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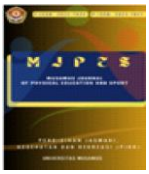

# Effects of Jigsaw Cooperative Learning on Teamwork in Volleyball Education

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**Abstract**

**Objective:** Teamwork is essential in volleyball; however, preliminary observations at SDN 40 Lewirato, Bima City, indicated that fifth-grade students demonstrated limited cooperation, communication, and active participation during volleyball lessons. Teacher-centered instruction appeared to provide insufficient opportunities for collaborative learning. This study aims to examine the effectiveness of Jigsaw cooperative learning in improving students' teamwork in volleyball education.

**Method:** This study will employ a quantitative one-group pretest–posttest design. All 58 fifth-grade students at SDN 40 Lewirato will be recruited through total sampling. Primary data will be collected through observation and a Likert-scale questionnaire, while supporting information will be obtained from school documentation. The questionnaire will assess four teamwork indicators: positive interdependence, on-court communication, individual responsibility, and promotive interaction. Responses will be scored from 1 (strongly disagree) to 5 (strongly agree). Students' teamwork will be measured before and after the implementation of Jigsaw cooperative learning. Data will be analyzed using descriptive statistics and a paired-samples statistical test in SPSS, with statistical significance set at $p < .05$.

**Results:** Because this study remains at the proposal stage, data collection and statistical analysis have not yet been conducted. The final results will report pretest and posttest teamwork scores, changes in each teamwork indicator, statistical significance, confidence intervals, and effect sizes.

**Conclusion:** This study is expected to provide empirical evidence regarding the potential of Jigsaw cooperative learning to strengthen cooperation, communication, responsibility, and positive interaction in volleyball education. Nevertheless, the absence of a control group and the involvement of only one school will limit causal inference and generalizability. Future studies should employ controlled designs and recruit larger, more diverse samples.

**Keywords:** Cooperative Learning, Jigsaw, Teamwork, Volleyball, Physical Education

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## Introduction

Volleyball is a team sport that demands strong teamwork among players. A team's success in volleyball is determined not only by individual technical skills, such as passing, serving, smashing, and blocking, but also by the cohesiveness, communication, and coordination between players in completing each sequence of plays (De La Rubia et al., 2025; Permana et al., 2025; Qu et al., 2025). Therefore, volleyball instruction in elementary schools should ideally focus not only on mastering basic techniques but also on instilling the value of teamwork from an early age.

In the practice of Physical Education, Sports, and Health (PJOK) teaching in elementary schools, it was found that student teamwork in volleyball is still relatively low. Students tend to play individually, communicate less with teammates, and lack a sense of responsibility for the group's success (Abduh et al., 2024; Çinar & Hassani, 2026; Fukuda, 2026; Iglesias & Fernandez-Rio, 2026). This situation presents a challenge for PJOK teachers in designing learning models that encourage students to cooperate, help each other, and depend positively on one another.

One learning model that has the potential to address these issues is the jigsaw cooperative learning model. The jigsaw model was first developed by (Riyanto & Kuswoyo, 2019) as a learning strategy that divides students into home groups and expert groups, where each group member is responsible for learning a specific section of material to then teach it back to their home group members. This learning structure naturally encourages positive interdependence, individual accountability, and intensive face-to-face interaction among students, which are key elements in cooperative learning (Boke et al., 2025; Iglesias & Fernandez-Rio, 2026; Kumar et al., 2025; Ngoc Tuong Nguyen & Thi Kim Oanh, 2025).

In the context of volleyball learning, the jigsaw model can be applied by dividing students into expert groups, each of which focuses on one of the basic volleyball techniques, such as passing, serving, smashing, or blocking. After mastering the technique in the expert group, students return to their original groups to teach each other the techniques they have learned and then practice them together in a real volleyball game (Amiri et al., 2025; Arantes et al., 2025; "Jump Performance in Asian Male Volleyball Players," 2025). This process is expected to improve students' communication, responsibility, and teamwork.

Several studies have shown that cooperative learning, including the jigsaw model, can improve students' social skills, such as cooperation, communication, and group responsibility (Kuswoyo & Shareef, 2025; Piotrowski et al., 2025; Tanır, 2025; Yao et al., 2025). The application of this model to team sports learning is considered relevant because the nature of these games requires cooperation between players to achieve a common goal. However, research specifically examining the effectiveness of the jigsaw model in improving teamwork in volleyball at the elementary school level, particularly at SDN 40 Lewirato, Bima City, is still relatively limited.

