



THE USE OF AN INCLINED MAT TO IMPROVE THE LEARNING OUTCOMES OF FIFTH-YEAR PUPILS AT STATE PRIMARY SCHOOL IN THE FORWARD ROLL SKILLS

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Received: April 2026, Revised: May 2026, Accepted: June 2026

Abstract

This study aims to determine whether the use of an inclined mat can improve the learning outcomes of fifth-year pupils at State Primary School 02 Babadan in the forward roll skill. The research was motivated by low learning outcomes, particularly in the psychomotor and affective domains, as well as the lack of varied teaching media in physical education. A quantitative approach with a quasi-experimental method and a one-group pretest-posttest design was employed. The population consisted of all 17 fourth-year pupils, selected through saturated sampling. Data were collected through cognitive, affective, and psychomotor tests. Descriptive analysis showed an increase in average scores across all domains. The paired t-test results indicated no significant improvement in the cognitive domain ($p = 0.136$), but a significant improvement in the affective domain ($p = 0.015$). The Wilcoxon signed-rank test revealed a significant improvement in the psychomotor domain ($p = 0.002$), with 13 pupils showing increased scores. In conclusion, the use of an inclined mat is effective in improving students' affective and psychomotor learning outcomes in forward roll gymnastics, although it does not significantly affect cognitive understanding. This research recommends the inclined mat as an innovative and practical teaching aid for primary school physical education.

Keywords: inclined mat, forward roll, learning outcomes, physical education, primary school, floor gymnastics

INTRODUCTION

Education is one of the most important aspects of human life. Everyone has the right to a proper and equitable education (Fitriani, 2021). Article 1(1) of Law of the Republic of Indonesia No. 20 of 2003 on the National Education System states that "Education is a conscious and planned endeavour to create a learning environment and learning process so that learners actively develop their potential. Meanwhile, Article 3 emphasises that the national education system serves to develop abilities and shape the character and civilisation of a dignified nation in order to enlighten the life of the nation" (Law of the Republic of Indonesia, 2003).



However, efforts to improve the quality of education must be accompanied by improvements in the quality of students, as they play a vital role in achieving educational goals to the fullest extent possible (Sutriawan et al., 2024). Education, in essence, is a conscious effort to enhance learners' potential through the development of learning activities that are encouraged and facilitated. Education generally aims to prepare students for the careers they will pursue in the future (Muhammad Fakhur Rozi, Juanda Putra, Sumirwan, 2023). Education is a concrete endeavour to help people become more independent and mentally mature, so that they are able to survive in a competitive world. Education also means helping others to develop their full potential, which drives a process of human development that enables them to compete in their respective fields of life (Arifin, 2017).

Physical education is an important part of the overall education system as it provides students with the opportunity to engage directly in a variety of learning experiences; physical activity is an integral part of education as a whole. Thus, physical education is an important part of the overall education system (M. Riyyal Munadi.M.P et al., 2024). Within the education system, physical education is a vital component aimed at enhancing health, fitness, critical thinking skills, emotional stability, social skills, reasoning, and moral conduct through sport and physical activity (FATKHUROHMAN, 2022). Physical education plays a vital role in enhancing education as a lifelong development process, particularly as it provides students with direct access to a variety of learning experiences through systematic physical activities (Alfyanti et al., 2024).

Physical education is intended to produce individuals who possess knowledge, skills, independence, physical and mental health, and a sense of responsibility. (Studi Pendidikan Jasmani Kesehatan dan Rekreasi Fakultas Pendidikan Olahraga dan Kesehatan IKIP PGRI Pontianak Jalan Ampera Nomor, 2016). Physical education is a subject taught at every level of education, including in primary schools, lower secondary schools, and upper secondary schools in Indonesia (Yoga, 2021).

Primary schools provide physical education that goes beyond mere sport; it also helps pupils to develop better character and health (Fajri et al., 2025). Primary school is the stage of education where pupils are given a foundation and prepared for the next level of education. Therefore, a model of pendidikan jasmani that emphasizes the development of character and discipline in students is very crucial (Lestari, 2021). Physical education in primary schools must be delivered using methods appropriate to children's developmental stages so as to provide a learning experience that is both enjoyable and meaningful (Krisna et al., 2025).

To achieve learning objectives for elementary school-aged children, teaching methods that are enjoyable, innovative, and varied—and tailored to the children's stage of growth and



development—are necessary (Suganda et al., 2022). In addition, physical education teachers are expected to have the ability to manage the learning interaction process in a way that optimally encourages student engagement and participation. This is important to ensure that the learning process is not one-sided and to prevent students from becoming bored or afraid to ask questions and explore knowledge, which could ultimately lead to poor learning outcomes (Kd Yusdika et al., 2024).

