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Improving the Effectiveness of Learning Volleyball Using Modified Mini-Balls for 5th-Grade Students

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ABSTRACT. This study aimed to improve the effectiveness of volleyball learning through the use of modified mini-balls among fifth-grade students at State Elementary School Sumberharjo, Pacitan District, Pacitan Regency, during the second semester of the 2023/2024 academic year. The study employed Classroom Action Research involving 14 fifth-grade students, consisting of six boys and eight girls. The research was conducted in two cycles, with each cycle consisting of planning, action, observation, and reflection. Data were collected through observations of student and teacher activities, practical assessments of volleyball skills, and student response questionnaires. The findings showed that student activity increased from 70% in Cycle I to 80% in Cycle II, with an average of 75%, while teacher activity increased from 95% to 100%, with an average of 97.5%. Students' volleyball learning outcomes also improved across underhand passing, overhead passing, and smashing. Underhand-passing mastery increased from 95% to 100% among boys and from 70% to 80% among girls, while overhead passing and smashing also demonstrated improvements in both groups. Student responses were highly positive, with an average satisfaction level of 85%, and 90% of students supported continuing the use of mini-balls. The study concludes that modified mini-balls can improve volleyball learning effectiveness by increasing student participation, technical learning outcomes, and positive responses to physical education instruction.

Keywords: *Modified Mini-Ball; Volleyball Learning; Physical Education; Elementary School; Student Activity; Learning Effectiveness*

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INTRODUCTION

Physical Education, Sports, and Health (PJOK) is an essential component of elementary education because learning is directed not only toward physical fitness but also toward the development of motor skills, knowledge, cooperation, confidence, and positive attitudes(Lorås, 2020). At the elementary-school level, physical education should be presented through activities that correspond with students' physical, psychological, and developmental characteristics. Volleyball is one of the sports commonly introduced in elementary schools because it can

develop coordination, agility, balance, cooperation, and fundamental movement skills. However, volleyball learning at this level cannot always be implemented in the same form as volleyball for adolescents or adults because the size, weight, and speed of standard equipment may exceed children's abilities. Therefore, learning activities need to be adapted so that students can participate actively and progressively in accordance with their developmental characteristics (Samsudin et al., 2023) (Kustiawan et al., 2019)

The development of fundamental volleyball skills requires learning experiences that provide students with sufficient opportunities to move, practice, and interact with learning equipment. In elementary schools, fundamental skills such as underhand passing, overhead passing, serving, and smashing are not acquired automatically but require repeated practice supported by appropriate instructional strategies and facilities. ("The Development of Physical Education Learning Models for Mini-Volleyball to Habituate Character Values among Elementary School Students," 2021) found that fifth-grade students' basic mini-volleyball skills still required improvement, particularly because of limited learning time and inadequate supporting facilities. This situation indicates that the effectiveness of volleyball learning is closely related to the extent to which teachers can provide learning conditions that are accessible and manageable for children. Consequently, volleyball instruction needs to be designed around students' capabilities rather than simply reproducing formal volleyball practices. Such an approach can increase opportunities for students to experience successful movement and gradually develop their technical abilities(Batez et al., 2021).

One important strategy for adapting volleyball learning to elementary-school students is modification of learning equipment. Modification does not eliminate the essential characteristics of the sport but adjusts equipment, playing space, rules, or activities to make learning more accessible to students. (Kustiawan et al., 2019), for example, demonstrated that simple modifications of learning aids could improve elementary students' manipulative movement learning outcomes. The use of modified equipment can also provide a more manageable learning environment because students can practice movements repeatedly without being excessively burdened by equipment that is too large, heavy, or difficult to control. Thus, equipment modification represents a pedagogical strategy for bridging the gap between the demands of formal sports and the physical characteristics of elementary-school learners(Brocken et al., 2020).

Volleyball-specific research provides further support for the use of modified learning media. Wahyudi (2021) reported that the application of modified balls improved volleyball underhand-passing learning outcomes among elementary-school students, with mastery increasing across the action-research cycles. Similarly, (Astuti, 2022) found that mini-volleyball modification improved psychomotor, affective, and cognitive learning outcomes among sixth-grade students. These findings suggest that modification can facilitate not only technical performance but also broader student involvement in physical education learning. In addition, (Sukari et al., 2020) demonstrated that game-based mini-volleyball learning could improve students' upper-serving abilities, with mastery increasing after the second cycle. Therefore, modified volleyball learning has considerable potential as an instructional approach for overcoming difficulties encountered when children are introduced directly to conventional volleyball activities.

