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Development of Modified Circuit Training in Basketball Learning to Improve Basic Technical Skills and Student Learning Motivation at SMKN 1 Sikur

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Abstract: Basketball is one of the popular sports taught in physical education because it develops students' motor skills, coordination, cooperation, discipline, and motivation to participate in learning. However, the implementation of basketball instruction at SMKN 1 Sikur is still constrained by students' low mastery of basic techniques and limited learning motivation. These conditions are related to limited facilities, a large number of students in each class, and the continued use of conventional teaching methods. A circuit-based approach may provide varied and active practice stations that accommodate large classes and optimize the use of available facilities. This study aimed to develop a modified circuit training-based basketball learning model and determine its feasibility and effectiveness in improving students' basic basketball skills and learning motivation. This research used a research and development method based on the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation. The participants were 36 tenth-grade students of the Visual Communication Design program at SMKN 1 Sikur. Data were collected using material-expert and field-practitioner validation sheets, the AAHPERD Basketball Skill Test covering dribbling, passing, and shooting, and a Likert-scale questionnaire measuring learning motivation. The data were analyzed using a paired-samples t-test with a significance level of $\alpha = 0.05$. The results showed that the developed model was categorized as "Very Feasible," receiving scores of 88.5% from material experts and 91.2% from field practitioners. Students' average basic basketball skill score increased from 54.30 in the pretest to 78.65 in the posttest, with a statistically significant difference ($p < 0.05$). Learning motivation also increased from 58% ("Sufficient") to 85% ("Very High"). Therefore, the modified circuit training-based basketball learning model is feasible and effective for improving basic basketball skills and learning motivation in vocational high school physical education.

Keywords: Basic technical skills, Basketball learning, Learning motivation, Modified circuit training, Physical Education.

INTRODUCTION

Physical education is a crucial component of the education system, contributing to the improvement of human resource quality through physical activity. In addition to maintaining physical fitness, sports also serve as a means to develop motor skills, thinking, and social skills, as well as to shape students' character. Physical education, sports, and health are crucial components of the educational process, utilizing physical activity as a learning medium. Through this learning, students are expected to develop creativity, innovation, and motor skills that support the effective implementation of physical activity (Candra & Wahyudi, 2020; Pranata, 2023). Therefore, sports instruction in schools is not only directed at improving physical abilities but also at the balanced development of cognitive, affective, and psychomotor aspects, enabling students to adopt an active and healthy lifestyle in their daily lives.

As an implementation of sports education in schools, Physical Education, Sports, and Health (PJOK) is an integral part of the education system that plays a role in developing physical abilities, motor skills, cognitive and affective aspects, and the character of students as a whole. Physical education is a learning process designed to improve fitness, develop motor skills, knowledge of active living, and sportsmanship through physical activities (Prasetyo & Sukarmin, 2017).

Therefore, PJOK learning is not only oriented towards improving physical fitness but also aims to form attitudes of discipline, cooperation, responsibility, sportsmanship, and problem-solving skills through physical activities. To achieve these goals, PJOK learning must be able to provide an active, enjoyable, and student-centered learning experience so that every student has the same opportunity to move, practice, and develop their skills.

One of the main subjects in Physical Education (PJOK) learning in vocational high schools (SMK) is basketball. This game requires mastery of basic technical skills, such as dribbling, passing, and shooting, combined with coordination, agility, speed, and cooperation between players. Basketball requires each player to master and apply basic techniques effectively throughout the game, both in efforts to score points against the opponent's hoop and to defend the defensive area so that the opponent does not score (Perdima, 2017). Mastery of basic techniques is the main foundation in basketball because it determines the success of students in implementing game strategies and increases self-confidence during learning. A person's basic techniques are an important initial capital to know in the learning process (Malik & Rubiana, 2019). Basketball playing skills will be achieved if students master effective and efficient basic techniques (Selan et al., 2023). he effectiveness and efficiency of movements in basketball are largely determined by the level of mastery of basic skills possessed by the players (Gunawan, 2019). On the other hand, learning basketball in physical education, sports, and health contributes to the development of motor skills and the formation of students' character (Hasyim et al., 2025). However, basketball instruction in schools still faces various obstacles, preventing optimal achievement of learning objectives. The learning process is generally dominated by demonstrations and alternating practice, resulting in most students spending more time waiting for their turn than engaging in physical activity. Ineffective training and unengaging training methods can hinder mastery of basic basketball techniques (Wati et al., 2018). This situation results in limited active learning time, limited repetition of movements, and less than optimal opportunities for students to develop their basketball skills.

