



## Effects of Game-Based Teaching Modules on Fundamental Movement Skills of Elementary School Students

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### ABSTRACT

This study aimed to analyse the effect of traditional game-based teaching modules on the development of fundamental movement skills of elementary school students in Physical Education learning. The study used a quasi-experimental design with a pre-test post-test design. The purposive sampling was employed involving 40 Grade V Elementary School students. The research instrument used the Test of Gross Motor Development-2 (TGMD-2) to measure fundamental movement skills, including locomotor and object control skills in children. The results of the study showed a significant increase in the experimental group with a p value  $<0.05$  in all basic skill components and all skill aspects. The significance value for the two-tailed test was 0.000, meaning that the probability of this result occurring by chance is very small (less than 0.001), so the difference was truly significant. The *Kaulinan* Teaching Module, a module based on traditional games, has proven to be effective in improving the fundamental skills of elementary school students in Physical Education learning. The result ensures that the *Kaulinan* teaching module can be more than just research findings. It can be an educational movement to enrich PE learning, preserve cultural heritage, and holistically shape the character of elementary school students.

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## INTRODUCTION

Specific challenges in implementing a curriculum that emphasizes independent learning in elementary school physical education include the teacher tendency to revert to conventional teaching methods (Pratiwi et al., 2023). Its implementation remains far from expectations since most teachers still use conventional teaching methods. Learning principles are often conveyed directly by teachers with limited opportunities for abstraction and generalization, which may contribute to a relatively low level of educational quality, particularly in elementary school physical education (Nugroho & Lubis, 2023).

Fundamental Movement Skill (FMS) is an important foundation in the physical development of elementary school-age children. Fundamental movement skills are the basic movement patterns that form the foundation for more complex and specialized movement skills needed in various physical activities and sports (Wang et al., 2022). The period of fundamental movement patterns occurs around the age of 1 to 7 years, when children begin to acquire basic movement skills such as running, jumping, throwing, catching, kicking, dribbling, and hitting. Physical activity plays an essential role in a child physical development, with strong evidence demonstrating positive associations between physical activity and the development of motor skills in children (Dapp et al., 2021). Mastering these skills not only affects a child physical abilities, but also affects their cognitive, social, and emotional development.

In Indonesia, especially in the West Java region, there is a wealth of traditional Sundanese games known as *Kaulinan*. Traditional games can be an effective means of strengthening character and reducing gadget independence in elementary school-aged children because they train social skills, sportsmanship, cooperation, honesty, and responsibility through direct interaction with peers (Muhammad Imanda Ilham et al., 2025). These traditional games have historically helped children develop their motor skills through fun and culturally meaningful activities. In addition, many students are identified to have suboptimal fundamental movement skills, which will affect the achievement of subsequent motor skills (Ariyanto et al., 2020). This encourages the need for innovation in physical education learning that combines traditional values with modern approaches. The *Kaulinan* teaching module was developed as an innovative solution that integrates traditional Sundanese games with the application of game-based learning teaching modules. The implementation of the *Kaulinan* module shows significant potential as an innovative learning medium combining traditional values with interactive learning processes (Murdoch et al., 2021).

Fundamental movement skills are basic movement patterns that provide the foundation for more complex and sport-specific movement skills (Roscoe et al., 2024). Fundamental movement skills can be divided into three main categories, including locomotor skills (such as walking, running, jumping), manipulative skills (such as throwing, catching, kicking), and stability skills (such as balance and coordination) (Lindsay, 2020). Good motor coordination is needed to achieve the fundamentals of good motor skills. In addition, physical activity plays an essential role in a child physical development, with strong evidence showing positive associations between physical activity and motor skills in children (Vetter, 2020). Research had found significant relationships among perceived and actual motor skill competence and physical activity in Indonesian preschoolers, showing the relevance of the Game-Based Learning in Physical Education in the Indonesian context (Famelia et al., 2018).

Game-based learning involves the use of educational games or some aspects of games in educational contexts, also known as educational gamifications (Camacho-Sánchez et al., 2023). A systematic review concluded that the game-based physical education programs could significantly improve enjoyment and engagement among children and adolescents (Mo