The importance of appropriate equipment becomes increasingly evident when considering the characteristics of elementary-school learners. Children generally require concrete, enjoyable, and repetitive learning experiences that allow them to understand movement through direct practice rather than through verbal explanations alone(De Stefani et al., 2020). A ball that is more manageable in terms of size and weight can enable students to focus on the correct movement pattern, including body position, arm placement, coordination, and direction of the ball. In this context, a mini-ball can function as an intermediary learning medium between simple throwing-and-catching activities and the more complex demands of formal volleyball. The use of modified

equipment can therefore reduce unnecessary difficulty while maintaining the essential movement characteristics of volleyball. This pedagogical principle is consistent with research showing that game-centered volleyball learning can effectively improve fundamental volleyball movements among elementary-school students (Samsudin et al., 2023)

The problem of limited facilities is particularly relevant in elementary-school physical education because learning effectiveness depends partly on the availability and suitability of equipment. When students perceive the standard volleyball as difficult to control, they may hesitate to participate, make repeated technical errors, or become less interested in the learning process. The study by Arif et al. (2020) illustrates that limited facilities and insufficient basic skills can become obstacles to effective mini-volleyball learning at the elementary level(Moon et al., 2024). In contrast, appropriately designed modifications can create greater opportunities for students to practice fundamental movements according to their abilities. Modification can also help teachers organize learning activities in a more flexible manner by providing equipment that is easier to handle and distribute among students(Buszard et al., 2020). Consequently, improving the suitability of learning equipment should be considered an integral part of efforts to improve the quality of elementary physical education.

Recent research also indicates that modification can improve volleyball learning outcomes when combined with appropriate learning approaches. (Ariwibowo et al., 2024) found that a modified Teaching Games for Understanding (TGfU) volleyball program was more effective than traditional physical education instruction in improving elementary students' serving and forearm-passing skills. The study demonstrated significant differences between experimental and control groups in several volleyball technical skills, indicating that adaptation to students' learning characteristics can strengthen instructional effectiveness. Similarly reported that modification of learning tools and media increased volleyball learning mastery among fifth-grade students across successive classroom-action cycles (Risno et al., 2024). These findings strengthen the argument that modification should not be viewed merely as a substitute when standard equipment is unavailable but as a deliberate instructional strategy. The teacher can use modified equipment to create learning situations that are more appropriate, participatory, and achievable for elementary-school students.

Student engagement is another important consideration in determining the effectiveness of physical education learning. Physical education becomes more meaningful when students are willing to participate actively, experience enjoyment, and perceive learning tasks as achievable. Research on elementary physical education has shown that appropriately designed movement activities can positively influence students' motivation and motor development (Aliriad et al., 2024). In volleyball learning, modified equipment can reduce the physical and technical barriers that sometimes make students reluctant to practice. The opportunity to successfully control the ball may also increase students' confidence and encourage them to participate more frequently in learning activities(Zhang et al., 2021). Accordingly, the effectiveness of modified volleyball learning should be considered not only from the perspective of final technical achievement but also from student activity, participation, and learning responses.

The need for modification is particularly relevant to the learning context at SD Negeri Sumberharjo, Kecamatan Pacitan, Kabupaten Pacitan. The uploaded study reports that students were less interested and less confident when volleyball learning used a standard large ball, resulting in learning that was considered less effective and in lower curriculum achievement. The researchers therefore proposed a mini-ball as an alternative medium because it retained the general characteristics of a volleyball while being lighter, easier to practice with, and relatively inexpensive. The study involved 14 fifth-grade students, consisting of eight girls and six boys, and used classroom action research conducted through planning, action, observation, and reflection(Sakir & Kim, 2020). This context provides a strong empirical basis for examining how

modified mini-balls can improve the effectiveness of volleyball learning among fifth-grade students at the school.

The initial learning problem at SD Negeri Sumberharjo was also reflected in students' difficulties performing volleyball techniques correctly, particularly underhand passing. The source study reports that students frequently performed underhand passing incorrectly, causing the ball to move away from the intended direction and indicating weaknesses in movement technique(López-Ferrer et al., 2022). Through the first cycle, students practiced throwing and catching a mini-ball in pairs before progressing to self-tossing and underhand-passing movements, while the second cycle emphasized overhead passing through partner and self-toss activities. The learning process subsequently produced improvements in student activity, teacher activity, and learning outcomes across the two cycles. These findings suggest that the mini-ball provides a practical medium for gradually developing volleyball skills among elementary-school learners.

