



# Improving martial arts education through gamified learning: The case of Pencak Silat with Quizizz

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## ABSTRACT

**Background:** The use of digital media in learning is an innovative effort to improve the quality of the teaching and learning process, including in physical education, particularly in the subject of Pencak Silat

**Objectives:** This study aims to determine the effect of using the Quizizz application on the learning outcomes of Pencak Silat among students at Public Senior High School 1 Indralaya Selatan.

**Methods:** This research was conducted using a quantitative approach. The design used is a one-group pretest-posttest design. In this design, students are given a pretest before treatment, followed by a learning treatment using Quizizz media. After the treatment is completed, a posttest is administered. The population in this study consists of all 11th-grade students at Senior High School 1 Indralaya Selatan, totaling 149 students. From that population, a simple random sample of 30 students will be taken to serve as the research sample. The research instruments include a cognitive test in the form of multiple-choice questions and a psychomotor test in the form of basic Pencak Silat technique practice. Then the data were analyzed using the Shapiro-Wilk normality test to ensure data distribution, followed by a paired sample t-test using IBM SPSS Statistics version 30.0.0.0 (172) software.

**Results:** The analysis shows a significant increase in pretest to posttest scores, both in cognitive aspects (from an average of 37.87 to 58.83) and psychomotor aspects (from an average of 5.43 to 8.70). In the paired sample t-test, the significance value showed <0.001, indicating a significant effect of Quizizz media on students' learning outcomes.

**Conclusions:** This research concludes that the Quizizz application effectively enhances the understanding of concepts and fundamental movement skills of Pencak Silat in a fun and interactive way.

**Keywords:** learning media, learning outcomes, pencak silat, physical education, quizizz.

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## INTRODUCTION

Pencak Silat is a sport and a cultural heritage of Indonesia taught as a physical education subject in schools (Cakrawijaya, 2021). Pencak Silat is not only studied as a subject but also plays an important role in daily life, as it can serve as a means of character development for students and instill discipline (Febriyanto, Haqiyah, & Iskandar, 2024). Additionally, Pencak Silat improves students' physical fitness (Salma & Haryanto, 2023). Pencak Silat instruction is typically conducted at the high school level, focusing on teaching various movement techniques.

However, this instructional process still faces challenges, particularly in the practical aspect. Many physical education teachers still rely on traditional methods, such as lectures, without utilizing supporting media. As a result, students struggle to practice movements, easily become bored due to limited learning experiences, and demonstrate low participation and interest in the instruction. Another impact is the weak understanding and skills acquired after learning (Hidayat, 2022; Magdalena et al., 2021). This issue is important to address promptly, as Pencak Silat learning requires mastery of concepts and motor skills that can only be obtained through appropriate learning approaches.

Previous studies have shown that interactive digital media can improve learning outcomes. Mulyati & Evendi (2020) demonstrated that using the Quizizz application can significantly improve mathematics learning outcomes through fun and competitive game elements. Nababan et al. (2023) found that learning with Quizizz media can increase student motivation through interactive features such as avatars, quizzes, images, audio, and video. Similar findings were also obtained by Jong & Tacoh (2024) in the context of science learning.

However, most of these studies focused on predominantly cognitive subjects, such as mathematics, language, and science. Only a few studies have examined the application of Quizizz in motor skill learning, such as Pencak Silat. The research by Ali (2022) and Sutrisno, Nugraha, & Diana (2023) emphasizes the development of video media for Pencak Silat learning, without integrating real-time interactive gamification approaches like Quizizz. Thus, no research explicitly examines the effectiveness of Pencak Silat learning using an interactive gamification platform to improve cognitive and psychomotor learning outcomes.

This study aims to fill this gap by applying Quizizz-based learning to Pencak Silat material and measuring its effect on students' learning outcomes in cognitive and psychomotor aspects. The novelty of this study lies in the combination of psychomotor-based martial arts learning with a digital gamification approach, which has rarely been used in physical education.

Therefore, this study aims to determine the extent to which the application of Quizizz as a gamification medium can improve students' Pencak Silat learning outcomes at State Senior High School 1 Indralaya Selatan. The findings of this study are expected to provide practical contributions for physical education teachers in developing more effective technology-based learning strategies, as well as theoretical contributions in the development of interactive learning media for psychomotor learning contexts.

