STAD-type cooperative learning model and conventional learning model: a comparative study on the learning outcomes of basic volleyball lower passing techniques
Modelo de aprendizaje cooperativo tipo STAD y modelo de aprendizaje convencional: estudio comparativo de los resultados del aprendizaje de las técnicas básicas de pase inferior en voleibol

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Abstract. This research investigates the impact of STAD-type cooperative learning models and conventional learning models on the learning outcomes of basic volleyball passing techniques. The study was conducted among students of State Junior High School 1 Siak Hulu in the academic year 2023/2024, utilizing a random sampling technique to select a total of 72 students. The participants were divided into two groups: a control group and an experimental group, each consisting of 36 students. Analysis assisted by SPSS 26. The significance results of $0.000 < 0.05$ is significant. The results indicate that the use of the STAD technique significantly improves learning and proficiency of specific volleyball skills, exceeding the results achieved through conventional strategies. The STAD type cooperative learning model allows students to collaborate, share ideas and assess answers collectively within the group, providing a simple and easy-to-understand approach. Proficiency in basic volleyball techniques is emphasized as a crucial factor for individual player performance. Factors affecting student engagement in learning the upper pass include internal aspects (limited understanding of the material, incorrect practice, and haphazard execution) and external factors (teachers' learning approach and constraints of space, class time, and class size). These findings underscore the importance of adopting effective teaching methods to optimize students' learning experiences and outcomes in volleyball passing techniques.
Keywords: Learning Model, Cooperative, STAD, Conventional, Learning Outcomes, Basic Technique, Volleyball Passing.

Resumen. Esta investigación analiza el impacto de los modelos de aprendizaje cooperativo de tipo STAD y los modelos de aprendizaje convencionales en los resultados del aprendizaje de las técnicas básicas de pase de voleibol. El estudio se llevó a cabo entre los estudiantes de la Escuela Secundaria Estatal 1 Siak Hulu en el año académico 2023/2024, utilizando una técnica de muestreo aleatorio para seleccionar un total de 72 estudiantes. Los participantes se dividieron en dos grupos: un grupo de control y un grupo experimental, cada uno compuesto por 36 estudiantes. Análisis asistido por SPSS 26. El resultado de significación de $0,000 < 0,05$ es significativo. Los resultados indican que el uso de la técnica STAD mejora significativamente el aprendizaje y el dominio de habilidades específicas del voleibol, superando los resultados obtenidos mediante estrategias convencionales. El modelo de aprendizaje cooperativo tipo STAD permite a los alumnos colaborar, compartir ideas y evaluar respuestas de forma colectiva dentro del grupo, proporcionando un enfoque sencillo y fácil de entender. Se hace hincapié en el dominio de las técnicas básicas del voleibol como factor crucial para el rendimiento individual de los jugadores. Los factores que afectan al compromiso de los alumnos en el aprendizaje del pase superior incluyen aspectos internos (comprensión limitada del material, práctica incorrecta y ejecución desordenada) y factores externos (enfoque de aprendizaje de los profesores y limitaciones de espacio, tiempo de clase y tamaño de la clase). Estos resultados subrayan la importancia de adoptar métodos de enseñanza eficaces para optimizar las experiencias y los resultados de aprendizaje de los alumnos en las técnicas de pase en voleibol.
Palabras clave: Modelo de Aprendizaje, Cooperativo, STAD, Convencional, Resultados de Aprendizaje, Técnica Básica, Pase de Voleibol.

Introduction

The success of a student is not solely determined by their individual abilities; it is significantly shaped by educational institutions and the pivotal role of teachers as educators (Mashud et al., 2023). In the process of learning, it is insufficient for teachers to possess only subject-specific knowledge; they must also focus on various learning facets that contribute to fostering the holistic development of students' potential (Hardinata et al., 2023; Tanri et al., 2023). To achieve favorable outcomes in physical education, teachers in this field should strive to enhance the quality of instruction, engaging a wide range of students in the learning process (Aziz, Okilanda, Permadi, et al., 2023; Aziz, Okilanda, Rozi, et al., 2023). This approach aims to encourage students to be more active and creative in their activities, recognizing that the learning process plays a crucial role in determining student outcomes (Westerlund, 2023).

The learning process greatly influences student learning outcomes; therefore, students actively try to find out what they don't know (Merma-Molina et al., 2023). The enhancement of student learning outcomes can be achieved through the implementation of an effective and efficient learning model across various subjects, including physical education. A recurring issue in physical education instruction is the persistence of conventional teaching methods (Vanluyten et al., 2023). This is evident in the classical and large-group settings where the learning process takes place without considering the individual characteristics of the students. The teacher's role remains predominant, with full authority in organizing and dictating the learning process, hindering students from developing their critical thinking skills (Mashud et al., 2024). Additionally, a notable challenge is the insufficient adoption of learning models that

actively engage students in the learning process (Samodra et al., 2023; Suryadi et al., 2024).