The empirical findings from SD Negeri Sumberharjo further demonstrate the potential of modified mini-balls to improve learning effectiveness. Student activity increased from 70% in the first cycle to 80% in the second cycle, producing an average activity level of 75%, while teacher activity increased from 95% to 100%. Learning outcomes also improved across volleyball skills, with underhand passing, overhead passing, and smashing showing higher mastery percentages in the second cycle. Moreover, 85% of students reported feeling happy during mini-ball volleyball learning, while 85% stated that the mini-ball made learning easier, and 90% supported continuing the use of the medium. These results indicate that modified mini-balls can simultaneously support technical learning, student activity, and positive learning responses.

Although previous studies have established the usefulness of modified equipment and modified volleyball learning, the present study remains important because instructional effectiveness is highly dependent on the specific characteristics of students, school facilities, teachers, and local learning conditions. Studies by Wahyudi (2021), Astuti (2022), and Nurshafa et al. (2024) provide evidence that modified volleyball equipment can improve learning outcomes, while Wibowo et al. (2024) demonstrates the effectiveness of modified volleyball learning models. However, the context of SD Negeri Sumberharjo presents a specific problem involving fifth-grade students, limited student confidence in using a standard volleyball, and the need for an accessible learning medium. The use of a modified mini-ball therefore offers an opportunity to connect the theoretical principle of developmentally appropriate physical education with an actual classroom-based intervention. Accordingly, the present study focuses on improving the effectiveness of volleyball learning using modified mini-balls for fifth-grade students at State Elementary School Sumberharjo, Pacitan District, Pacitan Regency, in the second semester of the 2023/2024 academic year.

METHOD

This study employed Classroom Action Research (CAR) to improve the effectiveness of volleyball learning through the use of modified mini-balls among fifth-grade students at State Elementary School (Tsoukos et al., 2019) Sumberharjo, Pacitan District, Pacitan Regency. The research was conducted during the second semester of the 2023/2024 academic year and involved 14 fifth-grade students, consisting of 6 boys and 8 girls. The selection of the class was based on the learning problems identified in the initial condition, particularly students' difficulties in performing volleyball techniques correctly and their limited interest and confidence when using a standard volleyball(Putra Aji et al., 2020). The intervention used a modified mini-ball as an alternative learning medium that maintained the basic characteristics of volleyball while being lighter and easier for elementary-school students to control. The study was intended to determine

whether the use of the modified mini-ball could improve student activity, teacher teaching activity, volleyball learning outcomes, and students' responses to the learning process.

The CAR procedure was conducted in two cycles, with each cycle consisting of four main stages: planning, action/implementation, observation, and reflection. During the planning stage, the researcher prepared the learning scenarios, learning activities, modified mini-ball media, observation instruments, and practical assessment procedures. During the action stage, volleyball learning was implemented through gradual practice activities using the mini-ball; in Cycle I, students practiced throwing and catching the mini-ball in pairs and subsequently performed self-tossing followed by underhand passing. In Cycle II, learning was developed toward overhead passing through alternating partner-tossing and self-tossing activities, with improvements made based on the reflection from Cycle I. The observation stage was conducted collaboratively with another teacher to record student and teacher activities, while the reflection stage was used to identify weaknesses in the previous cycle and determine improvements for the subsequent cycle(Stoszkowski et al., 2021).

Data were collected through observation, practical performance tests, and student response questionnaires. Observation was used to assess student activity and teacher activity during the volleyball learning process, while practical tests were used to assess students' mastery of volleyball skills, particularly underhand passing, overhead passing, and smashing(Rifki et al., 2022). The questionnaire was administered after the second cycle to identify students' responses and satisfaction with learning through the modified mini-ball. The collected data were analyzed descriptively using percentages, allowing the researcher to compare changes between Cycle I and Cycle II. The study considered improvement in student activity, teacher activity, learning mastery, and student responses as indicators of increased learning effectiveness. The original study likewise states that the collected data were processed using percentages and described to provide an actual picture of the learning process.

The research indicators were established by comparing the results obtained in each cycle. Student activity was assessed based on their participation and involvement during volleyball learning, whereas teacher activity was assessed based on the implementation of the planned learning scenario or lesson plan(Cents-Boonstra et al., 2021). Learning outcomes were determined from students' practical performance in volleyball techniques, while students' responses were determined from their perceptions of the modified mini-ball learning process. The data from the two cycles were then compared to identify whether there was an increase following the intervention. In the original study, student activity increased from 70% in Cycle I to 80% in Cycle II, while teacher activity increased from 95% to 100%, demonstrating the application of the CAR procedure in evaluating and improving the learning process.

