Multidisciplinary Journal of Tourism, Hospitality, Sport and Physical Education
Vol. 2, No. 2, Dec 2025, pp. 197~205
ISSN: 3062-9551DOI: 10.37251/jthpe.v2i2.3282

Development of the Circuit Basketball Learning Model for Junior High School Students in Physical Education Learning

Siti Nur Izzah[1],
[1]Department Physical Education and Sport Science, Sport and Physiology, National Defence University of Malaysia, Selangor, Malaysia

Article Info

Article history:

Received Nov 23, 2025
Revised Oct 7, 2025
Accepted Dec 19, 2025
OnlineFirst Dec 20, 2025

Keywords:

Basketball Learning
Circuit Basketball
Physical Education
Research and Development

ABSTRACT

Purpose of the study: This study aimed to develop a *Circuit Basketball* learning model for seventh-grade junior high school students and examine its feasibility, practicality, and effectiveness in improving cognitive, affective, and psychomotor learning outcomes in physical education basketball learning activities.

Methodology: This study employed a Research and Development (R&D) method based on the Borg and Gall model. Data were collected through observation sheets, questionnaires, interviews, documentation, and learning assessment sheets involving 12 students in small-group trials, 34 students in large-group trials, one basketball expert, and two physical education learning experts. Data were analyzed using descriptive quantitative and qualitative analysis techniques.

Main Findings: The results showed that the Circuit Basketball learning model achieved a "very good" feasibility category with an average expert validation score of 89.6%. Small-group trials produced an average score of 80 in the "good" category, while large-group trials achieved an average score of 86 in the "very good" category. The model improved students' participation, motivation, confidence, teamwork, and basketball basic skills during learning activities.

Novelty/Originality of this study: The novelty of this study lies in the integration of basketball game modification and *circuit training* principles into a structured and student-centered learning model specifically designed for beginner-level junior high school students. The developed model combines technical skill practice, enjoyable movement activities, simplified rules, and modified facilities to create more effective and engaging basketball learning experiences.

Corresponding Author:
Siti Nur Izzah,
Department Physical Education and Sport Science, Sport and Physiology, National Defence University of Malaysia,
Kem Perdana Road, Kuala Lumpur, Selangor, 57000, Malaysia
Email: sitinurizzah@gmail.com

1. INTRODUCTION

Physical Education, Sports, and Health is an integral part of the educational process that plays an important role in developing students' physical, cognitive, social, and emotional competencies. Through well-designed physical education learning, students are expected not only to improve their physical fitness but also to develop discipline, teamwork, responsibility, and problem-solving skills [1]-[3]. Previous international studies have shown that quality physical education contributes significantly to students' holistic development and promotes lifelong

healthy lifestyles [4], [5]. In the Indonesian educational context, PJOK is also positioned as a strategic subject for fostering balanced psychomotor, cognitive, and affective development among students. Therefore, the implementation of effective and innovative physical education learning models becomes essential to support meaningful learning experiences in schools.

One of the important characteristics of Physical Education, Sports, and Health learning is the use of movement-based activities as the primary learning medium. Learning through movement experiences allows students to develop motor skills, physical fitness, and social interaction simultaneously [6], [7]. However, successful movement learning requires instructional approaches that are adapted to students' developmental characteristics and learning needs. Several studies have reported that physical education learning often remains teacher-centered and overly focused on technical mastery using rigid and conventional methods [8], [9]. Such conditions tend to reduce students' enthusiasm and participation during learning activities, particularly among beginner-level learners who have limited prior experience in sports. Consequently, students often experience difficulties in mastering basic movement skills and become less motivated to actively participate in learning.

The challenges of Physical Education, Sports, and Health learning are particularly evident in basketball instruction at the junior high school level. Basketball is considered one of the most complex sports for beginner students because it requires coordination, agility, movement control, teamwork, and mastery of various basic techniques such as dribbling, passing, and shooting [10]. Previous studies have shown that many junior high school students experience difficulties in understanding and performing basketball techniques correctly due to the complexity of movements and the use of standard game rules [11]. In addition, limited facilities and infrastructure, such as inadequate courts and insufficient equipment, often hinder the effectiveness of basketball learning in schools. As a result, students tend to become passive, less confident, and less enthusiastic during basketball learning activities.