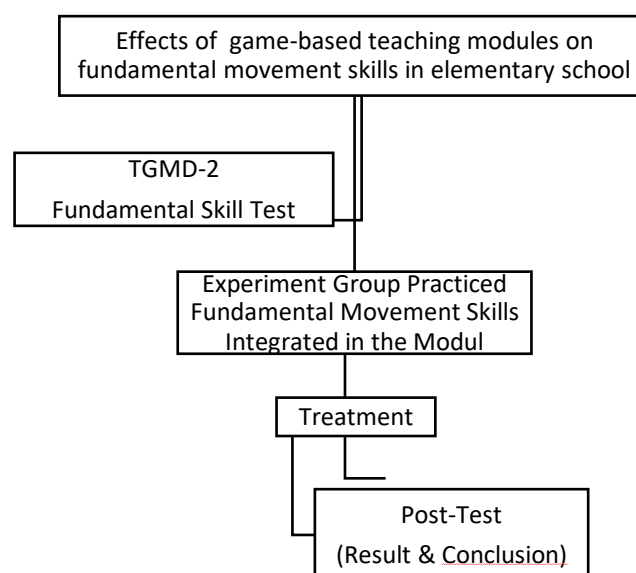
et al., 2024). Game-based Physical Education programs significantly and consistently increase participant enjoyment levels compared to traditional Physical Education teaching methods. Meta-analysis showed a positive and statistically significant difference (Mo et al., 2024). This approach provides a meaningful context for the learning of motor skills. A study investigating motor skills and motivations to learn physical education using traditional games, involving 40 students from elementary schools in Grobogan Regency, showed a significant improvement in the participant motor skills and learning motivations (Aliriad et al., 2024). There is also great potential for developing physical education learning models in elementary schools based on traditional games (Ketut Yoda et al., 2021). In addition, study had shown that the use of traditional games can significantly improve the fundamental movement skills of elementary school students (Supriadi, 2020). For this reason, implementing traditional games, specifically the Sundanese *Kaulinan* games that contain cultural characteristics different from other regions, is promising. Therefore, this research aimed to test and develop a module based on Cianjur specific local wisdom. This study also examined the effect of the *Kaulinan* teaching module on the development of fundamental movement skills of elementary school students.

## METHODS

The method used in this study was the experiment method. This study used a quasi-experimental approach with a pre-test post-test design to analyze the effect of the *Kaulinan* teaching module on the fundamental movement skills of elementary school students. It has been suggested that physical education in children should promote fundamental movement skill development through structured and progressive activities (Goodway & Robinson, 2015).

### Participants and Samples

The research participants of this study were elementary school students. The purposive sampling technique was used for the sample selection. The samples were students aged 10-11, consisting of 40 5<sup>th</sup> grade students of Pasarsuuk Elementary School, Cianjur Regency. This age period was chosen since it is the end of middle childhood and a critical and peak period for mastering Fundamental Movement Skills (FMS). Meanwhile, fundamental motor skill assessment should involve children in the appropriate age range for the optimal skill development (Aye et al., 2017). Table 1. provides the detail of the research procedure.



**Figure 1.** Research Framework

**Table 1.** Research Procedures

Phase	Duration	Activity	Information
<b>1.Preparation</b>	2 Weeks	<ol style="list-style-type: none"> <li>1. Licensing and proposing ethical clearance</li> <li>2. Socialization to teachers and students</li> <li>3. Training on the use of Game Teaching Module</li> <li>4. Pilot testing of the instruments</li> </ol>	Ensuring all administrative, ethical, and tool readiness aspects run smoothly
<b>2. Pre-test</b>	1 Week	<ol style="list-style-type: none"> <li>1. Measurements using the TGMD-2</li> <li>2. Baseline assessment of the fundamental skills</li> </ol>	Measuring the baseline ability of all subjects before the intervention
<b>3. Intervention</b>	8 Weeks	Treatments: <ol style="list-style-type: none"> <li>1. Learning using the Game Teaching Module</li> <li>2. Conducting 3 meetings per week, 60 minutes each</li> <li>3. Integrating 4 types of traditional games</li> </ol>	Giving treatments
<b>4. Post-test</b>	1 Week	<ol style="list-style-type: none"> <li>1. Measurement using the TGMD-2</li> </ol>	Measuring the final FMS ability and obtaining feedbacks from students

The research instrument used in this study was the Test of Gross Motor Development-2 (TGMD-2) to measure fundamental movement skills (Song et al., 2022) which is categorized as a reliable and valid instrument for assessing locomotor and object control skills in children. The experimental group used the *Kaulinan* Teaching Module which integrated traditional Sundanese games such as Gobak Sodor, Boyboyan, and Ucing Jongkok.

### Data Analysis

This research used descriptive statistics analysis to examine the subject characteristics and the mean scores, as well as paired t-test to measure the mean differences before and after the intervention.

## RESULTS

The results of the study showed that students who engaged in traditional games showed a significant increase in discipline, both in academic and social aspects. By integrating traditional games into the educational curriculum, schools can create a more dynamic learning environment and support student character development. Therefore, it is important for educators and policymakers to consider the use of traditional game models as a strategy to build discipline and preservation of local culture among the younger generation.

**Table 2.** Research Subject Characteristics

Characteristics	N
Age (years)	11-12
Gender (L/P)	20/20
Class	5

Based on Table 2, participants were at the 5<sup>th</sup> grade level of elementary school aged 11 to 12 years and had a balanced sex composition. This profile illustrates that the research sample had represented a population of primary school children in general who were healthy and in the appropriate developmental stage to receive interventions to improve motor skills. These homogeneous characteristics also helped in controlling the disruptive variables and ensuring that the outcome of the intervention was due to the treatment given.