RESULT AND DISCUSSION

Result

1. Initial Condition of Volleyball Learning

The initial observation showed that fifth-grade students at State Elementary School Sumberharjo had difficulties performing basic volleyball techniques correctly. In particular, students' underhand passing movements were not yet performed properly, with errors in hand positioning and ball direction frequently occurring during practice. The learning problem was also related to students' limited confidence and interest when practicing with a standard volleyball because the ball was considered relatively difficult for elementary-school students to control. Consequently, the learning process did not run optimally and the expected learning targets were not fully achieved. These conditions became the basis for implementing modified mini-ball media

as an alternative learning medium that was lighter, easier to control, and still represented the basic characteristics of volleyball.

The classroom action research involved 14 fifth-grade students, consisting of 6 boys and 8 girls, and was implemented in two cycles. Each cycle consisted of planning, action, observation, and reflection, enabling the researcher and collaborating teacher to identify weaknesses in one cycle and improve the learning process in the following cycle. In Cycle I, students were introduced to the mini-ball through simple activities involving throwing and catching in pairs, followed by self-tossing and underhand-passing exercises. In Cycle II, the learning activities were developed toward overhead passing using partner tosses and self-tossing exercises performed alternately. This gradual progression was designed to provide students with opportunities to adapt to the modified equipment before performing more complex volleyball movements.

2. Student Activity During the Learning Process

The observation results indicated an improvement in student activity after the implementation of modified mini-ball learning. In the first cycle, student activity reached 70%, while in the second cycle it increased to 80%, representing an improvement of 10 percentage points. The average student activity across the two cycles was 75%, which was categorized as active according to the indicators used in the study. The increase indicates that students became more involved in the learning activities after the learning process was improved in Cycle II. Students were observed to move actively both when completing assignments provided by the teacher and when participating through their own initiative during volleyball activities.

Table 1. Student Activity During Two Cycles

Cycle	Student Activity	Improvement
Cycle I	70%	—
Cycle II	80%	10%
Average	75%	—

The increase in student activity demonstrates that the modified mini-ball created a more accessible learning situation for the fifth-grade students. During the first cycle, some students still required adaptation to the learning activities and needed teacher guidance when performing the movements. Following reflection on the first cycle, the learning process was improved through varied formations and game-based activities, which encouraged greater student participation. By the second cycle, students demonstrated greater willingness to practice and participate in the assigned activities. Therefore, the increase from 70% to 80% indicates that the modified mini-ball learning intervention was accompanied by improved student engagement in the volleyball learning process.

3. Teacher Activity

Teacher activity also increased during the implementation of the two cycles. Observation results showed that teacher activity reached 95% in Cycle I and increased to 100% in Cycle II, representing an improvement of 5 percentage points. The average teacher activity across the two cycles was 97.5%, which was classified as very active according to the research indicators. The high level of teacher activity indicates that the learning implementation was conducted in accordance with the planned learning scenario and that the teacher actively facilitated students throughout the modified volleyball activities. The improvement in Cycle II was achieved after the teacher reflected on the first cycle and refined the implementation of the learning plan.

Table 2. Teacher Activity During Two Cycles

Cycle	Teacher Activity	Improvement

Cycle I	95%	—
Cycle II	100%	5%
Average	97.5%	—

The teacher's activity was important because modified equipment still required appropriate instructional guidance to ensure that students practiced volleyball techniques correctly. In Cycle I, the teacher's activity was already high at 95%, but improvements were still required, particularly in relation to the implementation of the lesson plan and the organization of learning activities. After reflection, the teacher improved the learning process in Cycle II, resulting in an activity score of 100%. This result indicates that the teacher was able to implement the planned learning activities completely and provide appropriate guidance during the mini-ball volleyball exercises. The average score of 97.5% consequently indicates a very active level of teacher involvement throughout the intervention.

4. Students' Volleyball Learning Outcomes

The practical assessment demonstrated improvement in students' volleyball learning outcomes between the first and second cycles. Three aspects of volleyball skills were assessed, namely underhand passing, overhead passing, and smashing, with the results differentiated between male and female students. In Cycle I, underhand passing mastery reached 95% for boys and 70% for girls, while overhead passing reached 80% for boys and 60% for girls. For smashing, the mastery percentages were 80% for boys and 65% for girls in the first cycle. In Cycle II, the percentages increased to 100% and 80% for underhand passing, 90% and 80% for overhead passing, and 90% and 80% for smashing, respectively.