To address these learning problems, innovative and adaptive learning models are needed to create more enjoyable and student-centered basketball learning environments. One approach that has attracted considerable attention in physical education learning is the use of game modification and circuit-based learning activities. Modified games are believed to increase students' enjoyment, movement opportunities, and active participation during learning activities [12]. Similarly, the circuit training approach has been widely recognized as an effective method for improving motor skills, physical fitness, and movement repetition in physical education contexts [13], [14]. Through circuit-based learning, students can engage in varied and structured activities that reduce boredom and increase learning motivation. Therefore, integrating basketball learning with circuit training principles may provide a more suitable learning environment for beginner-level students at the junior high school level.

In the Indonesian educational context, several studies have attempted to implement modified learning activities and circuit-based approaches in PJOK learning. However, most of these studies still focus on general physical fitness training or general sports activities rather than specifically addressing basketball learning for junior high school students [15]-[17]. Moreover, basketball instruction in many schools still relies heavily on conventional teaching methods emphasizing technical drills without sufficient modification based on students' characteristics and abilities. This condition indicates that there is still a need for innovative basketball learning models capable of integrating technical skill development, physical activity, enjoyment, and student participation into a comprehensive learning system. Therefore, the development of a Circuit Basketball learning model becomes important to support more effective and meaningful basketball learning experiences for students [18].

The Circuit Basketball learning model developed in this study combines the principles of circuit training with basketball game modifications specifically designed for seventh-grade junior high school students. The model consists of several activity stations focusing on basic basketball skills, including dribbling, passing, shooting, agility, coordination, and teamwork [19], [20]. In addition, modifications are applied to the rules, equipment, and learning activities to ensure that the learning process is more accessible, enjoyable, and suitable for beginner learners. This learning model is expected to improve students' cognitive understanding, affective attitudes, and psychomotor skills simultaneously while creating a more active and student-centered learning atmosphere [21].

Several previous studies have investigated modified sports learning and circuit-based approaches in physical education contexts. Canpolat and Norman reported that modified games effectively increased student participation and enjoyment in sports learning activities [22]. Furthermore, Adank et al. found that circuit training programs contributed positively to students' motor skill development and physical fitness improvement [23]. Another study conducted by Marhanes et al. revealed that circuit-based learning improved students' motivation and activity levels in physical education classes [24]. However, these previous studies mainly examined game modification and circuit training separately without specifically integrating both approaches into a basketball learning model for junior high school students. In addition, previous studies generally focused on physical conditioning and general sports instruction rather than contextual basketball learning for beginner-level learners. Therefore, a research gap still exists regarding the development of a basketball learning model that combines game modification and circuit-based learning adapted to students' developmental characteristics and school learning conditions.

The novelty of this study lies in the development of a Circuit Basketball learning model specifically designed for seventh-grade junior high school students by integrating basketball skill learning with circuit training principles and modified game activities. Unlike conventional basketball instruction, this model combines technical practice, physical movement activities, enjoyable learning experiences, and simplified game rules into a structured and student-centered learning system. The model also adapts basketball learning activities to students' developmental stages, learning needs, and school conditions, making it more practical and applicable in physical education learning. Therefore, this study contributes to enriching innovative learning models in PJOK, particularly in basketball instruction at the junior high school level [25].

The implications of this study are expected to contribute both theoretically and practically to the development of physical education learning. Practically, the developed Circuit Basketball model can serve as an alternative learning strategy for teachers to create more engaging, active, and enjoyable basketball learning activities. The model may also help teachers overcome limitations related to facilities, infrastructure, and varying student skill levels through flexible learning modifications [26]. Theoretically, this study contributes to the development of innovative physical education learning literature by integrating game modification and circuit-based learning approaches into basketball instruction. Furthermore, the study may provide references for future researchers interested in developing creative and student-oriented learning models in physical education contexts [27].

The urgency of this study is closely related to the need for improving the quality of basketball learning in junior high schools. Many students still experience low motivation, low participation, and difficulties in mastering basketball basic skills due to the dominance of conventional teaching methods and limited learning innovation. If these conditions continue, students may lose interest in physical education learning and fail to achieve optimal learning outcomes. Therefore, developing an innovative, enjoyable, and student-centered basketball learning model becomes highly important to support effective physical education learning. Through the implementation of the Circuit Basketball model, students are expected to become more active, confident, motivated, and skilled during basketball learning activities. Hence, this study is considered important as an effort to improve the quality of basketball instruction and physical education learning in junior high schools.