This problem was also found at SMKN 1 Sikur based on initial observations and interviews with physical education teachers. Basketball learning is still hampered by limited facilities and infrastructure, particularly the number of basketballs that is not proportional to the number of students in one class, which ranges from 32 to 36. Furthermore, sharing the court with other classes limits students' mobility. These learning conditions also affect student motivation. Long waits for their turn cause students to lose focus, feel bored, and become less enthusiastic about participating in learning. In fact, some students consider basketball a difficult subject and can only be mastered by students with better athletic abilities or who participate in extracurricular activities. However, learning motivation is a crucial factor in determining the success of the learning process. The decline in student interest and enthusiasm for basketball is due to the lack of interest and the difficulty of students in performing basic techniques (Dermawansyah, 2023). Student motivation is reflected in the desire to succeed, willingness to learn, readiness to face challenges, and enthusiasm for learning, as well as independence and responsibility in completing learning tasks. Basketball learning not only aims to develop technical skills but also fosters the ability to work together, develop game strategies, and improve students' physical and mental resilience. However, in practice, students are still found to have low enthusiasm and motivation to learn, resulting in suboptimal engagement in the learning process (Huda et al., 2025). Student learning motivation is measured through five indicators: the desire to succeed, willingness to learn, readiness to face challenges, enthusiasm for learning, and independence and responsibility in learning (Fadlan, 2019). Low learning motivation will impact decreased active student participation, resulting in less than optimal learning outcomes. Therefore, innovation and modification of the game are needed because students often get bored quickly (Synthiawati & Hendrawan, 2025).

Various previous studies have shown that learning modifications can improve student activity and learning outcomes. The use of learning models that emphasize group activities, games, and circuit training has been shown to increase student engagement during Physical Education (PJOK) lessons. Circuit training has also been widely used to improve physical fitness and motor skills through a system of alternating training stations. The implementation of circuit training not only increases VO_2max and aerobic capacity but is also effective in developing students' basketball skills (Azmi, 2024). The

implementation of circuit training contributes to the development of various components of students' motor skills, including balance, flexibility, speed, agility, endurance, and movement coordination required in sports activities (Ahmad & Saputra, 2024). However, most of this research still focuses on improving physical fitness or skills in specific sports. Research that specifically develops circuit training in basketball learning, taking into account limited school facilities, the characteristics of vocational high school students, and simultaneously measuring improvements in basic technical skills and learning motivation, is still relatively limited.

Based on these problems, a learning innovation is needed that can increase student engagement despite limited facilities and infrastructure. One alternative that can be developed is modified circuit training, a learning model that organizes students into several training stations with variations in dribbling, passing, and shooting activities that are adjusted to the number of equipment, field conditions, and student characteristics. Through this model, it is hoped that students will have more opportunities to practice, waiting time can be minimized, and the learning atmosphere will be more active and enjoyable, so as to improve basic technical skills as well as student learning motivation. Therefore, this study aims to develop modified circuit training in basketball learning to improve basic technical skills and student learning motivation at SMKN 1 Sikur.

METODE

This study employed a research and development design guided by the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation. The use of ADDIE in recent physical education and basketball research has been reported as an organized framework for developing, validating, implementing, and evaluating learning programs (Li & Cheong, 2023). The effectiveness of the developed model was evaluated using a one-group pretest–posttest design, which has also been applied in recent basketball training research (Sun & Khamcharoen, 2025).

The research was conducted at SMKN 1 Sikur, East Lombok Regency, during the odd semester of the 2026/2027 academic year. The population consisted of Grade X students enrolled in Physical Education at SMKN 1 Sikur. The sample consisted of 36 Grade X students from the Visual Communication Design program. The participants were selected using purposive sampling based on the recommendation of the Physical Education teacher, considering the students' heterogeneous basketball skill levels and relatively low learning motivation.