Table 3. Students' Volleyball Learning Outcomes

Volleyball Skill	Cycle I – Boys	Cycle I – Girls	Cycle II – Boys	Cycle II – Girls
Underhand passing	95%	70%	100%	80%
Overhead passing	80%	60%	90%	80%
Smashing	80%	65%	90%	80%

The most prominent improvement occurred in underhand passing among female students, increasing from 70% in Cycle I to 80% in Cycle II, while male students increased from 95% to 100%. The study reports that underhand passing therefore achieved an average mastery of 97.5% for boys and 75% for girls, with the learning effectiveness categorized as very effective for boys and effective for girls according to the indicators used. Overhead-passing performance also improved, with boys increasing from 80% to 90% and girls from 60% to 80%. These findings indicate that repeated practice using the modified mini-ball helped students develop better control of the ball and improve their execution of fundamental volleyball movements.

The improvement in learning outcomes was also evident in the second cycle, when students demonstrated greater mastery of the volleyball movements practiced during the intervention. The modified mini-ball allowed students to engage in repeated practice without the same difficulty associated with handling the standard volleyball. In the first cycle, students were introduced to simple throwing, catching, self-tossing, and underhand-passing activities, which provided a foundation for subsequent practice. The second cycle then increased the complexity of activities by introducing overhead passing through partner and self-tossing exercises. The progression of these activities corresponded with the observed increase in technical mastery across the assessed volleyball skills.

5. Student Responses to Modified Mini-Ball Learning

Students' responses to the modified mini-ball learning process were predominantly positive. After the second cycle, 85% of students stated that they were happy during volleyball

learning using the modified mini-ball, while 10% reported feeling ordinary and 5% reported that they were not happy. Regarding the function of the mini-ball as a substitute for a standard volleyball, 85% of students stated that it made learning easier, 10% gave a neutral response, and 5% considered it difficult. These responses indicate that most students perceived the modified mini-ball as a learning medium that reduced difficulties in practicing volleyball. The positive emotional response also suggests that the learning activity became more enjoyable and accessible to the students.

Table 4. Student Responses to Modified Mini-Ball Learning

Response Indicator	Percentage
Students felt happy during learning	85%
Students felt the mini-ball made learning easier	85%
Students wanted the mini-ball learning to continue	90%
Students considered learning tasks easy	80%
Average student response	85%

The students also expressed strong support for the continuation of modified mini-ball learning. As many as 90% of students stated that the use of the mini-ball could be continued, with 80% specifically indicating that it made learning easier. Regarding the learning instructions and assignments provided during the lessons, 80% of students considered them easy, 10% considered them ordinary, and 10% considered them difficult. The average student response reached 85%, which was categorized as very satisfied according to the study's response indicators. These findings demonstrate that the modified mini-ball was not only associated with improved technical learning but was also positively received by the students.

6. Comparison of the Overall Results

The overall results demonstrate a consistent improvement in the three principal components of the learning process: student activity, teacher activity, and volleyball learning outcomes. Student activity increased by 10 percentage points, from 70% in Cycle I to 80% in Cycle II, while teacher activity increased by 5 percentage points, from 95% to 100%. The practical learning outcomes also increased across underhand passing, overhead passing, and smashing for both male and female students. In addition, the student response questionnaire produced an average positive response of 85%, indicating a very high level of satisfaction with the learning process. The combination of these results demonstrates that the modified mini-ball intervention improved both the process and outcomes of volleyball learning among the fifth-grade students.

Table 5. Summary of Improvements in Volleyball Learning

Aspect	Cycle I	Cycle II	Improvement/Final Result
Student activity	70%	80%	+10%
Teacher activity	95%	100%	+5%
Underhand passing – boys	95%	100%	+5%
Underhand passing – girls	70%	80%	+10%
Overhead passing – boys	80%	90%	+10%
Overhead passing – girls	60%	80%	+20%
Smashing – boys	80%	90%	+10%
Smashing – girls	65%	80%	+15%
Student response	—	85%	Very satisfied

The findings show that the intervention produced improvement not only in students' technical achievement but also in their participation and perceptions of learning. The increase in activity from Cycle I to Cycle II suggests that students became increasingly engaged with the

modified learning activities. The increase in practical mastery indicates that students were progressively better able to perform fundamental volleyball movements after repeated practice with the mini-ball. Meanwhile, the 85% student-response score indicates that the majority of students experienced the learning process positively and found the modified equipment helpful. Taken together, the results provide empirical evidence that modified mini-ball media can serve as an effective instructional intervention for improving volleyball learning among fifth-grade elementary-school students.

