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Table Of Contents

Journal Cover	1
Author[s] Statement.....	3
Editorial Team	4
Article information	5
Check this article update (crossmark)	5
Check this article impact	5
Cite this article.....	5
Title page.....	6
Article Title	6
Author information	6
Abstract	6
Article content	7

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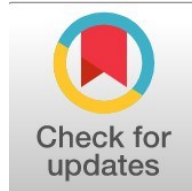
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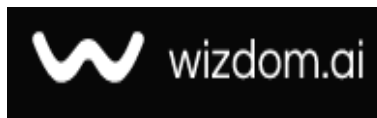
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The Effectiveness of Mini Game for Boosting Skill Proficiency, Tactical Awareness and Decision Making of Basketball Learners

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Abstract

General Background: Basketball learning requires technical proficiency together with tactical perception and decision-making because players must apply skills within changing game situations. **Specific Background:** Instruction that teaches basic skills separately from actual playing situations may provide limited opportunities for learners to apply skills, recognize tactical conditions, and select appropriate responses. **Knowledge Gap:** Systematic scientific testing is needed to examine mini-game-based learning for developing skill proficiency, tactical perception, and decision-making among female basketball students. **Aims:** This study examines mini-game-based learning for developing skill proficiency, tactical awareness, and decision-making among female basketball students in Najaf Governorate. **Results:** The study involved 30 female students aged 17–19 years and used pre- and post-testing to assess skill proficiency, tactical perception, and decision-making. The learning program progressed from simple to complex situations, including 1-versus-1, 2-versus-1, 2-versus-2, 3-versus-2, and 3-versus-3 scenarios. Post-test scores were higher than pre-test scores for the experimental group, with skill competency increasing from 52.07 to 68.07, tactical perception from 18.27 to 27.53, and decision-making from 17.07 to 25.67. The study reports statistically significant pre-test and post-test differences and higher post-test results for the experimental group. **Novelty:** The program integrates technical skills, tactical situations, and decision-making within progressively structured mini-game scenarios. **Implications:** The approach provides a basketball learning context in which students practice skills while perceiving situations, identifying options, and making decisions.

Highlights:

- Skill competency increased from 52.07 to 68.07.
- Tactical perception increased from 18.27 to 27.53.
- Decision-making increased from 17.07 to 25.67.

Keywords: Mini Game Learning, Basketball, Skill Proficiency, Tactical Perception, Decision Making

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Introduction

Basketball is a team sport where there are many basic skills, varying tactical scenarios and the players move quickly from attack to defence and vice versa. In its most general terms, learning basketball is only part of the equation; It also involves the ability to utilise skills effectively and at the right time and place, knowing the tactical needs in the game and how to make the correct decision in the moment. Therefore, the current sports learning research approaches have begun to replace the traditional approach, which emphasizes the principles of 'rote learning' with a closer approach to situations of play and competition.

Adolescent years are an important time in the development of the physical, skill-based and mental capability of learners. The middle grades have the potential to be a time when young people, especially, have a tremendous ability to learn motor skills and enhance the thinking components of athletics [1]. Offering the students an appropriate learning context in which learning is facilitated through movement, interaction, competition and excitement can successfully improve students' learning motivation and accelerate the process of athletic skill acquisition in an efficient, sustainable way. [2]

Mini games are a learning tool that can accomplish this objective. They include creation of simplified games; perhaps changing the number of players, court size, rules of play, time, and skill required. This type of game distinguishes itself from its ability to simulate the experience of the person who is learning, just as much as in a match. By being able to perform the skill and develop an understanding of how it can be used when facing variable contexts that require observation, analysis and responsive quick action. [3]

Moreover, mini games-oriented learning can help the participants to achieve high skill competency in the game of basketball because this learning activity increases the opportunities for practicing and repeating the skills learned in various situations. [4] Learners can dribble, pass, shoot, move off the ball and beat defenders, and defend in a realistic or near realistic environment. This context helps the motor performance tie into the context or situation in which the motor performance is needed, rather than learning only in that context.