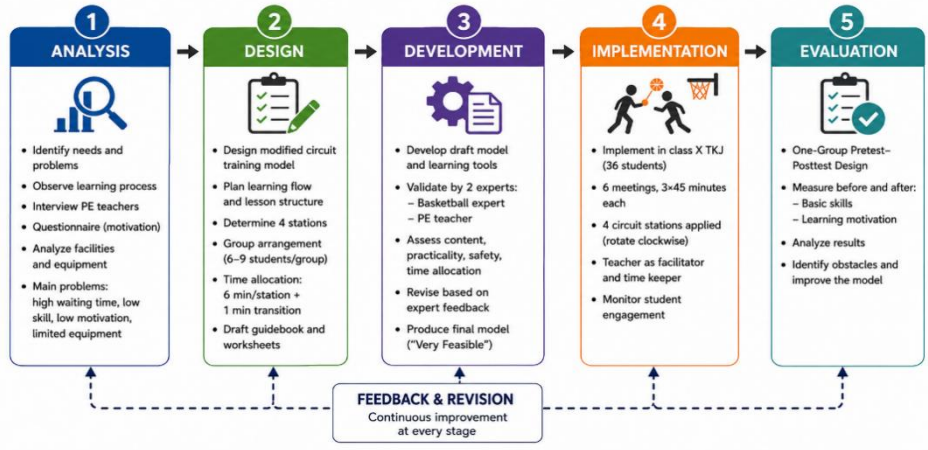

Figure 1. ADDIE Research Design

The research procedure followed the five stages of the ADDIE model. During the analysis stage, preliminary data were collected through classroom observation, interviews with the Physical Education teacher, distribution of a learning motivation questionnaire, and analysis of the available facilities and infrastructure. During the design stage, a modified circuit training-based basketball learning model was designed according to the identified learning needs. The design included learning objectives, training stations, activity sequences, and assessment procedures. During the development stage, the design was developed into a learning guidebook and supporting learning materials. The product was validated by two validators, namely a lecturer

specializing in basketball learning and a Physical Education teacher, and was revised according to their suggestions. During the implementation stage, the revised learning model was applied in six basketball learning sessions using four training stations that integrated dribbling, passing, and shooting skills. During the evaluation stage, students completed a pretest before the intervention and a posttest after the six learning sessions to measure changes in basic basketball skills and learning motivation.

Data were collected using expert validation sheets, the AAHPERD Basketball Skill Test, and a learning motivation questionnaire. The AAHPERD test was used to measure control dribbling, passing, and speed-spot shooting skills. Although the original AAHPERD manual remains the primary source for the test protocol, recent basketball research has continued to use AAHPERD passing and shooting tests to assess basketball-specific technical skills. The learning motivation questionnaire was developed based on Keller's ARCS model, consisting of Attention, Relevance, Confidence, and Satisfaction. Recent reviews confirm that these four dimensions remain widely used in contemporary educational research.

The validation data were analyzed descriptively using the percentage of feasibility, calculated by dividing the obtained score by the maximum score and multiplying the result by 100%. The resulting percentage was interpreted according to the predetermined feasibility criteria. Learning motivation scores were converted into percentages and classified according to the established motivation categories. Descriptive statistics were used to determine the mean pretest and posttest scores. The normality of the difference scores was examined using the Kolmogorov–Smirnov test. Since the pretest and posttest scores were obtained from the same participants, a paired-samples t-test was used to determine whether there was a significant difference following the intervention. The significance level was set at $\alpha=0.05$, and all analyses were conducted using IBM SPSS Statistics version 25.

FINDINGS AND DISCUSSION

The modified circuit training developed for basketball instruction at SMKN 1 Sikur is designed in the form of several training stations that focus on mastering basic basketball technical skills, such as dribbling, by utilizing cones as a medium to regulate the trajectory and level of movement difficulty. Each student takes turns practicing at each station according to a predetermined sequence, while the teacher provides direct direction, demonstrations, and feedback to ensure the accuracy of the technique.

Figure 2. Implementation of the Modified Circuit Training Model in Basketball Learning

The implementation of a modified circuit training model creates a more active, structured, and student-centered learning environment. The variety of activities at each station provides all students with the opportunity to practice repeatedly (repetitions) with relatively even intensity, thus supporting the improvement of basic basketball technical skills. Furthermore, learning packaged in a circuit format can increase student engagement, foster enthusiasm, and reduce boredom during the training process. These conditions indicate that the developed model not only has the potential to improve mastery of basic basketball techniques but also can increase student learning motivation through a more engaging, challenging, and collaborative learning experience in accordance with the objectives of the research development.

Findings

As part of the development process, content validation was conducted to ensure that the modified circuit training model for basketball learning developed had appropriate content, adequate scientific basis, and was suitable for implementation to improve basic technical skills and student learning motivation at SMKN 1 Sikur. A summary of the validators' assessment results is presented in Table 1.

Table 1. Validation Results

No	Validator	Assessment Indicators	Percentage Score (%)	Assessment Categories
1	Learning Materials Expert (Higher Education Academic)	Correctness of the Biomechanics of Movement Concept	87.00%	Valid
		Suitability of Adolescent Motor Workload	90.00%	Valid
2	Field Practitioner (Senior School Physical Education Teacher)	Level of Practicality of Equipment Modifications	92.00%	Valid
		Student Safety Factor	90.40%	Valid
Average Percentage Total			89.85%	Valid

Based on Table 1, the validation results indicate that the modified circuit training-based basketball learning model received excellent ratings from both validators. The assessment by subject matter experts indicated that the biomechanics of movement concept was 87.00% accurate, while the appropriateness of the adolescent motor workload was 90.00%. Both aspects fall into the "very feasible" category, indicating that the developed model aligns with the principles of movement learning and the developmental characteristics of students.