Discussion

The findings of this classroom action research indicate that the use of modified mini-balls contributed positively to the effectiveness of volleyball learning among fifth-grade students at State Elementary School Sumberharjo. The initial condition showed that students experienced difficulties in controlling the standard volleyball, particularly when performing basic movements such as underhand passing, while some students also demonstrated limited confidence and interest during practice. This condition confirms that learning equipment needs to be adapted to the physical and developmental characteristics of elementary school students. Modification of learning equipment can reduce the physical and technical barriers that prevent children from actively participating in physical education activities. Therefore, the use of a lighter and more manageable mini-ball can be interpreted as a pedagogical adaptation that makes volleyball learning more accessible to elementary school students (Yono & Sodikin, 2020) (Astuti, 2022). Research on modified volleyball equipment similarly demonstrates that equipment modification can support students in mastering basic volleyball movements by making the learning environment more appropriate to their abilities (Suryantopo & Waluyo, 2018).

The improvement in student activity from 70% in Cycle I to 80% in Cycle II demonstrates that modified equipment was accompanied by increased participation during the learning process. The increase of 10 percentage points indicates that students became more willing to engage in throwing, catching, self-tossing, passing, and other volleyball-related activities after becoming familiar with the modified ball. In the first cycle, students still needed adaptation and teacher guidance, whereas in the second cycle they were more confident and active in participating in learning activities. This finding is consistent with research showing that appropriate physical education learning modifications can encourage student participation because activities become less difficult and more enjoyable. In elementary physical education, motivation and participation are important components because students are more likely to practice motor skills when they perceive the learning activities as achievable and meaningful (Cahyati et al., 2020) (Rojo-Ramos et al., 2022)

The increase in student activity can also be explained by the principle of gradual motor-skill development. In Cycle I, students were introduced to relatively simple activities, including throwing and catching in pairs, self-tossing, and underhand passing, before being exposed to more complex movements. In Cycle II, the learning activities were expanded through overhead passing and partner-based practice, allowing students to develop their abilities progressively. Such sequencing is important because elementary students require repeated opportunities to experience successful movement before they can perform more complex technical skills. The use of modified equipment therefore did not merely change the physical characteristics of the ball but also supported a learning progression that reduced the difficulty of the task. Similar principles have been reported in volleyball learning research showing that play-based and modified approaches can facilitate the development of fundamental technical skills (Samsudin et al., 2023) (Ariwibowo et al., 2024).

The findings regarding teacher activity further demonstrate that equipment modification alone is insufficient without appropriate instructional management. Teacher activity increased from 95% in Cycle I to 100% in Cycle II, indicating that the teacher became increasingly effective

in implementing the learning scenario and facilitating student practice. The improvement occurred after reflection on the first cycle, particularly through better organization of formations, varied activities, and game-based learning. This finding supports the view that the teacher's role in physical education is not simply to demonstrate movements but also to motivate, guide, organize, and provide feedback throughout the learning process. (Cahyati et al., 2020) emphasized that teachers function as facilitators and motivators who influence students' participation and motivation during physical education learning. Consequently, the high teacher activity observed in this study can be regarded as an important factor supporting the effectiveness of the modified mini-ball intervention.

The improvement in underhand-passing skills provides further evidence of the effectiveness of the modified mini-ball. Among male students, underhand-passing mastery increased from 95% in Cycle I to 100% in Cycle II, while among female students it increased from 70% to 80%. The difference in improvement between male and female students suggests that the intervention benefited both groups, although the magnitude of improvement varied according to students' initial abilities. Importantly, the overall direction of improvement was positive, indicating that repeated practice with a more manageable ball helped students gain better control over the movement. Previous research on modified balls in elementary volleyball learning has similarly reported improvements in underhand-passing mastery following the implementation of modified equipment (Suryantopo & Waluyo, 2018).

The improvement in overhead passing also indicates that the modified mini-ball was useful beyond a single basic volleyball technique. Male students improved from 80% to 90%, whereas female students improved from 60% to 80%, representing the largest improvement among the assessed passing skills for female students. Overhead passing requires coordination between hand position, force control, body balance, and ball trajectory, making it a relatively complex movement for elementary students. The lighter and more controllable mini-ball provided students with more opportunities to repeat the movement and adjust their body position according to the trajectory of the ball. These results correspond with the broader literature indicating that modified volleyball activities can enhance technical execution and provide more opportunities for students to practice fundamental skills (Castro et al., 2022).