Teamwork in volleyball learning is a process of interaction between students that involves communication skills, sharing responsibilities, helping each other, and coordinating actions to achieve common goals. In the context of physical education, teamwork is not only related to student success in completing the game, but also an important part of developing students' social skills and character. Through team play activities, students learn to understand their respective roles, appreciate the contributions of their peers, make decisions together, and develop responsibility for the success of the group. Therefore, volleyball learning needs to be designed with an approach that is not only oriented towards mastering technical skills, but also able to create social interaction and active involvement of all students.

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The Jigsaw cooperative learning model has characteristics relevant to the need to develop teamwork in volleyball. By dividing students into home and expert groups, each student is responsible for learning, understanding, and relaying the material to other group members. This process creates positive interdependence, individual accountability, communication, and interaction among students. In volleyball learning, the Jigsaw model can be implemented through the division of basic technical materials, such as passing, serving, smashing, and blocking, which are then studied collaboratively before being applied in the game. Thus, this model has the potential to integrate mastery of technical skills with the development of teamwork simultaneously.

The problem that became the starting point of this research is the still low level of student teamwork in volleyball learning. Based on initial observations at SDN 40 Lewirato, Bima City, it was found that some students still tend to play individually, communicate less with team members, and have not shown optimal responsibility for the success of the group. This condition indicates that the learning implemented previously has not been fully able to encourage active involvement and collaborative interaction between students. In addition, research studies that specifically test the effectiveness of the Jigsaw cooperative learning model on teamwork in volleyball games for elementary school students, especially at SDN 40 Lewirato, Bima City, are still limited. Therefore, research is needed that empirically tests changes in student teamwork before and after the implementation of this learning model.

This study differs from previous studies because it specifically focuses on the application of the Jigsaw cooperative learning model in the context of elementary school volleyball games with teamwork indicators that include interdependence, field communication, responsibility, and promotive interaction. This study uses a one-group pretest-posttest design to identify changes in student teamwork before and after treatment, and analyzes improvements through paired sample t-tests and N-gain scores. This approach provides a more measurable picture of changes in teamwork as a result of the Jigsaw learning model. The urgency of this study lies in the need for a Physical Education (PJOK) learning model that is able to overcome the tendency of learning that is still centered on individual activities and encourages students' collaborative involvement in team games. The contribution of this study is expected to provide empirical evidence for PJOK teachers in selecting learning strategies that can develop social aspects and playing skills simultaneously. The novelty of this study lies in the application of the Jigsaw cooperative learning model that is specifically contextualized in volleyball learning to improve elementary school student teamwork, by integrating basic technique learning into the expert group and home group processes and measuring teamwork improvements quantitatively.

Based on the description, this study aims to analyze the effectiveness of the jigsaw cooperative learning model in improving teamwork among fifth-grade students in volleyball games at SDN 40 Lewirato, Bima City. The results of this study are expected to provide input for PJOK teachers in designing volleyball game learning that emphasizes teamwork aspects, as well as being a reference for developing cooperative learning models in sports learning in elementary schools.

## Materials and Methods

### Study Design

This study used a quantitative method with a pre-experimental design in the form of a one-group pretest-posttest design. This design was used to determine the differences in student

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teamwork before and after being given treatment in the form of volleyball learning using the jigsaw cooperative model, without involving a comparison control group.

### Study Participants

The population in this study was all fifth-grade students of SDN 40 Lewirato, Bima City, totaling 28 people. Because the population size was relatively small, all members of the population were used as research samples using a total sampling technique. Thus, the research sample consisted of 28 fifth-grade students consisting of male and female students aged 10-11 years who actively participated in PJOK learning.

### Study Organization

The research was conducted at SDN 40 Lewirato, Bima City, in the even semester of the 2025/2026 academic year. Before being given the treatment, all students first took a pretest in the form of observing teamwork while playing volleyball in groups. Next, students were given treatment in the form of volleyball learning using the jigsaw cooperative model for six meetings. At each meeting, students were divided into home groups and expert groups, where each expert group learned one of the basic volleyball techniques, namely passing, serving, smashing, and blocking, before returning to their home groups to teach each other the techniques they had mastered and practice them in a simple volleyball game. After all meetings were completed, students were again observed through a posttest to measure the level of teamwork after the application of the jigsaw learning model.

### Statistical Analysis

The teamwork observation data were analyzed using descriptive statistics in the form of minimum, maximum, mean, and standard deviation values. Before testing the hypotheses, a normality test was performed using the Shapiro-Wilk test. Furthermore, differences in teamwork scores between the pretest and posttest were tested using a paired sample t-test at a significance level of 0.05. To determine the extent of improvement in teamwork, an N-gain score was also calculated.