## METHODS

### Study Design and Participants

This study uses a quantitative approach with a quasi-experimental design, namely a one-group pretest-posttest design. This design was chosen to observe the impact of using the gamification-based Quizizz application in Pencak Silat learning on students' learning outcomes. The research population includes all 149 students of the XI grade at Public Senior High School 1, Indralaya Selatan. From that number, 30 students were randomly selected using the simple random sampling technique with the help of the random.org application (Widianti et al., 2022), so each student had an equal chance of being selected (Wardana et al., 2024). Because the primary focus of this research is to examine the influence of learning media on the learning outcomes of pencak silat from cognitive and psychomotor aspects (Arumdhani et al., 2024), demographic data such as age, height, weight, and Body Mass Index were not collected in detail. Therefore, general information regarding the participants' physical characteristics, such as age distribution and body condition, is not presented in the form of descriptive statistics like mean values and standard deviations.

### Ethical approval statement

This research has passed the ethical feasibility review conducted by the Health and Medical Research Ethics Committee (Komite Etik Penelitian Kedokteran dan Kesehatan/KEPKK) of the Faculty of Medicine, Universitas Sriwijaya, and has been declared ethically appropriate with Ethical Clearance Certificate Protocol Number: 111-2025. All human participant procedures were conducted by the ethical standards outlined in the Declaration of Helsinki. All participants provided written informed consent prior to data collection.

### Research Instruments

The instruments used in this study include two types: the first is a cognitive test consisting of 20 multiple-choice questions covering the basic techniques of Pencak Silat, such as stances, punches, and kicks, which are administered in the form of a pre-test and post-test (Putri, Susilawati, & Wahyudi, 2024). The questions have been designed based on the fundamental competency indicators for the basic techniques of Pencak Silat, covering stances (questions 1-10), punching techniques (questions 11-15), and kicking techniques (questions 16-20). The second test is a psychomotor test conducted through the observation of Pencak Silat movement practices, which consists of three assessment aspects, such as stances, punches, and kicks, with the evaluation based on the mastery of basic techniques and a maximum score of 12 points (Ali, 2022). According to Sari (2023), the implementation of this research was carried out in three stages: the first stage was a pre-test to determine the initial abilities of the students, the second stage involved treatment through learning using the Quizizz application, and the third stage was followed by a post-test to observe changes in learning outcomes after the instruction.

### Data Analysis

After the pretest and posttest data, both cognitive and psychomotor data, were obtained, the next step was to analyze the data using the IBM SPSS Statistics program version 30.0.0.0 (172). The analysis begins with the normality test using the Shapiro-Wilk method because the sample size is less than 50 (Subamia, Sri Wahyuni,

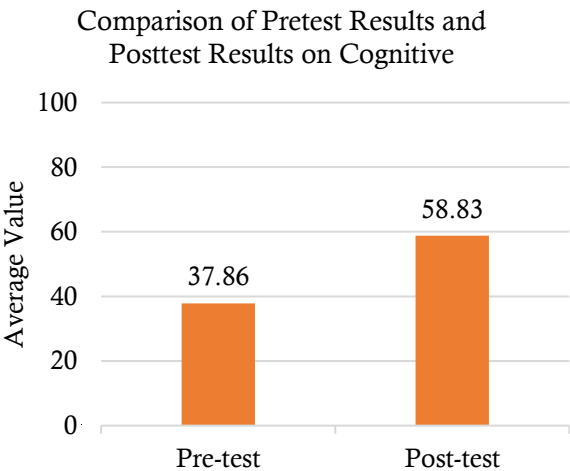
& Widiasih, 2021). This test is to ensure the data distribution is normal. If the data is normally distributed, the next step is to conduct a paired sample t-test to see if there is a significant difference between the pretest and posttest results obtained after learning using interactive media in the form of Quizizz (Al Mawaddah et al., 2021).

## RESULTS

The results of this study are divided into two categories: cognitive assessment and psychomotor assessment. Here is the analysis of the comparative results.