In physical education, gymnastics is one of the subjects that often presents difficulties. Floor gymnastics is the most common form of gymnastics and is taught in schools. As the name suggests, floor gymnastics involves movements and exercises performed on the floor. Floor gymnastics is a type of sport that involves the use of mats (Rama et al., 2025).

Floor gymnastics is one of the subjects taught in physical education (PJOK) at primary school. It involves various movements performed on a mat, such as forward rolls (Situmeang et al., 2025). A study (Nuromadon et al., 2024) states that practicing a number of floor gymnastics movements with clearer and smoother movements, as well as fostering a sense of confidence, discipline, and aesthetics, are important competencies in physical education learning. The learning objective is for pupils to be able to perform floor gymnastics movements and to foster courage and self-confidence. The basic concept of the forward roll is an indicator of success.

In a study conducted by Prakasa et al., (2025), it was found that many pupils still struggled to perform a forward roll, as evidenced by the large number of pupils who required assistance when performing the movement, as well as some pupils who managed to perform a forward roll without assistance but using incorrect technique. According to (Rejeki & Gunawan, 2021), physical education teachers lack creativity and variety in their teaching (monotonous), and the methods used are still considered traditional and fail to engage students' interest in learning. One measure to be implemented to assist students in performing floor gymnastics movements, particularly the forward roll, is the use of sloped mats.

Data on the learning outcomes of Year 5 pupils at SDN 02 Babadan for the 2025/2026 academic year indicates that pupils' learning outcomes across various domains have not yet been fully optimised. The learning outcomes for the forward roll in the cognitive domain yielded an average score of 73.1, an average affective score of 74.3, and an average psychomotor score of 72.8. The assessment of the forward roll showed that the highest score achieved by a pupil was 91, whilst the lowest was 61. The class average score for the forward roll was 74.0, which remains below the Minimum Passing Criteria (KKM) set at 75. Based on this KKM, 8 students (47.06%) achieved the learning proficiency, whilst 9 students (52.94%) did not. It can therefore be concluded that the learning outcomes of Year 5 pupils in floor gymnastics lessons on the forward roll during the



2025/2026 academic year still need to be improved so that all pupils can achieve the established learning success indicators. These data were provided by the PE teacher at SDN 02 Babadan.

Explanation from (Qiyam, 2025): The inclined surface referred to here involves the use of an inclined mat with one side higher than the other, and the lower side not flat but sloping. Using an inclined mat can help pupils learn the forward roll floor exercise. The mat is usually flat, but in this study it was raised at a certain angle to make it easier for the students to roll. According to (Nurulita et al., 2024), mastering the skill of rolling forwards using an inclined plane is essentially aimed at overcoming the difficulties faced by students, as they often struggle to roll correctly and precisely when using a flat mat. According to (Ansar et al., 2024), the forward roll learning method involves various learning variations designed to facilitate the execution and understanding of the basic forward roll movement. These include the use of an inclined surface, the partner rolling game method, and the simple movement practice method. According to (Sutoro & Nurhidayah, 2023), the success of the activities carried out is influenced by the use of learning media in the form of an inclined plane and the chosen learning model.

States in his research that learning media are essentially tools that can be used to convey messages and information about learning materials so that students undergo a learning process to achieve their objectives. According to (Husna & Supriyadi, 2023), learning media in teaching and learning activities play a very important role as they can help clarify material, complement the learning process, and facilitate the delivery of messages and material through examples found in the students' surroundings. Learning media, as part of the entire learning process, must receive serious attention from educators. The appropriate use of learning media will provide many benefits, improve the efficiency of the learning process, and make learning activities more engaging and meaningful for students. A study by (Wardani et al., 2024) states that learning media must be able to function as a communication tool in the delivery of lesson content. To ensure that the outcomes of learning media innovation can be maximised in line with the desired objectives, there are several aspects that need to be considered in the innovation process, namely theoretical rationale, the underlying principles of learning, and the learning environment (Yusfi & Sriwijaya, 2023). Teaching materials should be selected with due regard to pupils' needs and abilities so that teachers can deliver the content easily and accurately and help pupils achieve optimal learning outcomes.

According to (Jean Imaniar Djara et al., 2023), learning outcomes represent accomplishments that illustrate how well students have comprehended and mastered the content after the educational process. These outcomes serve as indicators of learning success, as they reflect changes in students' abilities—in terms of knowledge, attitudes and skills—acquired during the learning process. However, according to (Agus et al., 2021), it is not only the students' environment



and the teacher's teaching style that influence learning outcomes; they are also significantly influenced by factors within the students themselves, known as internal factors. These internal factors include various personal aspects of the students, such as their motivation to learn, intellectual ability, health, attention, attitude, and mental readiness to receive instruction. If all these factors are favourable, students will perform better.