The improvement in smashing skills provides additional evidence that the intervention supported the development of more complex volleyball movements. Male students' mastery increased from 80% in Cycle I to 90% in Cycle II, while female students' mastery increased from 65% to 80%. Although smashing is more complex than passing because it requires coordination among approach, jumping, arm swing, ball contact, and landing, students demonstrated measurable improvement after repeated practice. This result suggests that mastery of fundamental movements can provide a foundation for students to gradually perform more demanding volleyball techniques. The finding is also consistent with research emphasizing that volleyball skill development depends on repeated exposure to appropriately structured practice and progressive task difficulty (Salsabila et al., 2023). Therefore, the modified mini-ball appears to have functioned as a transitional medium between basic motor learning and more advanced volleyball techniques.

Another important finding concerns the students' positive responses to the modified mini-ball learning process. Approximately 85% of students reported that they were happy during volleyball learning, while 85% also considered the mini-ball helpful in making learning easier. Furthermore, 90% of students wanted the modified mini-ball learning activities to continue, and 80% considered the learning tasks easy. These results suggest that the intervention influenced not only psychomotor outcomes but also students' affective experiences during learning. Positive emotional experiences are important in elementary physical education because enjoyment and perceived competence can encourage students to remain engaged in physical activities. Research on physical education motivation has shown that students' motivation is closely related to the

quality of their learning experiences and opportunities for active participation(De Bruijn et al., 2023)

The high level of student acceptance can also be understood from the perspective of perceived task difficulty. When students use equipment that is too heavy, large, or difficult to control, they may experience repeated failure and consequently become less confident in performing the activity. In contrast, a lighter and more manageable ball can increase the possibility of successful movement, which may strengthen students' confidence and willingness to practice. The present findings support this interpretation because students reported that the mini-ball made volleyball learning easier, while their participation increased from Cycle I to Cycle II. Similar evidence has been reported in research on modified physical education equipment, which found that equipment adapted to students' abilities can improve enthusiasm and interest in sports activities. Thus, modification of equipment can be viewed not only as a technical solution to limited facilities but also as a strategy for creating psychologically supportive learning experiences (Yono & Sodikin, 2020).

The findings are also consistent with the broader pedagogical concept of small-sided and modified volleyball learning. Small-sided games and mini-volleyball reduce certain constraints of conventional volleyball, such as court size, number of players, net height, and task complexity. A systematic review by Castro et al. (2022) found that small-sided games can contribute to technical-tactical performance, participation, decision-making, psychological outcomes, and physical development across different volleyball populations. Although the present study primarily focused on modified equipment rather than a complete small-sided-game model, both approaches share the principle of adapting learning constraints to the learners' capabilities. The increased student activity and technical mastery observed in this study therefore provide classroom-level support for the broader argument that modified volleyball environments can facilitate learning. The findings also suggest that equipment modification can be combined with game-based approaches to create more engaging and developmentally appropriate volleyball instruction.

The results can further be interpreted in relation to play-based learning. Volleyball is a technically demanding sport for elementary students because learners must coordinate several motor components while simultaneously responding to the movement of the ball and other players. Play-based approaches can reduce the formal and rigid characteristics of technical instruction and provide students with more opportunities to experiment with movements. (Samsudin et al., 2023) demonstrated that a playing-based learning model was more effective than conventional instruction in improving basic volleyball techniques among students. In the present study, the use of the mini-ball, combined with varied formations and game-based activities in Cycle II, created a similar opportunity for students to learn through active practice rather than through passive observation. This combination may explain why student activity and technical mastery increased simultaneously during the second cycle.

The improvement observed in this study is also relevant to the findings of (Gaspar et al., 2021) who examined the influence of Teaching Games for Understanding (TGfU) on motivational outcomes in elementary physical education. Their findings demonstrate the importance of instructional approaches that provide meaningful activity and promote students' involvement in learning. In the present research, the teacher's reflection after Cycle I resulted in greater variation in activities and increased opportunities for students to practice. This change may have enhanced students' perception of competence because they could perform the volleyball movements with equipment that was easier to control. Therefore, the success of the intervention should not be attributed exclusively to the mini-ball itself, but to the interaction between modified equipment, progressive instruction, teacher facilitation, and repeated practice. This interpretation is important because it positions equipment modification as part of an integrated pedagogical strategy rather than as an isolated intervention.

The findings also demonstrate the importance of repeated practice in developing motor skills. Students in the present study were given opportunities to repeat movements through self-tossing, partner activities, passing, and progressively more complex exercises. Such repetition allowed students to receive immediate sensory feedback regarding the direction, force, and trajectory of the ball. The use of a mini-ball reduced the difficulty of controlling the equipment and therefore enabled students to focus more directly on the mechanics of the movements. This process is particularly important for elementary students, whose motor skills are still developing and who benefit from practice conditions that match their physical capabilities. The results are consistent with the broader evidence that appropriately structured volleyball activities can improve technical performance when learners receive sufficient opportunities to practice and adapt their movements (Castro et al., 2022).