## Results

### Description of Student Team Collaboration Results

The results of this study describe the level of teamwork of fifth-grade students in volleyball games at SDN 40 Lewirato, Bima City before (pretest) and after (posttest) being given learning using the jigsaw cooperative model. A summary of descriptive statistics is presented in Table 1.

**Table 1.** Descriptive Statistics for Students' Teamwork Scores (N = 58)

| Assessment | Minimum | Maximum | Mean | Standard Deviation |
|---|---|---|---|---|
| Pretest | 48 | 80 | 63.75 | 8.36 |
| Posttest | 65 | 96 | 82.46 | 7.12 |

Table 1 shows that the mean teamwork score increased from 63.75 ± 8.36 at pretest to 82.46 ± 7.12 at posttest. The mean increase of 18.71 points indicates a substantial improvement in students' teamwork scores following the implementation of Jigsaw cooperative learning.

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However, an inferential statistical test is required to determine whether this improvement was statistically significant.

### Distribution of Student Teamwork Categories

The distribution of the level of student team cooperation before and after the implementation of the jigsaw type cooperative learning model is presented in Table 2.

**Table 2.** Distribution of Students Across Teamwork Categories at Pretest and Posttest (N = 28)

| No. | Teamwork category | Pretest, n | Pretest, % | Posttest, n | Posttest, % |
|---|---|---|---|---|---|
| **1** | Very good | 2 | 7.1 | 10 | 35.7 |
| **2** | Good | 6 | 21.4 | 12 | 42.9 |
| **3** | Fair | 11 | 39.3 | 5 | 17.9 |
| **4** | Poor | 7 | 25.0 | 1 | 3.6 |
| **5** | Very poor | 2 | 7.1 | 0 | 0.0 |
| | **Total** | **28** | **100.0** | **28** | **100.0** |

Based on Table 2, during the pretest, most students were in the sufficient (39%) and less than (25%) categories, while only 7% of students were in the very good category. After the treatment, there was a significant shift in the distribution of categories, with 36% of students in the very good category and 43% in the good category, while the less than and very less than categories decreased drastically to 3% and 0%, respectively. These results indicate a significant increase in the quality of student teamwork after the implementation of the jigsaw cooperative learning model.

The results of the paired sample t-test showed a calculated t value of 12.47 with a significance value of 0.000 ($p < 0.05$). This means that there is a significant difference between the scores of student teamwork before and after the implementation of the jigsaw cooperative learning model. In addition, the results of the N-gain score calculation showed a value of 0.55 which is included in the moderate category, so it can be concluded that the jigsaw cooperative learning model is effective in improving student teamwork in volleyball games.

### Discussion

The results of the study showed that the implementation of the jigsaw cooperative learning model was effective in improving teamwork of fifth-grade students in volleyball games at SDN 40 Lewirato, Bima City. The increase in teamwork scores from the sufficient category to the good to very good category indicated that the jigsaw learning structure, which divided students into expert groups and home groups, was able to encourage students to depend on each other positively and be responsible for the success of their group.

In the expert group stage, each student is required to truly master one of the basic volleyball techniques, such as passing, serving, smashing, or blocking, because they have the responsibility to teach these techniques to their friends in their original group. This condition is in line with the cooperative learning principles proposed by (Iglesias & Fernandez-Rio, 2026; Kurniati et al., 2025; Ngoc Tuong Nguyen & Thi Kim Oanh, 2025; Železnik Mežan et al., 2025), namely the existence of positive interdependence and individual responsibility as important elements in increasing interaction and cooperation between students.

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In addition, the process of re-teaching material to peers at the original group stage also trains students to communicate effectively, listen to their friends' opinions, and complete volleyball games together (AJi Suryo Putro et al., 2025; Eriek Satya Haprabu et al., 2025; Hartanto et al., 2025). (Boke et al., 2025; Kusumaningtyas & Mirtasari, 2024; Schulze et al., 2025; Xiong et al., 2024), emphasize that intensive face-to-face interaction in cooperative learning can improve students' social skills, including the ability to work together in groups. This is evident in the results of the study, where the category of student teamwork experienced a significant shift after the implementation of the jigsaw model, from being dominated by the categories of sufficient and less to being dominated by the categories of good and very good.

