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Journal of General Education and Humanities
Vol. 5, No. 3, June 2026, pp. 3603 – 3612, https://doi.org/10.58421/gehu.v5i3.1377
ISSN 2963-7147

A Game-Based Shooting Practice Model to Improve the Basketball Shooting Accuracy among High School Students

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Article Info

Article history:

Received 2026-04-09
Revised 2026-06-06
Accepted 2026-06-08

Keywords:

Basketball
Game-based learning
Physical education
Shooting skill

ABSTRACT

This study aimed to determine the effect of a game-based shooting learning model on improving basketball shooting accuracy among high school students. The method used was a quasi-experimental study with a pretest-posttest control group design. The study sample consisted of 60 students divided into two groups: an experimental group (game-based model) and a control group (conventional drill method), each with 30 students. The research instrument was a basketball shooting test to measure shooting accuracy. Data analysis used descriptive statistics and an independent sample t-test. The results showed that both groups improved, but the experimental group showed greater improvement, with an average posttest score of 83.40 compared to 70.80 in the control group. The statistical test results showed a significant difference ($p < 0.05$), indicating that the game-based learning model was more effective in improving shooting skills. Theoretically, the game-based learning model is grounded in the constructivist approach and Teaching Games for Understanding (TGfU), which emphasize active student involvement, decision-making, and learning within a real-world game context. This approach not only improves technical skills but also students' motivation and tactical understanding. Therefore, the implementation of student-centered, game-based learning is highly recommended in physical education.

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1. INTRODUCTION

One of the sports that is widely enjoyed by the public is basketball. Basketball itself is extremely popular, as evidenced by the numerous basketball competitions held at the elementary, middle, high school, and college levels. According to Wibowo and Hidayatullah [1], basketball is the most popular sport in Indonesia after soccer; people of all ages, from children to adults, still frequently play or participate in this sport. Basketball has developed

significantly in Indonesia; what was once a sport not widely favored by the public has now begun to flourish. The development of basketball in Indonesia has been rapid, particularly in terms of programs, which are now organized through formal structures as a mandatory requirement for establishing basketball development initiatives. Recent studies indicate that the basketball development system in Indonesia is increasingly structured through talent development environments, systematic coaching, and organized competition pathways involving student-athletes across regions [2].

Furthermore, the implementation of structured training models and small-sided games has improved technical skills and player engagement, reflecting the modernization of basketball coaching practices in Indonesia [3]. In addition, talent identification systems based on anthropometric, biomotor, and technical aspects have become essential components in supporting long-term athlete development programs [4]. because basketball is not merely practiced as a sport but has also become a lucrative industry. Therefore, basketball in Indonesia has been developing rapidly; numerous training programs and tournaments are now being held, all aimed at advancing the sport in Indonesia.

Basketball is a team sport in which each team consists of five players. The objective is to score as many points as possible in the opponent's basket while preventing the opponent from scoring, so that at the end of the game, the team has a higher score than the opponent [5]. Oliver [6] states that basketball is a type of sport that is fun, competitive, educational, entertaining, and healthy. A basketball game is played by two teams, each of which attempts to put the ball into the opponent's basket, prevent the opponent from putting the ball in, or score points by passing, rolling, or dribbling the ball in accordance with predetermined rules [7].

The majority of students in the basketball program at State High School 14 Jakarta still lack good shooting accuracy. Based on field observations, several issues were identified in the shooting instruction process, including improper finger placement during shooting, poor shooting skills, insufficient knowledge of proper shooting technique, and a lack of motivation to perform basic shooting movements. Furthermore, based on interviews with physical education teachers, it was found that students' lack of shooting ability stems from not all students being willing to participate in shooting activities during the learning process. Another obstacle mentioned is the use of a teaching model that tends to be monotonous, leading to student disinterest and boredom. Teachers simply ask students to line up and shoot in sequence.