The study also has implications for physical education teachers working in schools with limited sports facilities. Modified equipment can provide a practical alternative when standard equipment is unavailable in sufficient quantities or is unsuitable for younger learners. (Yono & Sodikin, 2020) demonstrated that modified plastic balls could support volleyball learning by increasing the availability of usable balls and making them easier for elementary students to play. Similarly, research on modified learning equipment indicates that adaptation of facilities can increase students' opportunities to participate actively in physical education. The present study strengthens this argument because the intervention was implemented with a relatively small group of 14 students and still produced improvements in activity, technical performance, and student responses. Consequently, inexpensive and simple equipment modifications can represent a feasible strategy for improving the quality of physical education learning without requiring extensive infrastructure.

The results should nevertheless be interpreted within the methodological limitations of classroom action research. The study involved only 14 fifth-grade students in one elementary school, so the findings cannot automatically be generalized to all elementary school students or other educational contexts. The improvement observed across two cycles may also have been influenced by repeated exposure to the volleyball tasks, teacher adaptation, and students' increasing familiarity with the assessment procedures. In addition, the study did not include a control group using standard volleyball equipment, meaning that the specific contribution of the mini-ball cannot be separated completely from other instructional improvements. These limitations are important because systematic evidence on modified volleyball and small-sided games also highlights substantial variation in participants, interventions, and outcomes across studies (Castro et al., 2022). Future research should therefore employ larger samples, comparison groups, longer intervention periods, and more standardized skill assessments to strengthen the evidence concerning modified volleyball equipment.

Overall, the findings indicate that the use of modified mini-balls was associated with meaningful improvements in the volleyball learning process among fifth-grade students at State Elementary School Sumberharjo. Student activity increased from 70% to 80%, teacher activity increased from 95% to 100%, and all assessed volleyball skills showed improvement across the two cycles. The strongest improvement among the reported technical outcomes occurred in overhead passing among female students, which increased by 20 percentage points, while smashing among female students increased by 15 percentage points. The positive student response, which reached an average of 85%, further indicates that the intervention was perceived as enjoyable, accessible, and worth continuing. These findings support previous research suggesting that modified equipment and appropriately structured volleyball activities can improve technical learning, participation, motivation, and students' learning experiences in physical education (Astuti, 2022; Castro et al., 2022; Ariwibowo et al., 2024).

The theoretical implication of the study is that effective physical education for elementary students should consider the relationship between learner characteristics, equipment, task

difficulty, and instructional strategy. The modified mini-ball represents an adjustment of the learning environment that allows students to experience volleyball skills at a level appropriate to their physical and motor development. The practical implication is that teachers can use inexpensive modified equipment while maintaining the essential characteristics of volleyball movements and gradually increasing task complexity. Such an approach is particularly relevant for elementary schools where standard equipment may be difficult for younger learners to control or may be insufficient in quantity. Therefore, the implementation of modified mini-ball learning can be recommended as a practical, student-centered, and developmentally appropriate strategy for improving elementary volleyball learning, while future studies should continue testing its effectiveness across different schools, student characteristics, and instructional contexts.

CONCLUSION

The results of this classroom action research demonstrate that the use of modified mini-balls can improve the effectiveness of volleyball learning among fifth-grade students at State Elementary School Sumberharjo, Pacitan District, Pacitan Regency. The intervention was implemented through two cycles involving planning, action, observation, and reflection, with 14 students participating in the research. Student activity increased from 70% in Cycle I to 80% in Cycle II, resulting in an average activity level of 75%, which was categorized as active. Teacher activity also increased from 95% to 100%, with an average of 97.5%, indicating a very active implementation of the learning process.

The use of modified mini-balls also contributed to improvements in students' volleyball learning outcomes. Underhand passing mastery increased from 95% to 100% among boys and from 70% to 80% among girls, while overhead passing increased from 80% to 90% among boys and from 60% to 80% among girls. Smashing mastery also improved from 80% to 90% among boys and from 65% to 80% among girls. In addition, students demonstrated positive perceptions of the learning process, with 85% reporting that they were happy and 85% stating that the mini-ball made learning easier. Overall, the average student response reached 85%, categorized as very satisfied, while 90% of students supported continuing the use of modified mini-balls. Therefore, modified mini-balls can be considered an effective and practical learning medium for making volleyball instruction more accessible, active, and enjoyable for fifth-grade elementary-school students.

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