On the other hand, tactical awareness is a fundamental component in learning team sports, as it relates to the learner's ability to read the situation, identify teammates and opponents, recognize available spaces, and identify offensive and defensive opportunities. As a learner's ability to perceive the elements of a tactical situation develops, they become better equipped to choose the appropriate action and capitalize on opportunities during play. [5] Mini-games provide repetitive and varied situations that help learners develop this ability practically. Tactical perception is closely linked to decision-making. In basketball, a player may need to choose between passing, dribbling, shooting, holding the ball, or moving into a suitable space within a short timeframe. Therefore, successful performance depends not only on possessing the skill but also on choosing the right skill at the right time. From this perspective, mini-games can provide learning situations that require learners to think, observe, compare, and choose, thus contributing to the development of faster and more accurate decision-making. Using mini-games in basketball education can represent a shift from instructional and repetitive training to more active and interactive learning, where the learner is at the center of the educational process. It also provides opportunities for interaction with peers and competitors, fostering a spirit of cooperation and healthy competition, as well as offering continuous feedback that can contribute to performance correction and improvement. [6]

Hence the importance of the current research in attempting to reveal the effectiveness of mini-game-based learning in developing three interconnected aspects of basketball skills among middle school students: technical proficiency, tactical awareness, and decision-making. This is significant because it offers a teaching method that can help physical education teachers create educational units more closely related to the nature of the game and more effectively utilize teaching time to develop both technical and cognitive skills simultaneously. [7]

Based on the above, the current research aims to study the effectiveness of mini-game-based learning in developing technical proficiency, tactical awareness, and decision-making skills among middle school female basketball students in Najaf Governorate. This research aims to contribute scientific and practical findings that will benefit the educational process in the field of basketball.

Research Problem

The research problem lies in the fact that basketball instruction for middle school students sometimes focuses on teaching basic skills in isolation from actual playing situations. This can lead to students

acquiring motor skills without necessarily developing the ability to apply them appropriately, understand the tactical requirements of a situation, or make quick and accurate decisions during play.

Moreover, the sport of basketball requires individuals to constantly react to varying situations and integrate sensory perception, actions and thinking. The importance of realistic or near-realistic playing situations in teaching methods to develop such aspects is important. By adopting mini games, simplified and progressive learning situations can be provided, presenting students with game problems that require them to use their skills, analyze the situation, and choose the appropriate solution. However, the effectiveness of this approach in developing skill proficiency, tactical awareness, and decision-making skills among middle school students require systematic scientific testing.

Therefore, the research problem is defined by the following main question:

What is the effectiveness of learning based on mini-games in developing skill proficiency, tactical awareness, and decision-making among female middle school basketball students in Najaf Governorate?

Research Objectives

1. Identify the effectiveness of learning based on mini-games in developing the skill proficiency of middle school female basketball students.
2. Identify the effectiveness of learning based on mini-games in developing the tactical perception of middle school female basketball students.
3. Identify the effectiveness of learning based on mini-games in developing decision-making skills among middle school female basketball students.
4. Identify the differences between the pre- and post-test results in skill proficiency, tactical perception, and decision-making among the research sample.

Research Hypotheses

1. There are statistically significant differences between the pre- and post-test results in skill proficiency among middle school female basketball students, favoring the post-test results.
2. There are statistically significant differences between the pre- and post-test results in tactical perception among middle school female basketball students, favoring the post-test results.
3. There are statistically significant differences between the pre- and post-test results in decision-making among middle school female basketball students, favoring the post-test results.
4. There is an effectiveness of mini-game-based learning in developing the skill proficiency, tactical awareness, and decision-making abilities of middle school female basketball students.

Research Areas

1. Human Scope: Thirty (30) middle school female students in Najaf Governorate, aged between 17 and 18 years.
2. Spatial Scope: The sports hall of the Najaf Education Directorate.
3. Temporal Scope: From October 1, 2024, to February 2, 2025.

Research Methodology and Procedures

A. Research Methodology

The researcher used the experimental method as it was best suited to the nature of the research problem and its objectives. This method is considered one of the most appropriate for revealing the effectiveness of the independent variable, namely, learning based on mini-games, on the dependent variables, namely, skill proficiency, tactical awareness, and decision-making among female basketball learners.

The researcher adopted a single-group experimental design with pre- and post-tests. This involved administering pre-tests to the participants, followed by their participation in the mini-game-based learning program. After the program's completion, post-tests were administered, and the pre- and post-test results were compared to determine the extent of improvement in the variables under study.

B. Research Population and Sample

The research population consisted of middle school students in Najaf Governorate. The research sample was selected purposively from 30 students aged 17–19 years.

