throughout the learning process to obtain information on student activities, the implementation of the Problem Based Learning model, and teacher activities in managing learning. Meanwhile, documentation in the form of photographs of learning activities and other supporting documents were used as evidence of the implementation of actions and to strengthen the research data.

The research instruments consisted of student and teacher activity observation sheets, a backhand skills assessment rubric, an attitude assessment sheet, and a knowledge test based on learning competency indicators. Skills assessments were conducted by examining the accuracy of racket grip, body position, movement coordination, swing quality, and shot direction accuracy, according to a rubric developed prior to the study.

The research data were analyzed using quantitative descriptive analysis. The learning outcome scores for each student were obtained by comparing their scores with the maximum score, then converted into a percentage. Individual learning completion was determined based on the Minimum Completion Criteria (KKM) of 73, while classical learning completion was calculated based on the percentage of students achieving the minimum score. The analysis results from each cycle were then compared to determine the improvement in learning outcomes after the implementation of the Problem Based Learning model. Observation data were analyzed descriptively to describe changes in student activity and the quality of the learning process in each cycle, thus obtaining a comprehensive picture of the effectiveness of the actions given in improving students' backhand stroke skills.

Results and Discussion

This classroom action research was conducted in two cycles by applying the Problem Based Learning (PBL) model to the learning of badminton backhand stroke techniques in class VIII of SMP Negeri 6 Ambon. Each cycle consisted of planning, action implementation, observation, and reflection. Evaluation of learning outcomes was conducted at the end of each cycle based on the Minimum Completion Criteria (KKM) of 73. The implementation of learning in cycle I showed initial changes in student learning outcomes. Through problem-based learning, students began to be actively

involved in identifying the causes of backhand technique errors, discussing alternative solutions, and practicing the analyzed techniques with their groups. However, during the learning process, several obstacles were still encountered, such as suboptimal footwork coordination, inappropriate racket grip, and a lack of synchronization between arm swing and wrist movement when hitting. These conditions caused some students to be unable to produce accurate and consistent backhand strokes. Based on the results of reflection in cycle I, various improvements were made in cycle II, including providing more systematic technique demonstrations, increasing training intensity, providing individual feedback, and optimizing group discussions according to the syntax of Problem Based Learning.

These improvements had a positive impact on improving students' ability to master backhand stroke techniques. During the learning process in cycle II, students appeared more active in discussions, more confident in practicing, and were able to correct technical errors independently through group analysis results. This improvement was also reflected in the increasingly better quality of student movements, especially in aspects of foot position, racket grip, motor coordination, and accuracy of stroke direction. Quantitatively, student learning outcomes experienced a significant increase. In cycle I, 19 students (68%) had achieved learning completion, while 9 students (32%) had not reached the KKM. After corrective actions were taken in cycle II, all students (28 students or 100%) successfully achieved learning completion. Thus, there was an increase in learning completion of 32 percentage points from cycle I to cycle II. These results indicate that the application of the Problem Based Learning model is able to optimally improve learning outcomes in backhand stroke skills in grade VIII students of SMP Negeri 6 Ambon. The results of the study indicate that the application of Problem Based Learning (PBL) is able to improve learning outcomes in backhand stroke techniques in grade VIII students of SMP Negeri 6 Ambon.

Table 1. Comparison of Backhand Stroke Learning Outcomes in Cycle I and Cycle II

Cycle	Number of Students	Complete (n)	Completed (%)	Not yet finished (n)	Not yet completed (%)
I	28	19	68	9	32
II	28	28	100	0	0