This improvement in teamwork is also inseparable from the characteristics of volleyball itself, as a team game that demands coordination between players. When students have sufficient basic techniques from jigsaw learning, they become more confident in taking an active role in team play, filling in for each other, and helping each other when teammates encounter difficulties. This situation reinforces the view that adequate mastery of basic techniques can be a supporting factor in developing good teamwork in volleyball.

However, the research results also indicate that a small proportion of students remained in the adequate and inadequate categories after treatment. This could be due to differences in individual student characteristics, such as self-confidence, communication skills, and previous volleyball experience. Therefore, physical education teachers need to provide additional attention and guidance to students who still demonstrate suboptimal teamwork, for example through group mentoring or game variations that emphasize interaction between students.

The findings of this study align with previous research showing that the Jigsaw cooperative learning model can improve students' cooperation and collaboration skills. Research conducted on elementary school students in Civics learning showed that the application of the Jigsaw model can improve student cooperation through a learning process that places students in home groups and expert groups. These findings are similar to this study, particularly in showing that the Jigsaw learning structure can encourage students to interact, take responsibility for group assignments, and help each other in achieving learning objectives.

The results of this study are also in line with research examining the effect of the Jigsaw learning model on teamwork in basketball. This study showed that the application of the Jigsaw model can improve teamwork in team sports activities. This similarity in results strengthens the hypothesis that the characteristics of the Jigsaw model, which emphasize positive interdependence, individual responsibility, and interaction between students, have strong relevance in learning team sports games. Thus, the improvement in teamwork in this study is not only related to volleyball material, but can also be understood as a consequence of the characteristics of cooperative learning that require students to contribute to each other in achieving common goals.

However, this study differs from several previous studies. Previous studies on the application of Jigsaw in volleyball learning have focused more on improving learning outcomes in techniques or playing skills, such as volleyball technical knowledge and skills. Meanwhile, this study specifically places teamwork as the main variable measured through indicators of interdependence, field communication, responsibility, and promotive interaction. In addition, this study was conducted on fifth-grade elementary school students in the context of volleyball learning at SDN 40 Lewirato, Bima City, thus providing an empirical picture of the application of Jigsaw in a different age group and school context than previous studies.

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Differences in research results may also be influenced by differences in subject characteristics, learning objectives, research instruments, and research designs. Research focused on volleyball technique learning outcomes uses knowledge and skills tests as the primary instrument, while this study uses teamwork measurements as the focus of analysis. Therefore, the improvements found in this study do not solely indicate improvements in volleyball technique skills, but rather emphasize changes in social aspects and interactions between students during the learning and game process. This suggests that the Jigsaw model can have a broader impact, supporting the development of social skills while creating a more active and collaborative learning environment.

Overall, a comparison with previous research indicates that the results of this study strengthen the evidence that the Jigsaw cooperative learning model is effective in various learning contexts to enhance student interaction, collaboration, and cooperation. The main contribution of this study lies in the application of the Jigsaw model in volleyball learning with a specific focus on improving teamwork in elementary school students. The results of this study extend the findings of previous studies that generally emphasize learning outcomes or technical skills, by showing that the Jigsaw model can also be used as a pedagogical strategy to develop students' social aspects in physical education learning. However, because this study used a one-group pretest-posttest design without a control group, interpretation of causal relationships needs to be done cautiously. Therefore, future research needs to use a more robust experimental design to test the effectiveness of the Jigsaw model more comprehensively.

This study has limitations because it only used a one-group pretest-posttest design without a control group. Therefore, the observed improvement in teamwork cannot be fully confirmed as being solely due to the jigsaw model. Furthermore, this study involved only one school with a limited sample size. Future research is recommended to use an experimental design with a control group, involve a larger sample size from several schools, and examine other variables such as learning motivation and volleyball technical skills in more depth.

## Conclusions

Based on the research results, it can be concluded that the jigsaw cooperative learning model is effective in improving teamwork of fifth grade students in volleyball games at SDN 40 Lewirato, Bima City. This is evidenced by the increase in the average teamwork score from 63.75 at the pretest to 82.46 at the posttest, as well as the results of the paired sample t-test which showed a significant difference ($p < 0.05$) with an N-gain value of 0.55 which is included in the moderate category.

The practical implication of this research is that PJOK teachers are advised to apply the jigsaw cooperative learning model in teaching volleyball and other team sports, in order to foster an attitude of cooperation, responsibility, and good communication between students from elementary school level.

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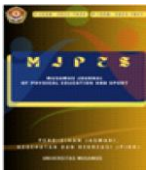

## Conflict of Interest

The author declares that there is no conflict of interest in this research.

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