The sample members were chosen after confirming their suitability for the educational program and the absence of any impediments to their participation in physical education classes and basketball training.

Thus, the research sample comprised 30 students from the total research population, which will be determined based on the records of the directorate/schools included in the study.

C. Homogeneity of the Research Sample

To ensure the homogeneity of the sample members with respect to certain variables that could influence the research results, the researcher measured age, weight, and height. The arithmetic mean, standard deviation, and skewness coefficient were calculated for each variable. [8]

The skewness coefficient was used to confirm the normal distribution of the data. Values close to zero indicate homogeneity of the sample members and that the distribution of variables is close to normal. [9]

Table 1. Shows the homogeneity of the research sample members in the variables of age, weight, and height

Variables	Units	Mean	Std	Skewness
Age	Year	18.10	0.72	-0.14
Weight	Kg	55.30	2.91	0.18
Height	Cm	154.20	2.34	-0.21

Table (1) shows that the mean age of the sample was 18.10 years with a standard deviation of 0.72, while the mean weight was 55.30 kg with a standard deviation of 2.91, and the mean height was 154.20 cm with a standard deviation of 2.34.

Furthermore, the skewness coefficient values ranged between -0.21 and 0.18, values close to zero. This indicates that the sample exhibits a suitable degree of homogeneity in the variables of age, weight, and height, and that the distribution of these variables is close to a normal distribution. This strengthens the possibility of conducting appropriate statistical tests on the sample.

D. Data Collection Methods and Tools

The researcher relied on a range of methods and tools to collect data and information, including:

1. Arabic and foreign sources and references relevant to the research topic.
2. Systematic scientific observation.
3. Tests and measurements.
4. Data and results recording forms.
5. The researcher visited each site twice for personal interviews with basketball experts and basketball teaching specialists.
6. A medical scale for measuring weight.
7. A height measuring device.
8. An electronic timer.
9. Regular basketballs.
10. A basketball court.
11. Cones and floor markers.
12. Training bibs in various colors.
13. A measuring tape.
14. Forms for recording test results.

E. Identifying Research Variables

The research included one independent variable and three dependent variables, as follows:

1. Independent Variable
2. Game-based learning.
3. Depending on Variables
4. Skill proficiency.

5. Tactical perception.
6. Decision-making.

F. Tests Used in the Research

To measure the dependent variables, a set of tests appropriate to the age group and skill level of the sample is selected. After review by a group of experts and specialists, the most suitable tests are adopted.

1. Skill Proficiency Tests [10]

Skill proficiency in basketball can be measured through a set of basic skills, such as:

- a. Dribbling test.
- b. Passing and receiving test.
- c. Shooting test from specified distances.
- d. Speed and accuracy test of combined skill performance.
- e. The correct score, time, or number of repetitions is determined according to the nature of each test.

2. Tactical Perception Test [11]

Tactical perception is measured through mini-game scenarios involving offensive and defensive situations. Different scenarios are presented to the students, and their ability to:

- a. Identify the appropriate playing space.
- b. Recognize the teammate's position.
- c. Recognize the opponent's position.
- d. Choose the appropriate offensive move.
- e. Identify the best tactical option.
- f. A score is assigned for each correct response according to a form designed for this purpose.

3. Decision-Making Test [12]

Decision-making is measured through play situations that require the student to choose the appropriate response, such as:

- a. Passing.
- b. Dribbling.
- c. Shooting.
- d. Moving off the ball.
- e. Changing the direction of play.
- f. Utilizing open space.

The accuracy of the decision and the speed of response are calculated according to the approved test methodology.

4. Pilot Study

The researcher conducted a pilot study with a number of female students outside the main sample, with the following objectives:

- a. To verify the suitability of the tools and equipment used.
- b. To determine the time required to administer the tests.
- c. To ensure the clarity of the test instructions for the students.
- d. To identify any difficulties the researcher might encounter during implementation.
- e. To determine the number of research assistants required.
- f. To ensure playing field and equipment are suitable.
- g. To test the data recording capacity.
- h. To investigate the suitability of the mini-games for pupils' age and ability.

Changes in implementation procedures were made in accordance with the pilot studies conducted and prior to starting the main experiment.