The increase in learning completion from 68% in cycle I to 100% in cycle II indicates that using real-world problems as a starting point for learning can help students understand and master basic techniques more effectively. This improvement occurs because the PBL syntax provides opportunities for students to identify the causes of technique errors, discuss alternative solutions, practice collaboratively, and then reflect on the results of the practice. This process allows students not only to imitate the teacher's movements but also to understand the biomechanical reasons why a technique is performed. Better conceptual understanding ultimately has an impact on improving the quality of motor skills. The findings of this study are in line with the results of other studies. Marini et al. (2026)which explains that PBL can improve higher-order thinking skills because students construct knowledge through authentic problem-solving. In sports learning, this mechanism helps students integrate conceptual knowledge with motor skills, making learning more meaningful. Problem-Based Learning (PBL) is a learning approach that uses real-world, open-ended problems without a single definitive answer as the starting point for the learning process. These problems motivate students to learn, seek information, and find solutions. Through the problem-solving process, students not only gain new knowledge but also develop various skills, such as critical thinking, communication, collaboration, and problem-solving. Furthermore, PBL emphasizes learning both independently and in groups, encouraging students to actively participate, collaborate, and take responsibility for their own learning (Sukack et al., 2022).

The results of this study also support the findingsLoyens et al. (2015)who reported that PBL consistently increased student engagement and the ability to apply knowledge to real-life situations compared to conventional learning. In this study, student engagement was evident through increased group discussion activity, increased confidence in expressing opinions, and increased ability to evaluate backhand technique errors. Improved backhand technique ability can also be explained from a motor skills learning perspective. Renshaw & Chow (2019), learning sports skills will be more effective if students are faced with game situations that resemble real conditions (representative learning design). This approach allows students to find movement solutions independently so that motor adaptation develops more optimally. These characteristics are evident in the application of PBL in this study when students are asked to solve problems why the shuttlecock often gets stuck in the net or why shots are less accurate. From a badminton biomechanics perspective, improved learning outcomes are influenced by improved

coordination of footwork, racket grip, and wrist snap movements.

Besides that, Phomsoupha & Laffaye (2015) explained that the quality of badminton strokes is greatly influenced by the coordination of whole-body movements, especially the synchronization of footwork, shoulder rotation, forearm, and wrist. After repeated practice through problem-solving activities in cycle II, this coordination improved, resulting in a significant increase in the quality of students' strokes. The results of this study also reinforce the view that problem-based learning models in physical education can improve critical thinking, collaboration, communication, and decision-making skills during the learning process. In this study, these changes were reflected in increased group cooperation, the ability to identify technical errors, and students' courage to provide solutions to problems faced by their group mates. Thus, it can be understood that the success of PBL implementation is not only due to increased training frequency, but also because students gain active, reflective, collaborative, and contextual learning experiences. This combination results in improved backhand technique skills while developing critical thinking, communication, and collaboration skills, which are important competencies in 21st-century learning.

Conclusion

The results of the study indicate that the implementation of the Problem Based Learning (PBL) model is effective in improving the learning outcomes of backhand stroke skills in eighth grade students of SMP Negeri 6 Ambon. This improvement is indicated by the increase in student learning completeness from 68% in cycle I to 100% in cycle II, after improvements were made to the learning based on the results of reflection in each cycle. These findings indicate that problem-solving-oriented learning can help students understand concepts and improve backhand technique skills through an active, collaborative, and student-centered learning process. In addition to improving learning outcomes in the psychomotor aspect, the implementation of PBL also has a positive impact on the quality of the learning process. Students become more active in discussions, are able to identify and analyze technical errors made, dare to express opinions, work together in groups, and are more confident when practicing backhand strokes. Learning activities that begin with real problems provide opportunities for students to build knowledge through direct learning experiences, so that understanding of techniques becomes deeper and the skills acquired are easier to apply in game situations. Based on these findings, the Problem Based Learning model can be recommended as an effective learning alternative in physical education, especially in the material of basic badminton techniques. The implementation of this model not only contributes to improving sports skills learning outcomes but also supports the development of critical thinking, communication, collaboration, and problem-solving skills, essential competencies in 21st-century learning. Therefore, physical education teachers are advised to continuously integrate PBL into the learning process to create a more meaningful and participatory learning experience that can improve the quality of student learning outcomes.

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