

# Enhancing Mastery of Basic Football Dribbling Skills among Upper Primary School Students through Augmented Reality-Based Interactive Learning Media

Ahmad Riady Hasibuan<sup>1</sup>, Suci Perwita Sari<sup>2</sup>, Indah Purnama Sari<sup>3</sup>

<sup>1,2,3</sup>Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia

[1ahmadriady@umsu.ac.id](mailto:ahmadriady@umsu.ac.id) [2suciperwita@umsu.ac.id](mailto:suciperwita@umsu.ac.id) [3indahpurnama@umsu.ac.id](mailto:indahpurnama@umsu.ac.id)

## Abstract

*This study aims to improve students' learning outcomes in the basic football dribbling technique through the implementation of augmented reality (AR) as an interactive learning aid. An experimental method was employed, using pre-tests and post-tests to measure students' learning gains. The analysis revealed a significant improvement in student performance following the use of AR technology. The average post-test score (69.32) was notably higher than the pre-test score (65.13), with the difference indicating that AR implementation effectively enhanced students' understanding and skills in dribbling. Homogeneity and normality tests confirmed that the data were normally distributed and homogeneous, thus supporting the validity of the study. Moreover, AR media was shown to foster student motivation and enhance learning interactivity, making it a compelling alternative to increase students' interest and academic performance, particularly in physical education. Overall, AR technology not only improved learning outcomes but also fostered a more engaging and interactive classroom environment, thereby holding potential to elevate educational quality at the primary level.*

**Keywords:** *Augmented Reality, Learning Motivation, Interactive Learning, Fundamental Football Techniques*

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## 1. INTRODUCTION

Football is one of the most popular sports among elementary school students and is often introduced informally even before formal instruction. This early exposure makes football a compelling medium for physical education, particularly when teaching fundamental techniques such as passing, shooting, dribbling, heading, and goalkeeping. Among these, dribbling is especially important, as it helps students develop control over the ball, coordination, and agility. However, many students tend to perform dribbling techniques incorrectly, often relying on intuition and personal improvisation rather than structured instruction and visual modeling (Ambar & Jannah, 2021).

In the elementary school context, observations reveal that educators frequently face challenges in optimizing students' understanding of basic football techniques due to limited and less engaging instructional media (Ekaristi et al., 2021). Traditional learning approaches often fail to support students in mastering correct techniques or maintaining enthusiasm in physical education sessions. As a result, students may exhibit lower motivation, reduced involvement, and minimal retention of motor skills.

To address this challenge, educators are increasingly exploring technology-enhanced learning strategies, including Augmented Reality (AR), as a means of creating engaging and effective instructional environments. AR is a technology that overlays digital elements—such as images, sounds, videos, or 3D animations—onto real-world settings through mobile devices, allowing learners to visualize and interact with abstract or dynamic content (Herlandy et al., 2020; Pharausia et al., 2021). In the context of physical education, AR enables students to observe accurate movements and simulate real-life actions, thus supporting both cognitive and psychomotor development.

The use of AR-based applications, particularly those developed using Unity 3D and Vuforia Engine, has been shown to improve student learning outcomes by providing 3D visualizations that are more detailed and interactive compared to traditional instructional methods (Riskiono et al., 2020; Wibowo et al., 2022). This interactive experience helps

learners understand motion, spatial orientation, and the purpose of each movement, such as in football dribbling, more effectively.

Additionally, football is a sport that supports the development of executive functions, including memory, focus, and decision-making (Diamond & Lee, 2011). As a team-based physical activity, football encourages students to build interpersonal skills, improve physical health, and cultivate emotional resilience. Bailey (2006) emphasizes that involvement in sports from an early age fosters physical, social, and personal development. Similarly, Eime et al. (2013) highlight the positive association between sports participation and social health among children and adolescents.

Although prior research has explored the role of AR in enhancing learning motivation and achievement (Pratama, 2018; Farda et al., 2022), its specific application in improving football dribbling techniques among upper elementary students remains underexplored. Therefore, this study aims to investigate the use of Augmented Reality as a tool to improve students' mastery of basic football dribbling techniques. By implementing AR-based learning media, this research seeks to create a more immersive and effective learning environment, thereby enhancing students' motor skills and engagement in physical education.

## 2. METHOD

The present research adopts a quantitative approach, the aim of which is to solve the problems studied by relying on numbers, from data collection to presentation and analysis. The research method employed is a pre-experimental design. The present study employed a One Group Pretest-Posttest design, wherein a single group was involved, namely the experimental group, and participants were neither relocated nor randomised. The experimental design comprises an initial pre-test, subsequent treatment, and a post-test. The population of this study comprised high-grade elementary school students, who constituted the source of information for the data required for the study. The population of this study comprised high-grade elementary school students in a school with a total enrolment of 288 students, divided into multiple classes, with only a subset of these classes being selected for the study. The sampling technique employed was cluster random sampling, whereby samples were obtained from specific groups at random. The participants in this study comprised students from a specific class, with a total of 31 individuals. The data were collected through the administration of questionnaires, and the subsequent data analysis employed descriptive statistics, which included data presentation in the form of averages, percentages, and standard deviations. Prerequisite tests of data normality and homogeneity were also conducted.