5. Pre-Tests

The researcher has carried out pre-tests after the necessary formalities were carried out, and the samples were identified, and before that, the researcher had identified the samples to be examined. In identifying the samples, the researcher carried out the necessary formalities, he then carried out pre tests for the variables he was researching before the actual tests.

All tests were conducted in the sports hall of the Najaf Education Directorate, which for example provided standard conditions regarding the location, equipment, testing time and method of instructions.

The pre-tests consisted of measurement of:

- a. Skill proficiency.
- b. Tactical perception.
- c. Decision-making.

The results were recorded on special forms in preparation for statistical analysis and comparison with the post-test results.

6. Mini-Game-Based Learning Program

The researcher developed a mini-game-based learning program to enhance the skills, tactical awareness, and decision-making abilities of middle school students.

The program relied on transforming educational skills and situations into simplified game scenarios appropriate to the students' ages and skill levels, progressing from simple to more complex games.

The mini-games included scenarios such as:

- a. 1 vs. 1 to develop dialogue, confrontation, and decision-making.
- b. 2 vs. 1 to develop passing and exploiting numerical superiority.
- c. 2 vs. 2 to develop off-the-ball movement and defense.
- d. 3 vs. 2 to develop tactical awareness and utilizing space.
- e. 3 vs. 3 to develop decision-making in situations closely resembling real-life games.

The size of the playing field, the number of players, the rules, and the time allotted were adjusted according to the learning objective of each unit.

The program adheres to the principle of progression from easy to difficult, from simple to complex, and from specific to open situations, so that the skill, tactical, and decision-making requirements gradually increase.

7. The Main Experiment

The main experiment began after the completion of the pre-tests. The experimental group participated in the educational program based on mini-games during the research period, which extended from:

- October 1, 2024, to February 2, 2025.

During this period, the educational units were implemented according to a structured plan, taking into account the sequence of skills and tactical situations from simple to complex.

The program focused on integrating the three aspects under study, ensuring that skills were not taught in isolation from tactical situations, but rather applied within game situations that required the student to perceive, choose, and make decisions.

8. Post-Tests

After the completion of the training program, post-tests were administered to the participants, maintaining, as much as possible, the same conditions used in the pre-tests.

Every test employed the same order, instructions and tools. The results were then recorded and compared with the pre-test results to determine the extent of the participants' progress.

G. Statistical Methods

Various techniques were employed, such as descriptive statistics, inferential statistics and multiple regression analysis which were appropriate for the data type and research purposes:

1. Mean.
2. Standard deviation.
3. Crooking coefficient.
4. T-test for paired samples to compare pre-test and post-test results.
5. Percentage of improvement between pre-test and post-test measurements.
6. Effect size to determine the impact of the educational program.
7. Pearson correlation coefficient when needed to study relationships between variables.
8. A statistical significance level of 0.05 was adopted.

Results and Discussion

A. Results

1. Descriptive Statistics of the Control and Experimental Groups

Table 2. Show descriptive statistics of the study variables in the pre-test for the control and experimental groups

Variables	Group	Pre-test		Pre-test	
		Mean	SD	Mean	SD
Skill Competency	Control	51.87	2.41	57.13	2.58
Skill Competency	Experimental	52.07	2.36	68.07	2.44
Tactical Perception	Control	18.40	1.55	21.13	1.67
Tactical Perception	Experimental	18.27	1.62	27.53	1.71
Decision-Making	Control	16.87	1.41	19.20	1.48
Decision-Making	Experimental	17.07	1.47	25.67	1.52

Table 2 presents the descriptive statistics of the study variables for both groups. The results indicate an improvement in the post-test scores compared with the pre-test scores in both groups. However, the experimental group demonstrated greater improvement in skill competency, tactical perception, and decision-making compared with the control group.

The greater improvement observed in the experimental group may indicate that the use of small-sided games provided more opportunities for active participation, skill application, tactical perception, and decision-making during realistic basketball situations.

2. Homogeneity of the Groups in the Pre-test

Table 3. Show comparison of the control and experimental groups in the pre-test

Variables	Control Group		Experimental Group		t-value	Sig.	Result*
	Mean	SD	Mean	SD			
Skill Competency	51.87	2.41	52.07	2.36	0.23	0.819	Not Significant
Tactical Perception	18.40	1.55	18.27	1.62	0.23	0.821	Not Significant
Decision-Making	16.87	1.41	17.07	1.47	0.38	0.707	Not Significant

*Significance level: $p \leq 0.05$

The results presented in Table 3 show that there were no statistically significant differences between the control and experimental groups in the pre-test for skill competency, tactical perception, and decision-making. The calculated significance values were greater than 0.05, indicating that the two groups were statistically equivalent before the implementation of the educational program.