Meanwhile, the assessment by field practitioners showed that the practicality of the equipment modifications achieved the highest rating, at 92.00%, while the student safety factor received 90.40%. Both aspects also fell into the "very feasible" category, indicating that the model is easy to implement in learning and safe for students to use. Overall, the validation results from both validators yielded an average rating of 89.85%, categorized as "very feasible." These results indicate that the modified circuit training model developed meets the requirements of content feasibility, material suitability, practicality, and safety, making it suitable for implementation in the learning trial phase at SMKN 1 Sikur.

As an absolute prerequisite before testing the hypothesis using the parametric paired sample t-test, a normality test was conducted for the distribution of pre-test and post-test data for the basic technical skills and learning motivation variables using the Kolmogorov-Smirnov algorithm. A summary of the prerequisite test results is summarized in Table 2.

Table 2. Results of the Kolmogorov-Smirnov Normality Test

Research Variables	Data Group	Sig. (p-value)	Conclusion
Basic Basketball Technical Skills	Pretest	0.210	Normally Distributed
	Posttest	0.185	Normally Distributed
Learning Motivation	Pretest	0.200	Normally Distributed
	Posttest	0.200	Normally Distributed

Based on Table 2, the results of the normality test using the Kolmogorov–Smirnov method indicate that all research data are normally distributed. For the basic technical skills variable, the significance value of the pre-test data is 0.210, and the post-test is 0.185, while for the learning motivation variable, the significance value of the pre-test and post-test is 0.200 each. All significance values are greater than the 0.05 significance level ($p > 0.05$), so the data is declared to meet the assumption of normality. With the fulfillment of this assumption, parametric statistical analysis using the paired sample t-test can be conducted to examine the differences in results before and after the application of the modified circuit training model in basketball learning. To empirically prove whether the modified circuit model intervention can provide meaningful changes in motor skills in Class X Visual Communication Design and Graphic Engineering students at SMKN 1 Sikur, a comparison of the average values of physical performance was conducted. The paired t-test hypothesis testing data is presented in Table 3.

Table 3. Results of Paired Sample t-Test Analysis on Basic Basketball Technical Skills

Evalution Stage	Mean Value	Standard Deviation	Mean Difference	t-count	Sig. (2-tailed)
Pretest	54.30	6.42	24.35	-11.564	0.000
Posttest	78.65	4.18			

Based on Table 3, the results of the paired sample t-test analysis indicate an increase in basic basketball technical skills after the implementation of the modified circuit training model. The average score for basic technical skills increased from 54.30 in the pre-test to 78.65 in the post-test, with a mean difference of 24.35 points. The statistical test results obtained a t-test value of -11.564 with a significance value (Sig. 2-tailed) of 0.000 ($p < 0.05$). These results indicate a significant difference between the pre-test and post-test scores, thus concluding that the implementation of the modified circuit training model is effective in improving students' basic basketball technical skills at SMKN 1 Sikur. Furthermore, the decrease in the standard deviation value from 6.42 in the pre-test to 4.18 in the post-test indicates that students' abilities after participating in the learning process have become more evenly distributed compared to before the model was implemented. In addition to measuring improvements in basic technical skills, this study also evaluated changes in students' learning motivation after implementing a modified circuit training-based basketball learning model. Motivation was measured using a Likert-scale questionnaire administered before (pre-test) and after (post-test) the learning model implementation. The measurement results were then analyzed based on percentage scores and classified into learning motivation level categories to determine changes that occurred after the treatment. The results of the student learning motivation measurement are presented in Table 4.

Table 4. Increasing Student Learning Motivation

Motivation Category	Questionnaire Score Range	Pretest Frequency	Pretest Percentage (%)	Posttest Frequency	Posttest Percentage (%)
Very High	$X \geq 100$	2	5.50	22	61.10
High	$80 \leq X < 100$	6	16.70	11	30.60
Fair	$60 \leq X < 80$	21	58.30	3	8.30
Low	$40 \leq X < 60$	7	19.40	0	0.00
Very Low	$X < 40$	0	0.00	0	0.00
Total Group		36 Student	100	36 Student	100

Based on Table 4, the analysis of learning motivation shows a significant increase after implementing the modified circuit training-based basketball learning model. During the pre-test, the majority of students were in the "fair" category (21 students (58.30%)), followed by 7 students in the "low" category (19.40%), 6 students in the "high" category (16.70%), and only 2 students in the "very high" category (5.50%). There were no students in the "very low" category.