**Table 1.** Comparison of Pretest Results and Posttest Results on Cognitive

| Results   | N  | Highest Score | Lowest Score | Mean  | Difference of Mean Pre-test and Post-test |
|-----------|----|---------------|--------------|-------|-------------------------------------------|
| Pre-test  | 30 | 55            | 20           | 37.86 | 20.97                                     |
| Post-test | 30 | 75            | 40           | 58.83 |                                           |

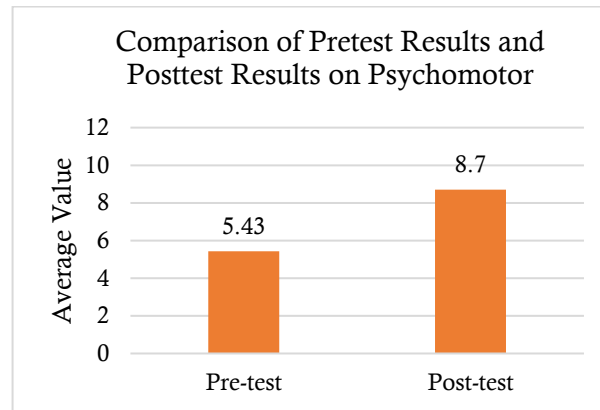


**Figure 1.** Comparison of Pretest Results and Posttest Results on Cognitive

Referring to Table 1 and Figure 1, it was known that the highest score is 55 and the lowest score is 20, with an average of 37.86. There was an improvement after being given treatment in the form of learning implementation using the Quizizz application. The final test results or posttest show that the highest score is 75, and the lowest score is 40, with an average of 58.83. The two test results showed an improvement with a difference of 20.97 after the provided learning media.

**Table 2.** Comparison of Pretest and Posttest Results on Psychomotor

| Results   | N  | Highest Score | Lowest Score | Mean | Difference of Mean Pre-test and Post-test |
|-----------|----|---------------|--------------|------|-------------------------------------------|
| Pre-test  | 30 | 9             | 3            | 5.43 | 3.27                                      |
| Post-test | 30 | 11            | 6            | 8.7  |                                           |



**Figure 2.** Comparison of Pretest Results and Posttest Results on Psychomotor

Table 2 and Figure 2 found that the highest score was 9 and the lowest was 3, with an average of 5.43. There was also an improvement after treatment in learning implementation using the Quizizz application. The final test or post-test results show that the highest score is 11, and the lowest is 6, with an average of 8.7. Both test results show an improvement with a difference of 3.27 after the learning media was provided.

**Table 3.** Normality Test on Cognitive Aspects

|          | Kolmogorov-Smirnov <sup>a</sup> |    |        | Shapiro-Wilk |    |       |
|----------|---------------------------------|----|--------|--------------|----|-------|
|          | Statistic                       | df | Sig.   | Statistic    | df | Sig.  |
| Pretest  | 0.098                           | 30 | 0.200* | 0.961        | 30 | 0.337 |
| Posttest | 0.123                           | 30 | 0.200* | 0.951        | 30 | 0.183 |

The results of the cognitive normality test using the Shapiro-Wilk test on Table 3 show significance values of  $0.337 > 0.05$  for the pre-test and  $0.183 > 0.05$  for the post-test. The results indicate that the test's significance values greater than 0.05 show that the pre-test and post-test data are normally distributed, allowing for parametric statistical analysis in the next stage.

**Table 4.** Normality Test on Psychomotor Aspects

|          | Kolmogorov-Smirnov <sup>a</sup> |    |       | Shapiro-Wilk |    |       |
|----------|---------------------------------|----|-------|--------------|----|-------|
|          | Statistic                       | df | Sig.  | Statistic    | df | Sig.  |
| Pretest  | 0.186                           | 30 | 0.010 | 0.945        | 30 | 0.125 |
| Posttest | 0.161                           | 30 | 0.047 | 0.935        | 30 | 0.065 |

The psychomotor test results using the Shapiro-Wilk test on Table 4 showed significance values of  $0.125 < 0.05$  for the pre-test and  $0.065 < 0.05$  for the post-test. The results indicate that the test's significance values greater than 0.05 show that the pre-test and post-test data are normally distributed, allowing for parametric statistical analysis in the subsequent stages.

**Table 5.** Results of Paired T-Test on Cognitive and Psychomotor Aspects

|                                | Mean   | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |        | t      | df | One-Sided p | Two-Sided p |
|--------------------------------|--------|----------------|-----------------|-------------------------------------------|--------|--------|----|-------------|-------------|
|                                |        |                |                 | Lower                                     | Upper  |        |    |             |             |
| Pretest-Posttest (Cognitive)   | 20.967 | 7.411          | 1.353           | 23.734                                    | 18.199 | 15.495 | 29 | <.001       | <.001       |
| Pretest-Posttest (Psychomotor) | -3.267 | 0.828          | 0.151           | -3.576                                    | -2.958 | 21.617 | 29 | <.001       | <.001       |

The paired sample t-test results (Table 5) showed significant improvements in both cognitive and psychomotor scores of 30 students. The cognitive scores increased from an average pre-test score of 37.87 to a post-test score of 58.83 (mean difference = -20.967, SD = 7.411,  $t = -15.495$ ,  $p < 0.001$ ), while the psychomotor scores improved from 5.43 to 8.70 (mean difference = -3.267, SD = 0.828,  $t = -21.617$ ,  $p < 0.001$ ). These findings indicate a statistically significant difference between pre-test and post-test results in both domains.