In basketball instruction, there should be a special, engaging approach for students. Developing innovative instructional models is one way to enhance motivation and skills. Research shows that student-centered,e-based learning approaches can significantly increase students' engagement and intrinsic motivation in physical education settings [8], [9]. A new game-based instructional model serves as a means to create a more engaging, enjoyable, and beneficial basketball learning experience for students, particularly in improving their shooting techniques. Studies have demonstrated that small-sided games and modified game approaches effectively improve technical skills, including shooting accuracy, while maintaining high levels of participation [8], [10]. It is hoped that students will be more motivated to improve their learning and avoid boredom during the learning process. In line

with this, innovative learning models that integrate play elements have been found to reduce monotony and increase students' active involvement in learning activities [11]. Therefore, this game-based learning model is expected to increase their interest, particularly in basketball, which is an important aspect of learning the sport. Furthermore, interest and enjoyment in learning are key predictors of sustained participation and skill development in sports education [12]. Based on the background described above, the author is interested in conducting research and developing a game-based basketball shooting learning model at SMA Negeri 14 Jakarta.

Various previous studies have explored the effectiveness of game-based learning models. For example, a study conducted by Arianto [13] concluded that a modified game-based learning model is more effective than conventional learning models; the modified game-based learning model is capable of fostering and enhancing children's/students' creativity in learning basketball passing skills, whereas the conventional learning model places greater emphasis on teacher-centered instruction, which makes students more passive. The novelty of this study lies in the game-based model applied to basketball shooting instruction to enhance students' ability and skills in performing shots. This study aims to examine the effectiveness of a game-based shooting learning model in improving basketball shooting accuracy.

2. METHOD

This study employs a quantitative approach using a quasi-experimental design. The specific design used is a pretest-posttest control group design, which aims to examine the effect of a game-based shooting instruction model on improvements in basketball shooting skills. The population in this study consists of students at State High School Jakarta who are enrolled in the Physical Education, Sports, and Health (PJOK) course. The sample was selected using purposive sampling, which involves selecting participants based on specific criteria relevant to the study's objectives. The criteria used included students who actively participated in PJOK classes, had never received systematic game-based shooting instruction, and possessed relatively homogeneous basic basketball skills. Based on these criteria, the research sample was divided into two groups: an experimental group of approximately 30 students and a control group of approximately 30 students. The division of these two groups was based on classes with relatively equivalent characteristics to minimize differences that could influence the research results.

The primary instruments used in this study were basketball shooting skill tests adapted from standard tests, such as the free-throw and set-shot tests. The use of these instruments was based on the consideration that these tests have been widely used in sports skill research to measure shooting ability objectively and in a standardized manner. The assessment indicators in this test include shooting accuracy, as indicated by the number of balls that enter the hoop; consistency of shooting results across each attempt; and the quality of basic shooting technique, which encompasses body position, movement coordination, and follow-through [14], [15].

The research was conducted in three main, interconnected phases. The first phase was the preparation phase, which included developing learning materials, validating the

instruments with experts, and coordinating with the school to ensure the smooth implementation of the research. The second phase was the implementation phase, which began with a pretest to measure the students' initial shooting skills. Subsequently, the treatment was administered over 6-8 sessions at a frequency of 2-3 times per week. During this stage, the experimental group received instruction using a game-based model, while the control group used conventional drill methods. The final stage was the posttest, which measured improvements in shooting skills following the treatment. This sequence of procedures aligns with a quasi-experimental design, which emphasizes a comparison of pre- and post-intervention conditions [16].

The data obtained in this study were analyzed quantitatively using descriptive and inferential statistics. Descriptive statistics were used to characterize the data, including the mean, standard deviation, and distribution of students' scores. Meanwhile, inferential statistics were used to test the research hypotheses by comparing pretest and posttest results within and across groups. This approach enabled the researcher to draw more objective conclusions about the treatment's effectiveness[14]. To ensure data quality, this study considered the validity and reliability of the instruments. Instrument validity was assessed through content validity, involving expert judgment from lecturers or physical education experts competent in their fields, and through empirical validity testing using product-moment correlation. Meanwhile, instrument reliability was assessed using Cronbach's Alpha, with $\alpha > 0.70$ indicating good internal consistency. Additionally, the researcher controlled for external variables by ensuring uniformity in treatment, practice time, and learning environment conditions to ensure the research results are more reliable [17], [15].