After implementing the learning model, the distribution of learning motivation experienced a significant change. The number of students in the "very high" category increased from 2 students (5.50%) to 22 students (61.10%), while the "high" category increased from 6 students (16.70%) to 11 students (30.60%). Conversely, the number of students in the "fair" category decreased significantly from 21 students (58.30%) to 3 students (8.30%), while the "low" and "very low" categories were no longer found in the post-test results.

These distribution changes indicate that the implementation of modified circuit training significantly increased student learning motivation. The majority of students who were initially in the moderate and low motivation categories shifted to the high and very high motivation categories after participating in the training. These results indicate that the developed model successfully created a more active, engaging, and challenging learning environment, thereby increasing student enthusiasm, participation, and engagement during basketball lessons at SMKN 1 Sikur.

Discussion

The results of the study showed that the modified circuit training program effectively improved students' basic basketball technical skills and learning motivation at SMKN 1 Sikur. This improvement demonstrates that the developed learning model is able to address the challenges faced in basketball learning, which has been dominated by classical methods with long waiting times, limiting students' opportunities for practice. By dividing students into small groups and rotating each training station, each student

receives more practice opportunities, increasing the intensity of physical activity and the frequency of movement repetitions. This aligns with the concept of Academic Learning Time in Physical Education (ALT-PE), which explains that the more active student learning time, the greater the likelihood of achieving learning objectives.

Improvement in basic technical skills is also influenced by the characteristics of modified circuit training, which provides repetitive practice in dribbling, passing, and shooting. Structured repetition of movements allows students to gain more motor experience, thereby gradually developing coordination and technical accuracy. These findings support the motor learning theory proposed by Schmidt & Wrisberg (2018), which states that motor skills develop through repeated, consistent practice accompanied by appropriate feedback. Thus, modified circuit training not only increases the quantity of learning activities but also the quality of the training students receives.

In addition to improving basic technical skills, the developed model also increased student motivation to learn. This was due to the learning process being designed to be more varied, involving small group activities, and incorporating elements of challenges and games at each training station. A more active and collaborative learning environment empowered students to be more confident in attempting each movement without fear of error. Small-group learning also provided opportunities for students to help each other, discuss, and provide feedback, creating a more conducive learning environment that supported the involvement of all students.

This increase in learning motivation was further evident through the implementation of game elements (gamification) in several training activities. The presence of challenges, a point system, and intergroup collaboration encouraged students to actively participate during the learning process. These activities reduced the boredom that often arises from repetitive technical training and increased student attention, self-confidence, satisfaction, and engagement in the learning process. These results align with research by Dermawansyah (2023), who found that modifying basketball learning through the application of modified circuit training can create a more engaging, enjoyable, and less monotonous learning environment, thereby increasing student enthusiasm for learning.

Circuit training can enhance learning activities and sports skills. Modifying basic movement games with a circuit training approach significantly improves children's gross motor skills. Modifying basic movement games with a circuit training approach creates a challenging and enjoyable learning environment for performing movement tasks (Mashuri et al., 2022). However, this study provides a new contribution through the development of modified circuit training exercises tailored to the characteristics of basketball learning in vocational schools, particularly in conditions of limited facilities and infrastructure. These modifications are not only oriented towards improving basic technical skills but are also designed to increase student learning motivation through more varied, collaborative, and enjoyable activities. Thus, the developed product has practical value as an alternative physical education (PJOK) learning model that can be effectively implemented in schools with large student populations and limited sports facilities.

CONCLUSION

Based on the results of the development research that has been conducted, it can be concluded that the modified circuit training in basketball learning that was developed has a very high level of feasibility based on the results of expert validation with an average percentage of 89.85%, so it is declared feasible, practical, and can be applied in PJOK learning in vocational schools. The results of the effectiveness test also show that the developed model is able to improve students' basic basketball technical skills, which include dribbling, passing, and shooting. This increase is proven through the results of the Paired Sample t-test which shows a significance value of 0.000 (<0.05), so there is a significant difference between students' abilities before and after the implementation of the model. In addition, the implementation of modified circuit training has also been shown to increase student learning motivation, as shown by an increase in the motivation index from 58% to 85%. This increase occurs because the learning model provides more practice opportunities, reduces waiting time, and creates a more active, collaborative, and student-centered learning atmosphere. Thus, modified circuit training can be used as an alternative effective basketball learning model to improve basic technical skills as well as student learning motivation at SMKN 1 Sikur.

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