**Table 3.** Descriptive Data Results

	Mean	N	Std. Deviation	Std. Error Mean
Pre-test	17.0000	40	6.96511	1.10128
Post-test	26.1750	40	5.53723	.87551

The data in Table 3 show the results on two paired conditions, namely pre-test and post-test on the same 40 samples. The mean score before the intervention was 17, with a standard deviation of 6.965, indicating considerable variation in values between the samples. After the intervention, the mean score increased to 26.175 with a smaller standard deviation of 5.537, indicating improved performance or better and consistent outcomes after the treatment. The standard error mean described the accuracy of the average estimates in this sample, 1.101 for the pre-test and 0.876 for the post-test, indicating that the mean was quite reliable. Overall, this description indicated a significant change between the before and after conditions with an increase in mean scores and a decrease in variation values. However, to ascertain the significance of the difference, it is necessary to perform further tests such as paired t-tests.

**Table 4.** Result of Hypothesis Testing

	Mean	Lower	Upper	t	Df	Sig (2-tailed)
Pre-Test & Post-Test	-9.17500	-11.15694	-7.19306	-9.364	39	0.000

Mean Difference (-9.17500) is the average difference between the Post-Test score and the Pre-Test score for the Experimental group. A negative sign indicated that the Post-Test score was, on average, 9.175 points higher than the Pre-Test score. The significance test confirmed that the change was real. The 95% confidence interval (Bottom: -11.15694, Top: -7.19306) indicated the 95% confidence that the true average increase in the population was

between a 7.19 and 11.16 point increase on testing. Since the entire interval was negative and did not include zero, this reinforced that the increase was statistically significant and substantial. The t-value (-9.364) was high and negative, showing a very strong effect. The degree of freedom ( $df = 39$ ) indicated that there were 40 participants in the Experiment group (because  $df = N - 1$ ). The Sig 2-tailed was 0.000, meaning that it was less than 0.001 showing a statistically significant value. There was only less than 0.1% chance that this observed increase occurred randomly. Therefore, we can confidently reject the zero hypothesis stating there was no difference between the pre and post-tests.

## DISCUSSION

The results of the study showed a significant improvement in the fundamental movement skills of students who used the Game Teaching Module. The p-value was reported to be 0.000, showing a statistically significant value. This finding is in line with the previous research conducted by Supriyanto et al. (2024) who reported that traditional games could significantly improve motor skill development of elementary school students. It might be because the Game Teaching Module provides structured and progressive exercises for running, jumping, and moving skills through traditional game simulations. The structured practice with immediate feedbacks is crucial for motor skill acquisitions in children (Song et al., 2022), confirming that manipulative basic movement skills can be effectively developed through traditional game-based learning models. Traditional Sundanese games, such as *Gobak Sodor*, *Boyboyan*, and *Ucing Jongkok*, and the simulation of throwing a basketball could train the student eye-hand coordination and manipulative skills. It is believed that the progressive skill development through varied practice opportunities enhances motor learning outcomes (Goodway & Robinson, 2015). In addition, the game teaching module with a game-based learning approach would significantly improve the student learning performance and motivation in physical education (Culajara, 2023).

The observation results showed that the student engagement level increased from 65% to 87% after using the Game Teaching Module. The gamification elements such as points, badges, and leaderboards could significantly increase the student motivation and participation (Camacho-Sánchez et al., 2023). In a meta-analysis, a study had found that game-based physical education interventions could consistently demonstrate positive effects on enjoyment and engagement across different age groups and contexts (Mo et al., 2024). Factors that might contribute to increased motivation include gamification systems, personalization of learning, immediate feedbacks, and the integration of cultural content.

Traditional games not only improve motor skills but also enhance cognitive and social development in elementary school students (Supriadi, 2020). Learning using the *Kaulinan* application showed an increase in problem solving (23%), decision making, spatial awareness, and social skills. Games-based approaches emphasize tactical awareness and decision-making skills that transfer to various physical activity contexts (PE Scholar, 2024).

A comprehensive motor skill development should address cognitive, social, and emotional aspects alongside physical competencies. However, the implementation of physical education based on interactive teaching modules requires adequate media and literacy among teachers and students (Saiz-González et al., 2025). In addition, despite showing positive results, the implementation of the Game Teaching Module faces challenges of technological infrastructure, content development, evaluation, and reciprocity. For this reason, technology should be a supplement, not a replacement, of the actual physical activity and social interaction in physical education (Dapp et al., 2021). It also emphasizes that

maintaining a balance between digital engagements and actual motor skill practices in real-world contexts is necessary (Lopes et al., 2021).

## CONCLUSION

The *Kaulinan* Teaching Module based on traditional games had proven to be effective in improving the fundamental skills of elementary school students in Physical Education learning. This study showed that the Game Teaching Module had a significant positive effect on the development of basic motor skills of elementary school students, confirming that traditional game-based interventions could significantly improve both motor skills and learning motivation in physical education. This will ensure that the *Kaulinan* teaching module becomes more than just research findings. It can also transform into an educational movement that enriches PE learning, preserves cultural heritage, and holistically shapes the character of elementary school students.

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## AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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