The conventional learning model relies heavily on rote memorization, where teachers predominantly deliver information to passive students. The learning process tends to be abstract and theoretical, disconnected from real-life situations, offering students a collection of diverse information with a focus on specific areas and study time. Many students are accustomed to tasks such as working on assignment books, listening to teacher lectures, and completing individual exercises (Umar et al., 2023). The quality of education spans various sectors and educational levels, encompassing basic education. Educational success is influenced by multiple factors, including the role of teachers (Mayasari, 2020). In contrast, cooperative learning places students at the center of the educational experience. Within cooperative learning sessions, all students actively contribute to group tasks, relying on each other to fulfill assignments. Teachers function as facilitators, working to transfer responsibility to students while ensuring accountability (Perdana et al., 2023; Suryadi et al., 2023).

In the document that conveys the lesson and subsequent lessons, the students collaborate in the apparatus to ensure that everyone has completed their tasks, ensuring that everyone in the apparatus wants to master the lesson presented by the teacher. Cooperative learning is applied in physical education classrooms to explore various impacts (Yang et al., 2021). STAD, an acronym for Student Team Achievement Division, is a model designed for small teams comprising 4-5 individuals. The cooperative learning approach, specifically the STAD model, encompasses five key components to consider: the class presentation stage, group-based learning, tests and quizzes, individual progress assessments, and group awards for team recognition (Adawiyah et al., 2021). So that this can be one of the solutions offered in learning physical education volleyball game material.

Volleyball poses challenges due to its complexity, requiring reliable movement coordination for all in-game actions (Duarte et al., 2023; Suganda & Suharjana, 2013). Essential techniques include the bottom pass, bottom serve, smash, top serve, and block (Ramirez-Campillo et al., 2021). Differentiating between lower and upper passes is crucial. Extracurricular activities' impact on competency and skill development, especially in volleyball, is essential (Grgantov et al., 2017). Volleyball, suitable for all age groups and genders, is recognized as a community sport (Aghajani et al., 2014; Shakila & Chandrasekaran, 2011). Successful play involves integrating physical and spiritual aspects, with mental strength driving one's abilities. Numerous championships at national and international levels attest to its popularity. However, the conventional learning model diminishes students' motivation to learn basic passing techniques (Wati & Suarni, 2020).

Inadequate mastery of the bottom passing technique is a prevalent issue among students due to teachers' unfamiliarity with the Physical Education learning model (Akhmad et al., 2022; Daryanto, 2022). The research identifies the need for modern teaching tactics like the STAD approach, a component of the cooperative education model (Wyk, 2012). The problem in this research is that there are still many students who are not able to apply the bottom passing technique when playing volleyball. Teachers do not master the physical education learning model, so learning becomes a little boring, and the sports learning process does not use learning models, especially cooperative models. The cooperative learning model is a teaching and learning process that involves small groups, which allows students to work or study together in groups to solve a problem or assignment given by the teacher (Mora et al., 2020). Learning methods are ways of presenting subject matter carried out by educators so that a learning process occurs in students in an effort to achieve goals. This approach should be linked to modern tactics, such as the STAD approach, which is a component of the cooperative education model (Wyk, 2012).

Despite volleyball having lower championship results, the STAD model's potential in enhancing learning outcomes and motivation is recognized. Previous studies demonstrate its effectiveness in various sports, including increased activity and learning outcomes (Wyk, 2012). This research aims to delve deeper into the STAD model's influence, specifically on basic volleyball passing techniques, with the hope of contributing to more effective physical education strategies (Ali et al., 2022). Mastery of sports skills in physical education is crucial for students' health and maintaining an active lifestyle (Griban et al., 2020). Motivation is vital for successful learning outcomes, and cooperative learning, particularly the STAD model, is acknowledged for promoting active engagement and improvement (Wang, 2012). Based on some of these research studies, it provides an opportunity for researchers to add to the existing novelty. Therefore, this study aims to determine the effect of STAD type cooperative learning model and conventional learning model on learning outcomes of basic volleyball passing techniques.

Methods

Participant

The participants in this research comprised students enrolled in State Junior High School 1 Siak Hulu during the academic year 2023/2024. Random sampling was employed as the sampling technique, resulting in the selection of 72 students. The chosen sample was then divided into two groups: the control group and the experimental group, each consisting of 36 students.