3. RESULTS AND DISCUSSION

3.1. Results

The results of this study compare students' basketball shooting skills between the experimental group, which received instruction using a game-based learning model, and the control group, which followed conventional (drill-based) instruction. The analysis was conducted to determine the extent to which the application of the game-based learning model could influence improvements in students' shooting accuracy. This approach not only emphasizes mechanical mastery of techniques but also integrates skills into more contextually and meaningfully relevant game situations. Therefore, it is important to examine the differences in learning outcomes between the two groups as an indicator of the effectiveness of the implemented learning model.

Table 1 below presents a summary of the pretest and posttest results for both groups, which are used to describe the initial conditions and the improvement in students' shooting skills after receiving the intervention.

Table 1. Descriptive Statistics of Pretest and Posttest Scores

Group	Group	N	Mean	Sig
Experiment (E)	Pretest	30	57.15	.117
	Posttes	30	83.40	.116
Control (K)	Pretest	30	55.43	.200*
	Posttes	30	70.80	.200*

Based on Table 1, both groups had comparable initial abilities, as evidenced by the pretest mean scores of the experimental group (57.15) and the control group (55.43), which were not significantly different. After the intervention, both groups showed improvement, but the improvement in the experimental group was much greater improvement. The average posttest score for the experimental group increased to 83.40, while the control group only reached 70.80. This indicates that the intervention administered to the experimental group was more effective in improving learning outcomes compared to the control group. Additionally, the relatively similar standard deviations in both groups suggest that the data distribution is fairly homogeneous.

For both groups, there was an increase in scores from the pretest to the posttest. Descriptively, the mean posttest score for the experimental class was higher than that of the control class. However, this difference needs to be confirmed through inferential analysis. The Shapiro–Wilk normality test indicates that the posttest data for both groups are normally distributed ($p > 0.05$), and the test for homogeneity of variances (Levene's test) indicates that the variances of the two groups are homogeneous ($p > 0.05$). Therefore, the analysis proceeds using the Independent Samples t-test.

Table 2. Independent Samples Test

Independent Samples Test					
		t-test for Equality of Means			
		Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower
Result	Equal variances assumed	.000	-10.733	1.435	-13.606
	Equal variances not assumed	.000	-10.733	1.435	-13.609

Based on the results of the Independent Samples Test, a significance value (Sig. 2-tailed) of 0.000 was obtained, which is smaller than the significance level of 0.05. This indicates that the null hypothesis (H_0) is rejected, and it can be concluded that there is a significant difference in the mean learning outcomes between the experimental and control groups. In other words, the treatment administered produced a statistically significant effect. Furthermore, the mean difference of -10.733 indicates an average difference of 10.73 points between the two groups. The negative sign indicates the direction of the difference, meaning the experimental group's average is higher than the control group's (consistent with the data coding). Practically speaking, this difference is quite large and reflects that the treatment administered is not only statistically significant but also practically meaningful in improving learning outcomes.

The Standard Error of the Difference value of 1.435 indicates that the margin of error in estimating the mean difference is relatively small. This suggests that the estimated difference between the groups is quite stable and reliable. The smaller the standard error, the greater the precision in measuring that difference. Furthermore, the 95% confidence interval for the difference, which falls approximately between -13.606 and -10.733 (and does not cross the zero line), further reinforces that the observed difference is consistent and significant. This interval provides confidence that the true mean difference in the population

lies within that range, thereby reinforcing the validity of the research findings. Thus, overall, it can be concluded that the treatment applied to the experimental group was more effective than the learning in the control group. These findings also indicate that the learning model or method used in the experimental group significantly improved students' learning outcomes, both statistically and practically.

3.2. Discussion

The study's results indicate that the game-based shooting instruction model significantly improves Basketball Shooting Accuracy among High School Students. This is evidenced by higher average scores in the experimental group than in the control group, and is further supported by statistical test results showing significant differences between the groups. The significant improvement in the experimental group indicates that game-based learning is highly effective in enhancing basketball shooting skills. From a pedagogical perspective, these findings can be explained through the Teaching Games for Understanding (TGfU) theoretical framework developed by Bunker and Thorpe [18], which emphasizes that the learning of sports skills should be situated within game contexts that resemble real-world situations. In this approach, students not only practice techniques in isolation but also understand when and how to apply them effectively in the game. This is reinforced by Griffin and Butler [19], who state that game-based learning fosters deeper cognitive and tactical engagement among students compared to traditional approaches.