This study on the use of an inclined mat to improve learning outcomes in the forward roll is underpinned by the behaviourist theory proposed by Edward Lee Thorndike. This theory states that learning occurs when a person establishes a connection between an event known as a stimulus (S) and a reaction known as a response (R). A stimulus is any change or stimulus that prompts a person to perform an action, and a response is any form of behaviour or action produced by that stimulus (Shahbana et al., 2020). In the context of floor gymnastics learning, the use of an inclined mat functions as a stimulus (S) that helps students produce a more accurate movement response (R). Through repeated practice and reinforcement, it is hoped that students' motor skills in performing forward rolls will show a significant improvement.

Although there has been a great deal of research on floor exercises, particularly the forward roll in physical education lessons, most of it has focused primarily on motor skills, with little attention paid to improvements in learning outcomes. Consequently, there is a research gap in the affective domain of learning, particularly regarding students' learning outcomes in physical education. The use of the inclined mat is intended as an alternative exercise to develop students' motor skills and thereby improve learning outcomes.

The inclined mat has been thoroughly researched; however, prior studies have primarily concentrated on product advancements or enhancements to the learning experience. This is evident from the prevalence of the Research and Development (R&D) method, which aims to produce and test the effectiveness of learning products, as well as the Classroom Action Research (CAR) method, which emphasizes continuous improvement of classroom teaching practices. Consequently, previous research has not extensively examined this medium using a quasi-experimental approach to observe its direct impact on learning outcomes, thereby presenting an opportunity for this study to address this gap.

Based on the background described above, the main research question can be formulated as follows: Can the use of an inclined mat improve the learning outcomes of Year 5 pupils at SDN 02 Babadan? This research question forms the core objective of this study, namely to determine whether the training method involving the use of an inclined mat has an impact on the learning outcomes of Year 5 pupils at SDN 02 Babadan. The theoretical benefits of this study are that it helps to develop the theory of Physical Education and Health (PJOK) learning for the



forward roll floor exercise. It also adds to the scientific literature on the effectiveness of using inclined mats to improve pupils' motor skills. Furthermore, it provides a foundation for further research seeking to examine similar learning media or methods using an experimental approach. The practical benefits of this research are as follows: for students, this research boosts their confidence, helps them master the forward roll movement, and improves their learning outcomes. For PE teachers, this research provides an effective alternative teaching aid, offers data on the impact of inclined mats, and enriches the range of teaching methods. Meanwhile, for the school, this research supports the improvement of PE teaching quality and can serve as a guideline for providing safe and effective facilities for floor gymnastics.

METHODOLOGY

This study employs a quantitative approach using a quasi-experimental method and a one-group pretest-posttest design, which was chosen to measure the extent of change in pupils' learning outcomes following the implementation of an inclined plane mat in primary schools. In this design, a single experimental group was given a pre-test, then received the treatment, and finally underwent a post-test without involving a control group; the pre-test and post-test results were compared to determine any improvement or change that had occurred. A similar approach was previously used in a study on the effectiveness of inclined planes in the floor gymnastics subject for the forward roll movement of pupils at SDN 93 Kota Jambi using blended learning (Yulio Syahdan Siregar & Widowati, 2022). The population of this study consisted of all 17 Year 5 pupils at SDN 02 Babadan; this cohort was selected because pupils at this level possess sufficient foundational skills to comprehend the material being assessed. The sample was selected using a saturated sampling technique, whereby the entire population was included as the sample, thereby enabling a more accurate representation of the population's characteristics.

The data analysis techniques in this study were conducted in several stages, including validity and reliability tests to determine the suitability of the research instruments, descriptive analysis to describe the pretest and posttest results based on the mean, minimum, maximum, and standard deviation, and a normality test using the Shapiro–Wilk test to determine the data distribution. Next, hypothesis testing was conducted using a paired-sample t-test to analyze differences in student learning outcomes before and after the implementation of the inclined plane mat as a teaching aid in elementary school instruction.