## 3. RESULT

### Description of Student Learning Outcomes Data

The results obtained from this study are presented in the table below.

**Table 1.**  
**Student Learning Outcome Data**

Data	N	Lowest Score	Highest Score	Total Score	Mean	SD
Pre-test	31	58	72	2019	3,956	65,13
Post-test	31	59	82	2149	5,437	69,32

As illustrated in Table 1, the data was collected from a total of 31 students. The lowest score on the pre-test was 58, while the highest was 72, with a total score of 2019 and an average of 65.13, with a standard deviation of 3.956. In the post-test, the lowest score

recorded was 59, while the highest score was 82, resulting in a total score of 2149. The mean score was determined to be 69.32, with a standard deviation of 5.437.

### Data Homogeneity Test

In this study, the homogeneity test was utilised to ascertain the similarity of variance between two or more groups. The results of the homogeneity test are presented in the following table.

**Table 2.**  
**Data Homogeneity Test**

Data	Significance Value	Description
Learning Outcome Results	0,143	Homogeneous

### Data Normality Test

The normality test is a statistical procedure employed to ascertain the normality of a distribution of research data. The results of the normality test are presented in Table 3 below.

**Table 3.**  
**Data Normality Test**

Data	Significance Value	Description
Pre-test	0,339	Normal
Post-test	0,544	Normal

As demonstrated in Table 3, the significance values for the pre-test and post-test data exceed 0.05 (0.339 and 0.544), indicating that the data follows a normal distribution.

### Paired Sample T-Test

The Paired Sample T-test was utilised to evaluate the variation in scores prior to and following the treatment. The results of the paired sample T-test are presented in Table 4 below.

**Table 4.**  
**Paired Sample T-test**

Data	Significance Value	Description
Pre-test	0,000	Signifikan
Post-test	0,000	Signifikan

Based on the table 4, the significance value for the paired sample T-test results is 0.000, which is smaller than 0.05. This shows that there is a significant difference between the pre-test and post-test results, which means that the use of augmented reality media has an effect on student learning outcomes in dribbling techniques.

### Increase Percentage in Student Learning Outcomes

The percentage increase is utilised to calculate the enhancement in student learning outcomes subsequent to the implementation of augmented reality media on football dribbling techniques. The findings of the analysis demonstrate that there has been a 6.04% increase in student learning outcomes following the integration of augmented reality. The calculation is derived using the following formula:

$$\text{Increase Percentage} = \frac{\text{Final Score} - \text{First Score}}{\text{First Score}} \times 100\%$$

$$\text{Increase Percentage} = \frac{69,32 - 65,13}{65,13} \times 100\% = 6,04\%$$

#### **4. DISCUSSION**

In light of the aforementioned research findings, it can be concluded that the implementation of augmented reality media in the domain of football dribbling techniques has the potential to enhance the learning outcomes of high-grade students enrolled in elementary schools. The utilisation of augmented reality media in the domain of learning dribbling facilitates a more profound comprehension of the fundamental techniques of the sport, as it enables students to observe and interact directly with three-dimensional models that illustrate the correct movements.

In accordance with the research undertaken by Susanto (2016), the utilisation of augmented reality media has been demonstrated to be an effective method of attracting students' attention and enhancing the overall enjoyment and interactivity of the learning experience. Moreover, research (Jannah, 2020) has demonstrated that the integration of augmented reality in educational settings has the capacity to enhance student interest and engagement in the learning process. This is evident from the significant increase in scores between the pre-test and post-test produced in this study.

It can thus be concluded that augmented reality media provides many benefits in sports learning, especially in the domain of football dribbling techniques.

- a. The enhancement of student learning outcomes is of paramount importance.
- b. This resource has been designed to assist students in comprehending the intricacies of dribbling techniques with greater ease and efficiency.
- c. It is imperative to cultivate a sense of curiosity and enthusiasm for learning among students.
- d. It is imperative to enhance student participation and engagement in the learning process.

#### **5. CONCLUSION**

The present study aims to enhance student learning outcomes on the subject of fundamental football dribbling techniques through the implementation of augmented reality (AR) media as an interactive learning tool. The findings of the data analysis demonstrate that there is a substantial enhancement in student learning outcomes consequent to the implementation of augmented reality (AR) technology. The mean value of student learning outcomes in the post-test (69.32) is higher than the mean value of the pre-test (65.13), with a significant difference, which indicates that the application of AR is effective in improving students' understanding and skills in dribbling techniques.

Furthermore, the homogeneity test demonstrated that the pre-test and post-test data possessed homogeneous variances, while the normality test indicated normal data distribution, thereby reinforcing the validity of the research findings. The utilisation of AR media has been demonstrated to enhance student motivation and augment interactivity in learning, thereby serving as an effective alternative to boost student interest and learning outcomes in PJOK subjects, particularly in the domain of football dribbling proficiency.

It is evident that AR technology has the capacity to enhance learning outcomes and foster a more engaging and interactive learning environment for students, thereby potentially elevating the quality of education at the primary level.

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