Research Procedure

This research uses a real experimental research design with an experimental group and a control group. The experimental group received learning using the STAD type cooperative learning model, while the control group received conventional learning without a cooperative model.

Data on learning outcomes of basic volleyball underpassing techniques were collected through practical tests carried out before and after the learning intervention. This practical test covers the technical and tactical aspects of down passing techniques, and is analyzed using appropriate statistical tests. Apart from that, this research also involved observing interactions between students in the experimental group during learning.

Data Analysis

Observations were conducted to assess the extent of student engagement and collaboration in attaining educational goals. The gathered data underwent comparative statistical tests to discern learning achievements between the experimental and control groups. Additionally, analysis of observation data was performed to assess the efficacy of the STAD-type cooperative learning model in enhancing student learning outcomes. This study draws upon prior research that has demonstrated the effectiveness of cooperative learning models within the realm of sports education (Silva et al., 2021). Consequently, the research methodology is grounded in a robust theoretical framework and pertinent previous studies. The analysis of data in this study was facilitated using the SPSS 26 application.

Result

This section will elucidate the outcomes of the research following the application of the STAD-type cooperative learning model and conventional learning models. The results of this study will encompass data regarding the proficiency in learning basic volleyball passing techniques from the two classes within the research sample. The normality test for the learning outcomes of basic volleyball underpassing techniques was conducted using the Kolmogorov-Smirnov test and the Shapiro-Wilk test at a significance level of $\alpha = 0.05$. The summary of data normality test results and calculations is presented in table 1:

Table 1.
Normality test

Learning outcomes	Class	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
	Class E	0.158	36	0.166	0.835	36	0.129
	Class F	0.183	36	0.151	0.827	36	0.176

a. Lilliefors Significance Correction

The computed results, as presented in table 1, indicate that for the learning outcomes in class E, the Kolmogorov-Smirnov significance value is 0.166, which is greater than 0.05, signifying normality. Additionally, the Shapiro-Wilk

significance is 0.129, also greater than 0.05, and can be considered normal. Concerning the learning outcomes in class F, the Kolmogorov-Smirnov significance value is 0.151 (> 0.05), indicating normality, and the Shapiro-Wilk significance is 0.176 (> 0.05), also denoting normality. Consequently, it can be inferred that the sample is derived from a normally distributed population. Hence, these results imply that parametric statistical analysis can be employed to test the hypotheses posited in this research, satisfying the initial condition for testing.

Table 2.
Homogeneity Test

Learning outcomes			
Levene Statistic	df1	df2	Sig.
1.774	1	70	0.358

The homogeneity test is employed to assess the similarity of samples, determining whether they are uniform or not. The criteria for declaring a test homogeneous are if sig > 0.05 and the F Levene statistic < F table. Conversely, if sig < 0.05 and F Levene > F, the test is deemed heterogeneous. According to the results presented in table 2, the Sig value is 0.198 (> 0.05), and Levene's F is 1.774 (< 4.00), indicating that the data is homogeneous.

Subsequently, data analysis was conducted using a paired sample t-test on the data from Class E and Class F. The outcomes of the analysis were validated at a significance level of $\alpha=0.05$. The effects of the STAD-type cooperative learning model and conventional learning models on the learning outcomes of basic volleyball underpassing techniques are outlined in Table 3.

Table 3.
Bottom Passing Ability T Test Results

Group Statistics					
	Class	N	Mean	Std. Deviation	Std. Error Mean
Bottom Passing	Class E	36	86.111	139,955	.23326
Results	Class F	36	73,611	119,888	.19981

Referring to the outcomes of the t-test provided in Table 3, the underpassing results for Class E, comprising 36 individuals, exhibited a calculated average (mean) of 86.111. Conversely, the underpassing results for Class F had an average (mean) of 73.611. In the experimental group, the mean value was 8.61, while in the control group, the mean value was 7.36. Through the independent sample test, the obtained significance figure is p = 0.000, which is less than 0.05. The results of the hypothesis testing are detailed in Table 4.

Table 4.
Hypothesis testing Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Lower Passing Result	Equal variances assumed	.774	.382	4.070	70	.000	125.000	.30714	.63743	186.257
	Equal variances not assumed			4.070	68.388	,000	125,000	.30714	.63718	186,282

Referring to the Hypothesis Test Results presented in Table 4 for the experimental group, the calculated T value of 4.070 exceeds the T table value of 1.994, and the significance (2-tailed) of 0.000 is less than 0.05. This indicates rejection of H0 and acceptance of Ha. Thus, it can be concluded that the Student Teams Achievement Divisions (STAD) type cooperative learning model has a significant effect on students' underpassing bolavoli learning outcomes.

