



Effects of Inquiry and Cooperative Learning Models on Volleyball Smash Skills: An Experimental Study of FKIP Physical Education Students

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Abstract

Objectives. This study looked at how the inquiry learning model and the cooperative learning model affect volleyball smash ability in FKIP Physical Education (Penjaskesrek) students, and which of the two gives better learning results.

Materials and Methods. The study used an experimental pretest–posttest design with two groups. A total of 40 FKIP Physical Education students took part and were split into two groups: 20 students followed the inquiry learning model and 20 students followed the cooperative learning model. Smash ability was assessed using a standardized volleyball smash test before and after the program. The intervention ran for six weeks during regular volleyball classes. Data were processed with descriptive statistics, normality and homogeneity tests, and paired as well as independent sample t-tests, using a significance level of 0.05.

Results. Both groups improved after the treatment. In the inquiry group, the mean score increased from 68.40 (pretest) to 78.75 (posttest). In the cooperative group, the mean score rose from 67.95 to 83.20. The t-test showed that the improvements in both groups were significant ($p < 0.05$). Even so, the cooperative group gained more overall and showed a stronger difference than the inquiry group.

Conclusions. Both inquiry and cooperative learning helped students improve their volleyball smash ability. However, cooperative learning led to better

progress. The group-based practice, peer feedback, and shared roles in cooperative sessions likely made it easier for students to refine technique and reach skill mastery during training.

Keywords: Inquiry learning, Cooperative learning, Volleyball smash skills, Physical education students, Experimental study.

Introduction

Volleyball is a core subject in the Physical Education study program. Among the basic techniques, the smash is one of the most important because it directly contributes to scoring (Al-Dabbagh, 2022; AL-Zuhairi, 2023). In class practice, however, many students still struggle with timing, coordinating the arm swing, and executing the jump properly (Arischo Mardiansyah, 2004; Grosse, 2020). This suggests that smash performance is influenced not only by physical ability, but also by the learning approach used during lectures (Abdul Jabbar & Felicia, 2015; Abdulaziz Saleh Aljohani et al., 2016; Adegbija & Fakomogbon, 2013).

Learning models in physical education have increasingly shifted toward student-centered approaches (Abduh et al., 2024a, 2024b, 2024c). The inquiry learning model encourages students to explore movement concepts, identify errors, and find solutions through guided questions. Meanwhile, cooperative learning focuses on teamwork through peer discussion, shared practice, and mutual correction. Both models promote active involvement, but their effectiveness for improving a specific technique like the volleyball smash still needs stronger empirical support (Choi et al., 2011; Fonseca et al., 2023; Sirait et al., 2022).

Several recent studies in physical education report that student-centered learning can improve motor skill acquisition and increase engagement during practice. However, direct comparisons between inquiry and cooperative learning in volleyball lectures—particularly among FKIP Physical Education students—are still limited.

Based on this background, this study aims to: (1) determine whether the inquiry learning model improves smash ability; (2) determine whether the cooperative learning model improves smash ability; and (3) compare the effectiveness of both models in enhancing smash performance. It is hypothesized that both models will significantly improve smash ability, with cooperative learning expected to yield higher improvement. **Novelty:** This study provides a direct comparison of inquiry and cooperative learning within the same volleyball lecture setting and focuses specifically on measurable gains in smash performance, offering practical guidance for lecturers in choosing the most effective model for skill-based instruction.

Materials and methods

Study Participants.

The participants were 40 FKIP Physical Education (Penjaskesrek) students who were taking the volleyball course. They were 19–21 years old. All students were in good health and had already completed basic volleyball instruction. The participants were randomly divided into two groups of the same size ($n = 20$ in each group) (Sugiyono, 2017).

Study organization.

This research used a two-group experimental design with pretest and posttest.

1. Pretest

Before the intervention, all students took a volleyball smash ability test. The test assessed smash accuracy, power, and technique execution.

2. Treatment

- a. **Inquiry group:** Students learned through guided problem-solving. They were asked to analyze smash technique, identify errors in movement, and practice corrections with supervision from the lecturer.
- b. **Cooperative group:** Students practiced in small teams. Each student rotated roles (performer, observer, and feedback giver), and peer assessment plus short discussions were included in every session.

The program ran for six weeks, with two sessions each week.

3. Posttest

After the six-week program, the same smash test was given again to see the improvement.

Statistical analysis.

Data were processed using SPSS. Mean and standard deviation were calculated as descriptive statistics. Data normality was checked with the Kolmogorov–Smirnov test, while variance homogeneity was tested using Levene’s test. A paired-sample t-test was used to examine changes within each group, and an independent-sample t-test was used to compare gain scores between the two groups. Statistical significance was set at $\alpha = 0.05$.

Results

Descriptive Results

Both groups improved after the intervention. In the inquiry learning group, the mean smash score increased from 68.40 (SD = 6.12) at pretest to 78.75 (SD = 5.85) at posttest. The

cooperative learning group showed a larger increase, rising from 67.95 (SD = 6.45) to 83.20 (SD = 5.40).

Table. Mean (SD) of Smash Scores Before and After the Intervention

Group	Pretest Mean (SD)	Posttest Mean (SD)
Inquiry Learning	68.40 (6.12)	78.75 (5.85)
Cooperative Learning	67.95 (6.45)	83.20 (5.40)

Normality and homogeneity tests confirmed that the data met the assumptions for parametric analysis ($p > 0.05$). Paired-sample t-tests showed significant improvements within both groups ($p < 0.05$). However, the independent-sample t-test on gain scores indicated that the cooperative learning group achieved a significantly greater improvement than the inquiry group ($p < 0.05$).

Overall, both approaches helped students improve their smash performance, but cooperative learning led to stronger gains.

Discussion

This study shows that both inquiry and cooperative learning models significantly improved students' volleyball smash ability (AL-Zuhairi, 2023; Bachtiar et al., 2024). In the inquiry group, the progress likely came from the way students were guided to explore the movement. When they had to observe their own performance and think through what went wrong, they became more aware of technical mistakes and how to fix them.

Even so, the cooperative group improved more. Working with peers made practice sessions more dynamic: students could correct each other right away, repeat the movement with clear feedback, and stay engaged throughout the drills. They also seemed more motivated and confident when training in teams (Albalad-Aiguabella et al., 2025; Bachtiar et al., 2024) training (Amiri et al., 2025). This is in line with recent physical education studies that highlight the benefits of peer-supported practice for developing motor skills (@ Charles et al., 2017; Abusleme-Allimant et al., 2023).

In terms of application, cooperative learning is a good fit for volleyball lectures because it allows technical training to run alongside communication and teamwork. At the same time, inquiry learning still has an important role, especially for helping students build the habit of analyzing movement and solving problems during practice (Neo & Ismat, 2024; Webster-Stratton & Reid, 2004).

Future studies could look at combining both approaches in one teaching program or testing them in other sports to see whether the pattern stays the same.

Conclusions

Both inquiry and cooperative learning models helped FKIP Physical Education students improve their volleyball smash ability. However, the cooperative learning group showed a bigger increase than the inquiry group. This may be because cooperative sessions provide clearer peer interaction and faster feedback, which makes it easier for students to correct mistakes and sharpen their technique. For that reason, lecturers are encouraged to use cooperative learning more often in volleyball classes to support better student performance.

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