RESULTS

Descriptive Statistical Analysis

Table 1. Descriptive analysis

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Pretest_Kognitif	17	9	14	11.24	1.348
Posttest_Kognitif	17	10	14	11.82	1.015
Pretest_Afektif	17	39	50	43.88	3.199
Posttest_Afektif	17	40	50	45.53	2.961
Pretest_Psikomotor	17	7	11	8.82	1.074
Posttest_Psikomotor	17	8	11	9.94	.827
Valid N (listwise)	17				

The findings from the descriptive analysis indicate that the average scores for each learning outcome aspect rose. In the cognitive domain, the mean rose from 11.24 to 11.82. In the affective domain, the mean rose from 43.88 to 45.53, while in the psychomotor domain, the mean went up from 8.82 to 9.94. This suggests that the intervention enhanced students' learning results.

Normality Test

Table 2.1. Normality Test

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest_Kognitif	.173	17	.186	.939	17	.309
Posttest_Kognitif	.203	17	.060	.915	17	.123

a. Lilliefors Significance Correction

The results of the normality tests indicate that the data are normally distributed. The significance values for the Kolmogorov-Smirnov and Shapiro-Wilk tests on the cognitive pre-test and post-test data were above 0.05 ($p > 0.05$).



Table 2.2 Normality Test

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest_Afektif	.192	17	.094	.947	17	.404
Posttest_Afektif	.168	17	.200*	.942	17	.338

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the Shapiro-Wilk test of normality for the affective aspect, this test was used to assess the normality of the data for the affective aspect. The results of the analysis showed that the Kolmogorov-Smirnov p-value was 0.094 and the Shapiro-Wilk p-value was 0.404. It can therefore be concluded that the data are normally distributed.

Table 2.3 Normality Test

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest_Psikomotor	.249	17	.006	.897	17	.061
Posttest_Psikomotor	.293	17	.000	.850	17	.011

a. Lilliefors Significance Correction

In the psychomotor pre-test data, the Shapiro-Wilk significance value of 0.061 (> 0.05) indicates a normal distribution, but in the psychomotor post-test data, the significance value of 0.011 (< 0.05) indicates a non-normal distribution. It can therefore be concluded that, overall, the psychomotor data do not follow a normal distribution.

Paired t-test

Table 3. Paired test

Paired Samples Test						
Paired Differences						
95% Confidence						
	Std. Error	Interval of the				Sig.
Mean	Deviation	Lower	Upper	t	df	(2-tailed)



Pair 1	Pretest_Kognitif - Posttest_Kognitif	-.588	1.543	.374	-1.382	.205	-1.571	16	.136
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In the cognitive section, the results of the paired t-test showed a mean difference of -0.588 between the pre-test and post-test, with a standard deviation of 1.543 and a standard error of the mean of 0.374. The 95% confidence interval lies between -1.382 and 0.205.

The results of the study indicate that there is no significant difference between the pre-test and post-test scores in terms of intelligence, with a calculated t-value of -1.571, 16 degrees of freedom (df) and a two-tailed significance value of 0.136. This significance value is greater than 0.05 ($p > 0.05$).

Table 3.2 Paired Test

		Paired Samples Test							
		Paired Differences							
		Std. Mean Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2- tailed)	
				Lower	Upper				
Pair 1	Pretest_Afektif - Posttest_Afektif	-1.647	2.499	.606	-2.932	-.362	-2.718	16	.015

The results of the paired t-test for the affective aspect showed a mean difference of -1.647 between the pre-test and post-test, with a standard deviation of 2.499 and a standard error of the mean of 0.606. The 95% confidence interval was -2.932 to 0.362.

According to the research results, the calculated t-value was -2.718 with 16 degrees of freedom (df) and a significance level (Sig. 2-tailed) of 0.015, indicating that there is a significant difference between the pre-test and post-test scores in terms of the affective aspect.

Wilcoxon Signed-Rank Test

Tabke 4. Wilcoxon Test

		Ranks		
		N	Mean Rank	Sum of Ranks
Posttest_Psikomotor -	Negative Ranks	1 ^a	4.00	4.00
Pretest_Psikomotor	Positive Ranks	13 ^b	7.77	101.00
		Ties	3 ^c	
		Total	17	

a. Posttest_Psikomotor < Pretest_Psikomotor



b. Posttest_Psikomotor > Pretest_Psikomotor

c. Posttest_Psikomotor = Pretest_Psikomotor

The results of the Wilcoxon Signed Ranks Test on psychomotor skills showed that 13 pupils achieved an improvement in their scores (positive rank), one pupil achieved a decline in their scores (negative rank), and three pupils showed no change. The mean rank was 7.77 with a total of 101.00 ranks, whilst the mean rank was 4.00 with a total of 4.00 ranks.

Table 4. Statitics test

Test Statistics ^a	
	Posttest_Psikomotor - Pretest_Psikomotor
Z	-3.132 ^b
Asymp. Sig. (2-tailed)	.002
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

There is a significant difference between the pre-test and post-test scores for the psychomotor aspect, according to the results of the Wilcoxon Signed Ranks test. The Z-score was -3.132 and the significance value (Asymptotic Sig. 2-tailed) was 0.002, with a significance level of less than 0.05 ($p < 0.05$).