Discussion

Based on the research findings regarding the impact of the STAD-type cooperative learning model and the conventional learning model on basic volleyball underpassing technique outcomes, the experimental group achieved an average score of 8.61, while the control group had an average score of 7.36. The significance value obtained from the independent sample test was p = 0.000 < 0.05. In the hypothesis test results, the calculated T value was 4.070 > T table = 1.994, and the significance value (2-tailed) was 0.000 < 0.05. Consequently, it can be concluded from the data analysis results that the STAD-type cooperative learning model significantly influences students' learning outcomes in volleyball underpassing. Earlier studies employing the STAD technique to teach and enhance specific volleyball skills have similarly shown a considerable positive impact, indicating that the STAD technique outperforms the Traditional strategy in volleyball learning (Ali et al., 2022).

Learning strategies and methods, as well as learning methods, are determining factors for student efficiency and success. Therefore, teachers need to try various alternative models and improve learning methods for the effectiveness of students' learning. One strategy that has proven effective is through the application of cooperative learning models (Perdana et al., 2023). Learning to pass in pairs can improve hand and foot coordination, increase hand muscle strength and flexibility, increase agility in receiving and passing the ball, and improve bottom passing skills in volleyball (Bavli & Topcu, 2021). Volleyball has different standards from other sports such as basketball or football (Akhmad & Mesnan, 2019).

The cooperative learning model of the STAD type offers students the chance to collaborate, share ideas, and collectively assess the most suitable answers within the group. This straightforward learning model is easily comprehensible for students (Ali et al., 2022). Mastering fundamental volleyball techniques is crucial, as it serves as a primary factor alongside a player's physical, tactical, and mental conditions. Proficiency in basic volleyball techniques at an individual level significantly contributes to a player's overall performance (Supriatna et al., 2023). Several factors contribute to students' lack of engagement in upper-passing learning, categorized into internal and external factors. Internal factors include students' insufficient understanding of the material and practice stages of down passing, incorrect practice of down passing compared to established techniques, and haphazard execution during learning. Active students may perform correctly but still need to pay attention to the teacher's guidance on down passing. External factors are attributed to the teacher's instructional approach, where the teacher primarily explains the form without demonstrating suitable movements. Additionally, limitations in space, class time, and class size can impede the physical effectiveness of educational teaching (J. Zhang, 2022).

A study found that indirect teaching methods were more effective in influencing participation decisions, indicating a need to reassess teachers' instructional strategies and adopt a more systematic approach to teaching games (Freitas da Silva et al., 2020). Additionally, other research explores two forms of constructivism and Teaching Games for Understanding (TGfU) as alternatives to conventional game teaching methods, potentially providing a more engaging learning experience for students (Singleton, 2009). Results revealed a higher prevalence of the reproductive teaching style compared to the production teaching style, with command, practice, and inclusion styles dominating classrooms across 15 countries (Chatoupis, 2018).

Previous studies have shown that cooperative learning models, like STAD, enhance student engagement, motivation, and learning outcomes across various subjects. However, research on implementing these models in sports education contexts, particularly for teaching basic volleyball passing techniques, is limited. Understanding the potential impact of cooperative learning in this area is crucial for optimizing teaching methods (Agwu & Nmadu, 2023). A learning model essentially depicts the entire learning process in a unique manner presented by the teacher (Rahmadi et al., 2023). In essence, it acts as a framework for implementing a learning approach, method, and technique (Tran, 2014). Several researchers have investigated the potential connection between teaching methods and volleyball game activities, aiming to promote wider understanding of these activities and foster rapid development in this popular sport (W. Zhang, 2020).

The results of this study have practical implications that are relevant to the world of education, especially in the context of physical education. Physical education teachers or

lecturers can adapt the STAD Model in teaching basic volleyball passing techniques to improve teaching effectiveness. Therefore, this study can contribute to the development of more innovative and learning outcome-oriented teaching methods.

Conclusion

The conclusion of this study states that the STAD type cooperative learning model and the conventional learning model have a comparison in learning outcomes of basic volleyball lower passing techniques. The results showed that the application of STAD techniques significantly improved the learning and proficiency of specific volleyball skills, surpassing the results achieved through conventional strategies. The STAD type cooperative learning model allows students to collaborate, share ideas and evaluate answers together in groups, providing a simple and easy-to-understand approach. Proficiency in basic volleyball techniques is emphasized as a crucial factor for individual player performance. Factors affecting student engagement in learning the upper pass involved internal aspects (limited understanding of the material, improper practice, and haphazard execution) and external factors (teacher instructional approach and constraints of space, class time, and number of students). These findings emphasize the importance of adopting effective teaching methods to optimize students' learning experiences and outcomes in volleyball lower passing techniques.

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