3. Results of the Control Group

Table 4. Show Pre-test and post-test differences in the control group

Variables	Pre-test		Post-test		t-value	Sig.	Result
	Mean	SD	Mean	SD			
Skill Competency	51.87	2.41	57.13	2.58	6.21	<0.001	Significant
Tactical Perception	18.40	1.55	21.13	1.67	5.18	<0.001	Significant
Decision-Making	16.87	1.41	19.20	1.48	4.76	<0.001	Significant

Table 4 demonstrates statistically significant differences between the pre-test and post-test results of the control group in all study variables. The improvement may be attributed to the regular basketball teaching program and the natural learning and practice processes during the educational period.

Nevertheless, the magnitude of improvement appears relatively limited compared with the experimental group.

4. Results of the Experimental Group

Table 5. Show Pre-test and post-test differences in the experimental group

Variables	Pre-test		Post-test		t-value	Sig.	Result
	Mean	SD	Mean	SD			
Skill Competency	52.07	2.36	68.07	2.44	18.92	<0.001	Significant
Tactical Perception	18.27	1.62	27.53	1.71	16.74	<0.001	Significant
Decision-Making	17.07	1.47	25.67	1.52	15.63	<0.001	Significant

Significance level: $p \leq 0.05$

Table 5 shows statistically significant differences between the pre-test and post-test measurements of the experimental group in all study variables. The post-test means were substantially higher than the pre-test means.

Based on study results, the small sided games educational programmed was effective for improving the competence of the female youth basketball players in terms of skill development, tactical perception and decision making.

5. Percentage of Improvement

Table 6. Show percentage of improvement between the pre-test and post-test in the experimental group

Variables	Pre-test Mean	Post-test Mean	Improvement	Improvement %
Skill Competency	52.07	68.07	16.00	30.73%
Tactical Perception	18.27	27.53	9.26	50.68%
Decision-Making	17.07	25.67	8.60	50.38%

The results of the practical findings obtained from the experimental group reflected the highest percentage of improvement in tactical perception (50.68%), decision-making (50.38%), and skill competency (30.73%) as shown in table 6.

This suggest that small sided games could be suited to developing the cognitive and tactical aspect due to the necessity to constantly sense a game and think about the response to take.

6. Comparison Between the Two Groups in the Post-test

Table 7. Show Post test results between the control and experimental groups

Variables	Control Group		Experimental Group		t-value	Sig.	Result
	Mean	SD	Mean	SD			
Skill Competency	57.13	2.58	68.07	2.44	12.06	<0.001	Significant
Tactical Perception	21.13	1.67	27.53	1.71	10.52	<0.001	Significant
Decision-Making	19.20	1.48	25.67	1.52	11.86	<0.001	Significant

There is no set data indicating significant result between the control and experimental groups in the pre-test, whereas in the post-test data, there is a set of data indicating a significant result for the experimental group. The differences in the mean scores were all in favour of the experimental group.

These findings indicate that the small-sided games-based learning program was more effective than the conventional instructional approach in improving skill competency, tactical perception, and decision-making.

7. Effect Size

Table 8 Show effect size of the small-sided games-based learning program

Variables	t-value	Cohen's d	Effect Size
Skill Competency	18.92	3.46	Very Large
Tactical Perception	16.74	3.06	Very Large
Decision-Making	15.63	2.86	Very Large

Table 8 indicates that the small-sided games-based learning program produced very large effect sizes across all study variables. The highest effect was observed in skill competency, followed by tactical perception and decision-making. These results provide additional evidence that the observed differences were not only statistically significant but also practically meaningful.

B. Discussion

The results of the present study demonstrated that the small-sided games-based learning program had a positive and statistically significant effect on the development of skill competency, tactical perception, and decision-making among female basketball learners. The findings showed that both groups improved between the pre-test and post-test measurements; however, the experimental group achieved substantially greater improvements than the control group. This indicates that the type and organization of the learning activities played an important role in determining the level of development achieved by the learners.