Furthermore, theoretically, this approach aligns with the constructivist learning theory proposed by Piaget and developed in an educational context by Vygotsky, in which students actively construct knowledge through direct experience (active learning). In the context of physical education, Light [20] asserts that game-based approaches enable students to learn through play (learning by doing), thereby fostering a more meaningful process of knowledge construction. Through game-based activities, students are presented with various situations that require them to adapt their shooting skills to the context, rather than merely repeating movements mechanically.

The results of this study indicate that although the control group, which used conventional (drill) methods, showed an improvement in shooting skills, this improvement was not as significant as that observed in the experimental group, which used a game-based learning model. These findings suggest that drill methods still contribute to the mastery of basic techniques, but their effectiveness is relatively limited when learning requires integrating technical skills, tactical understanding, and decision-making in game situations.

Conceptually, the drill method does focus on movement repetition to foster the automation of motor skills. According to Magill and Anderson [21], repetitive practice can improve movement consistency through the motor learning process, particularly during the cognitive and associative stages. However, this approach tends to be isolated (decontextualized), thus providing students with fewer opportunities to develop adaptive abilities in dynamic game situations. Furthermore, drill methods generally lack game context and fail to engage students' cognitive and affective aspects. This aligns with the view of Schmidt and Lee [22], who state that skill learning without situational context will limit transfer to real-game conditions.

In other words, students may be able to perform shooting techniques correctly in practice, but they may not necessarily be able to apply them effectively in match situations. Conversely, game-based learning demonstrates its advantages by holistically integrating various aspects of learning, including technique, tactics, and psychology. This approach aligns with the Teaching Games for Understanding (TGfU) framework developed by Bunker and Thorpe [18] and Tangkudung and Mahyudi [23], which emphasizes that sports skill learning should occur within a game context that mimics real-world conditions. In this approach, students not only learn "how to do," but also "when and why to do," thereby enhancing tactical understanding.

Recent research also supports these findings. A study by Harvey and Jarrett [24] showed that a game-based approach is significantly more effective in improving technical skills and tactical understanding than traditional approaches. Additionally, research by Gil-Arias et al. [8] found that a game-based approach can enhance decision-making skills and student engagement in physical education. From a constructivist learning theory perspective, game-based approaches allow students to construct knowledge through direct experience (learning by doing). This is supported by Vygotsky [25], who emphasizes the importance of social interaction and context in the learning process.

In games, students interact with peers, face challenges, and actively seek solutions to problems that arise during gameplay. Furthermore, this approach enhances psychological factors, such as motivation and engagement. Deci and Ryan [26], in their Self-Determination Theory (SDT), explain that intrinsic motivation increases when the needs for autonomy, competence, and relatedness are met. Game-based learning activities that are enjoyable, challenging, and interactive have been shown to meet these three needs.

In the context of skill transfer, game-based models are also more effective because they closely mimic real-game situations. According to Davids et al. [27], in the constraints-led theory approach, skills develop optimally when learned in an environment that resembles real-game conditions, thereby enabling more flexible and functional movement adaptation. Although drill-based methods remain relevant for reinforcing basic techniques, they need to be combined with, or even integrated into, game-based learning models to foster more meaningful learning. Game-based models have proven more effective in comprehensively developing shooting skills by improving technical aspects and enhancing tactical understanding, decision-making, and students' motivation to learn.

In addition to improving shooting skills, implementing game-based learning models has been shown to impact student motivation and engagement in the learning process positively. This improvement can be explained through the perspective of learning motivation theory, specifically Self-Determination Theory (SDT), proposed by Deci and Ryan [26]. This theory explains that students' intrinsic motivation develops optimally when three basic psychological needs are met: autonomy, competence, and relatedness. Enjoyable, challenging, and varied learning activities, such as those in a game-based approach, can fulfil these three needs, thereby fostering stronger intrinsic motivation.

More specifically, game-based learning that incorporates elements of fun, challenge, and varied activities has been shown to increase students' active engagement. According to Malone and Lepper [28], elements such as challenge, curiosity, control, and fantasy are key

factors that can enhance intrinsic motivation in the learning process. In the context of physical education, pedagogically designed games not only provide an enjoyable learning experience but also spark curiosity and a desire to keep trying, thereby engaging students more emotionally and cognitively.