These findings show that the educational intervention significantly enhanced students' psychomotor learning results. Additionally, the negative Z-score shows that the post-test scores exceeded the pre-test scores, implying that students' motor skills enhanced after the intervention.

DISCUSSION

Based on the results of the data analysis, the use of the inclined mat medium had different effects on each domain of learning outcomes for fifth-grade students at SDN 02 Babadan. In the cognitive domain, there was an increase in the average score from 11.24 to 11.82; however, this increase did not reach statistical significance. This finding indicates that the use of the inclined mat medium is more oriented toward the development of practical skills than toward strengthening students' conceptual abilities. Theoretically, cognitive learning is influenced not only by the use of media but also by the process of knowledge construction through critical thinking, problem-solving, and continuous concept reinforcement. Therefore, the use of practical media without being balanced by in-depth material elaboration strategies results in suboptimal improvement in the cognitive



domain.

This finding is consistent with the research by (Yulio Syahdan Siregar & Widowati, 2022), who also found that improvements in cognitive aspects tended to be insignificant because the inclined mat medium is designed more to facilitate motor skills rather than the transfer of theoretical knowledge. In the affective domain, the mean score increased from 43.88 to 45.53 with a significance value of 0.015 ($p < 0.05$), indicating a significant difference. This supports the statement by (Rejeki & Gunawan, 2021) that teachers need to be creative and varied in their teaching to attract students' interest, and is in line with (Sutoro & Nurhidayah, 2023) that the success of the intervention is influenced by the use of the inclined plane medium.

In the psychomotor domain, the mean score increased from 8.82 to 9.94. The results of the Wilcoxon test showed a Z-score of -3.132 with a significance level of 0.002 ($p < 0.05$), indicating a significant difference. A total of 13 pupils showed an improvement, 1 pupil showed a decline, and 3 pupils remained unchanged. These findings reinforce the research by (Fatkhurohman, 2022), which states that an inclined mat can improve learning outcomes for forward rolls, as well as the research by (Nurulita et al., 2024) that an inclined surface helps overcome pupils' difficulties when rolling on a flat mat. These results also support Thorndike's Behaviourist theory, in which the inclined mat functions as a stimulus that helps students produce more accurate motor responses through repeated practice.

Overall, the combined results from the three domains of learning outcomes indicate that the use of inclined mat media has a positive effect on improving student learning outcomes. Although the improvement in the cognitive domain was not statistically significant, the significant improvements in the affective and psychomotor domains suggest that inclined mat media are effective in creating a more active and engaging learning experience that supports students' mastery of motor skills. Thus, the use of inclined mat media not only contributes to the improvement of motor skills but also fosters students' emotional engagement and motivation in Physical Education and Health (PJOK) learning, thereby comprehensively enhancing the quality of student learning outcomes.

Although this study indicates a positive effect of using an inclined mat on student learning outcomes, it still has several limitations. The relatively small sample size means that the study's findings cannot yet be widely generalized. Furthermore, the use of a one-group pretest-posttest design without a control group means that the effects of the treatment cannot yet be compared more objectively with conventional learning. The limited duration of the treatment also means that improvements in the cognitive domain may not have developed optimally, as conceptual understanding requires a longer and more continuous learning process.



CONCLUSION

The findings of this study indicate that the use of an inclined mat medium contributes positively to improving pupils' learning outcomes in forward roll learning, particularly in the affective and psychomotor domains. The medium proved effective in enhancing pupils' confidence, participation, motivation, and movement skills during the learning process, as it enabled pupils to perform forward rolls more safely and comfortably. However, the improvement observed in the cognitive domain was not statistically significant, suggesting that the use of practical learning media alone is insufficient to optimally develop pupils' conceptual understanding without the support of more comprehensive theoretical reinforcement. Overall, the inclined mat medium can be regarded as an effective and innovative instructional medium for supporting physical education learning at the primary school level, especially in enhancing pupils' motor skills and learning engagement.

Based on these findings, teachers are encouraged to utilize varied and innovative learning media in gymnastics instruction in order to create a more active, enjoyable, and student-centred learning environment. In addition, teachers are advised to integrate practical activities with conceptual explanations to support cognitive achievement alongside psychomotor development. Furthermore, future researchers are recommended to conduct studies involving larger sample sizes, the inclusion of control groups, and longer treatment durations to obtain more comprehensive findings and strengthen the generalizability of the research results.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this research.

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