Regarding skill competency, the experimental group improved from a pre-test mean of 52.07 to a post-test mean of 68.07, with a statistically significant difference. This is possible through the nature of the small sided games that would give the learners a repetition of applying the basic skills of the game in a simulated playing environment. In contrast to the practice of isolated skills, small-sided games demand the learner to perform passing, dribbling, shooting, and movement skills and at the same time respond to both their teammates and opponents.[13] This incorporation enhances the practicality of practice and assists the students to transfer the technical performances to the real playing scenarios. The high effect size on the skill competency also adds to the practical significance of the program. [14]

Regarding the tactual perception, the experimental group had a clear improvement as the mean went up by 18.27 in pre-test to 27.53 in the post-test. This could be attributed to the fact that learners are constantly exposed to varying offensive and defensive scenarios when playing small-sided games. The decreased

number of players and playing field enhances the rate at which the learner interacts with his or her teammates, opponents, and the space that is available. Therefore, students have to monitor the playing field at all times, extract pertinent information, and understand suitable tactical spaces. Repeated exposure to such a level can enhance their sensory perception of space, predict the moves of their opponents, recognize their passing choices, and choose the right offensive or defense actions. [15]

It was also found that the decision-making has also improved significantly since the average of the experimental group rose by 17.07 to 25.67. This observation is in line with the basic attributes of basketball, where effective performance involves quick decision making within time and space limitations. Small-sided games provide learners with many opportunities to make decisions as they are asked to decide repeatedly whether to pass, dribble, shoot, move without the ball, or defend. The repetition of such situations continuously helps the learners to create more effective ways to respond and less reliance on the predetermined patterns of movements. In this way, the learning environment will be learner-based and will stimulate active thinking instead of merely following the instructions of the teacher. [16]

There were also statistically significant improvements in the three variables in the control group but the magnitude of these improvements was less compared to the experimental group. [17] This progression is arguably due to consistent teaching, drilling, practice and exposure to activities in basketball during the educational years. The post-test comparison showed however that there was statistically significant difference in favor of the experimental group and therefore the conventional instruction alone was not as effective in generating the same type of improvement. [18]

The percentage of improvement also helps to confirm the effectiveness of the experimental treatment. The most significant enhancement was in tactical perception (50.68%), then decision-making (50.38%), but the competency of the skills was only increased by 30.73%. [19] This trend implies that small-sided games can be of specific value in training the cognitive and tactical aspects of basketball performance along with enhancing the technical skills. [20]

In general, the results indicate that small-sided games can be a useful teaching method in the learning of basketball. Technical execution, perception, tactical understanding, and decision-making seem to be integrated in meaningful playing situations, which explains their effectiveness. Thus, the current findings suggest that small-sided games are potentially as dynamic and more functionally relevant as a learning context of female adolescent basketball learners as compared with conventional practice only.

Conclusions

1. Game-based learning proved to be effective in training basketball skills of middle school learners plainly. The experimental group was more improved when compared to the control group in the post-test.
2. Game-based learning has been able to enhance the creation of the students tactical awareness since they were exposed to various playing scenarios that constantly involved reading the court, locating players and their opponents and using the space at their disposal.
3. Game-based learning improved decision-making by placing students in situations that demanded quick choices between passing, dribbling, shooting, and off-the-ball movement, thus simulating the demands of actual play.
4. The experimental group outperformed the control group in the post-test results for all three variables, confirming that game-based learning is more effective than traditional teaching methods in developing the skill, tactical, and mental aspects of the research sample.
5. The results showed that game-based learning provides an integrated learning environment that combines skill performance, tactical awareness, and decision-making, making it a suitable teaching method for teaching basketball to middle school students.

Recommendations

1. Adopt mini-game-based learning within the basketball curriculum for middle school students, given its positive impact on developing skill proficiency, tactical awareness, and decision-making.
2. Design mini-games with progressive difficulty, starting with simple situations like 1-on-1 and 2-on-1, and progressing to more complex situations like 3-on-3, tailored to the students' skill level.
3. Integrate skill-based, tactical, and cognitive aspects within the learning unit, rather than training skills in isolation from game situations.
4. Train physical education teachers on how to design and implement mini-games, adjusting the court size, number of players, rules, and time to serve the educational objective of each skill or tactical situation.
5. Perform future research with mini-games involving other age groups and other types of team sports and investigate other variables, including reaction time, motivation, tactical thinking, and situational awareness.

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