This increase in motivation and engagement can also be explained by Csikszentmihalyi [29]. This theory states that individuals will experience a state of optimal engagement (flow) when the level of challenge they face is balanced with their abilities. In game-based learning, students are presented with dynamic, challenging situations that are appropriate for their skill level. These conditions allow students to fully engage in the activity, characterized by increased focus, enjoyment, and satisfaction in learning. In practice, game-based learning encourages students to be more physically active and to participate directly in learning activities.

Additionally, social interaction among students is enhanced through teamwork, communication, and healthy competition. According to Vygotsky [25], social interaction plays a crucial role in cognitive development and learning motivation, as it allows students to learn from one another and build understanding collaboratively. A healthy competitive atmosphere in games also provides positive external motivation, which ultimately strengthens students' intrinsic motivation.

Conversely, drill methods that tend to be repetitive and lack variety often lead to student burnout. Over the long term, this can diminish interest and learning motivation, especially when students fail to see a direct relevance between the exercises performed and real-world game situations. According to research findings reported by Ntoumanis [30] in the Journal of Educational Psychology, learning environments that lack autonomy and variety tend to reduce students' intrinsic motivation and increase the likelihood of amotivation. Based on these findings, it can be concluded that game-based learning is not only effective in improving motor skills but also plays a significant role in enhancing student motivation and engagement. This approach creates a more meaningful, enjoyable, and challenging learning experience, thereby supporting a holistic, student-centered learning process.

However, this study still has several limitations that require consideration. First, the study sample was drawn from a single school, so the results cannot necessarily be generalized to other schools with different characteristics. Factors such as the condition of the infrastructure, students' backgrounds, and teachers' teaching styles may influence the effectiveness of the applied learning model. Therefore, future research is recommended to involve a greater number of schools with diverse conditions to ensure more representative results.

Furthermore, the intervention duration in this study was relatively short, lasting only 6-8 sessions. Although it demonstrated significant improvements, it remains uncertain how this model would impact the learning process over a longer period. Despite these limitations, this study makes a significant contribution, particularly to basketball instruction in schools. One key point demonstrated is that a game-based approach can be a more effective alternative than conventional drill methods in improving students' shooting accuracy. Unlike some previous studies that focused more on general game-based approaches, this study

specifically examined shooting skills, which are often challenging for students. This shows that learning packaged in the form of games not only makes students more active but also helps them understand the context of using techniques in real game situations. Furthermore, this study's results reinforce the importance of a student-centered learning approach. When students are directly involved in fun and challenging activities, they tend to be more motivated to learn. In the context of physical education, this is especially relevant because the learning process focuses not only on mastering techniques but also on the learning experience itself. Therefore, physical education teachers can use these findings to inform the design in more varied and contextually relevant learning, thereby not only improving students' skills but also maintaining their interest and engagement in the learning process.

4. CONCLUSION

This study confirms that the game-based shooting learning model significantly improves basketball shooting skills compared to conventional drill methods. The findings highlight that learning through game situations enhances not only technical accuracy but also student engagement and participation. The study is important because it supports the shift toward student-centered, context-based learning in physical education. In line with contemporary sport pedagogy, particularly game-based approaches, this research provides empirical evidence that integrating skills within real-game contexts leads to more effective learning outcomes. The originality of this study lies in its specific focus on basketball shooting within an experimental framework in a school setting, demonstrating that game-based learning is both practically applicable and pedagogically superior for skill development.

Beyond these findings, this study's results also offer practical implications for implementing physical education (PE) curricula. Teachers are encouraged to begin integrating game-based learning models into regular instructional practices, particularly in teaching fundamental sports skills such as shooting in basketball. By designing learning activities that are more interactive, contextual, and student-centered, teachers can create a more engaging learning environment that supports both skill acquisition and student motivation. This approach can also be adapted to other sports or skill domains within the PE curriculum, making it a flexible and relevant strategy for improving overall learning quality.

For future research, it is recommended to explore the application of game-based learning models in a wider range of contexts, including different school levels, larger and more diverse samples, and longer intervention periods. In addition, further studies could examine other variables, such as motivation, decision-making skills, and tactical understanding, using more comprehensive measurement tools. Investigating the combination of game-based approaches with other instructional models may also provide deeper insights into how to optimize learning outcomes in physical education settings.

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