## DISCUSSION

The results of this study indicate that using the Quizizz application while teaching Pencak Silat can help students learn better in terms of concept understanding and fundamental movement skills. The results before and after the students' tests improved significantly. Cognitive scores increased from 37.87 to 58.83, and psychomotor scores increased from 5.43 to 8.70. The results show that Quizizz can be a good learning tool for movement-based sports such as Pencak Silat (Lahinda & Riyanto, 2022).

The alignment with the research hypothesis indicates that the Quizizz media improves students' learning outcomes. The results of the paired sample t-test showed a significance value of  $<0.001$ , indicating a significant difference in student learning outcomes before and after using the Quizizz media. Therefore, the alternative hypothesis is accepted, and the null hypothesis is not rejected (Faidah et al., 2024).

Compared to previous research, this finding aligns with previous research by Mulyati & Evendi (2020) and Jong & Tacoh (2024), which found that Quizizz can enhance student motivation and learning outcomes in cognitive subjects such as mathematics and science. However, this study focuses on psychomotor material, specifically Pencak Silat. This is a new contribution because previous research viewed Quizizz from the perspective of theoretical learning, not physical skills (Citra & Rosy, 2020). This study also supports the opinion of Jong & Tacoh (2024) and Aryanti, Victorian, & Solahuddin (2021) that interactive media make learning more enjoyable and meaningful.

However, the results of this study do not fully explain whether there are additional components that influence students' learning outcomes, such as study habits at home, self-motivation, or students' familiarity with technology. Moreover, whether the grade improvement will last or be temporary is unclear since the learning was conducted only four times.

The results of this study revealed an interesting finding, namely, the use of the Quizizz application with the concept of gamification in the process of learning the practice of Pencak Silat. According to previous research, the Quizizz application in the form of gamification is still widely applied to cognitive assessments, such as in mathematics or science subjects. In this study, Quizizz was able to improve students' learning outcomes both cognitively and psychomotorically, thus reinforcing and expanding the theory of technology-assisted learning in physical education, which previously relied on the lecture approach by teachers (Sumianingrum, 2017). Thus, the school can use these findings to develop the learning process using engaging and non-boring digital media for students (Widyana, Asyraf, & Fithri 2024).

## Limitations of the study

In this study, there are limitations in the research process, with the constraint faced by the researchers being that some students still do not have the technological tools needed to access questions through the Quizizz application. Students also face difficulties because they do not yet know how to access the application, which creates obstacles for those less familiar with using the internet.

Given the limitations of the research, it is recommended that future studies pay more attention to students, ensuring that all students have access to technological tools such as smartphones and internet access. Additionally, it is necessary to guide students who are not yet proficient in accessing the application to avoid difficulties during the learning process.

## CONCLUSIONS

The results of this study highlight that learning with interactive media plays a crucial role in enhancing the effectiveness of the teaching and learning process, particularly in the field of physical education, where both cognitive understanding and psychomotor skills are essential. The implementation of Quizizz proved to be a highly effective tool, not only in improving students' cognitive achievements but also in fostering the development of their motor skills through engaging, game-based activities. By integrating elements of competition, instant feedback, and interactive features, Quizizz increased student motivation, participation, and overall engagement in the learning process. These findings suggest that incorporating digital gamification platforms into physical education can bridge the gap between theory and practice, offering a more dynamic and student-centered learning experience. Quizizz can be recommended as a complementary medium for physical education teachers seeking to enhance learning outcomes across multiple domains, engaging and effectively.

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## DATA AVAILABILITY

All data supporting the findings of this study are included in the article and its supplementary materials. Additional datasets are available from the corresponding author upon a reasonable request.

## FUNDING

This research did not receive external funding.

## CONFLICT OF INTEREST

The author states that this study was carried out independently, with full integrity, and without any conflicts of interest involving any organization, institution, or individual. There were no financial, professional, or personal affiliations that could have influenced the design, data collection, analysis, or interpretation of the research.

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