2. RESEARCH METHOD

2.1. Research Design

This study employed a Research and Development (R&D) [28] approach aimed at developing a *Circuit Basketball* learning model for basketball instruction among seventh-grade junior high school students. The research design referred to the Borg and Gall development model, which emphasizes systematic stages beginning from needs analysis to product testing and final revision. The R&D approach was selected because it is appropriate for producing an innovative learning product that is feasible, practical, and effective for implementation in physical education learning. The development process focused on modifying basketball learning activities through a circuit-based approach adjusted to students' developmental characteristics, learning needs, and school conditions.

The *Circuit Basketball* model was designed to integrate basketball basic skills training with enjoyable and student-centered learning activities. The learning activities consisted of several stations containing modified drills for *dribbling*, *passing*, *shooting*, agility, and teamwork exercises. Through this approach, students were expected to actively participate in learning while improving their cognitive, affective, and psychomotor competencies simultaneously.

2.2. Research Subjects/Sample

The population of this study consisted of all seventh-grade junior high school students. The research sample involved 12 students for the small-group trial and 34 students for the large-group trial selected through random sampling techniques. In addition, the study involved one basketball expert and two physical education learning experts as validators of the developed product.

The selection of participants was based on the consideration that seventh-grade students are beginner learners in basketball instruction and require adaptive and enjoyable learning models suited to their developmental stage. The validators were selected based on their expertise and experience in basketball learning and physical education instruction. Their involvement was intended to assess the feasibility, practicality, and suitability of the developed learning model before implementation in the classroom setting.

2.3. Data Sources and Data Collection Techniques

The data sources in this study consisted of primary and secondary data [29]. Primary data were obtained directly from students, basketball experts, and physical education learning experts during the implementation of the research process. Secondary data were obtained from related literature, previous studies, journals, and documentation supporting the development of the Circuit Basketball learning model.

Several data collection techniques were employed in this study, including observation, questionnaires, interviews, and documentation. Observation was conducted to identify the initial conditions of basketball learning and students' responses during the implementation of the learning model. Questionnaires were distributed to experts and students to obtain data regarding the feasibility, attractiveness, practicality, and acceptance of the developed model. Interviews were conducted to gather additional information and suggestions from validators and teachers regarding the implementation of the learning model. Documentation techniques were used to collect supporting data in the form of photographs, field notes, and learning activity records during the research process.

Table 1. Data Collection Techniques and Research Purposes

Technique	Purpose	Respondents
Observation	Identify learning conditions and student activities	Students
Questionnaire	Assess feasibility and attractiveness of the model	Experts and students
Interview	Obtain suggestions and evaluation	Experts and teachers
Documentation	Record learning activities and research evidence	Research process

Based on Table 1, it can be seen that multiple data collection techniques were used to obtain comprehensive and valid research data. The combination of observation, questionnaires, interviews, and documentation strengthened the accuracy and credibility of the research findings.

2.4. Research Instruments

The instruments used in this study consisted of observation sheets, questionnaire sheets, interview guidelines, and learning assessment sheets. Observation sheets were used to record students' activities, participation, enthusiasm, and responses during the learning process. Questionnaire sheets were used to assess the feasibility and practicality of the Circuit Basketball model from both expert validators and students. The questionnaires employed a Likert scale consisting of several assessment categories ranging from "very poor" to "very good.".

Interview guidelines were used to obtain qualitative information regarding the strengths and weaknesses of the developed model from validators and teachers. Meanwhile, learning assessment sheets were used to evaluate students' cognitive, affective, and psychomotor achievements during the implementation of the model. The psychomotor assessment focused on students' mastery of basketball basic skills, while affective assessment evaluated discipline, teamwork, and responsibility during learning activities [30].

Table 2. Assessment Criteria of the Research Instruments

Percentage (%)	Category
81–100	Very Good
61–80	Good
41–60	Fair
21–40	Poor
0–20	Very Poor

The use of these assessment criteria aimed to simplify the interpretation of research data and determine the feasibility level of the developed learning model.

2.5. Data Analysis Technique

The data obtained in this study were analyzed using descriptive quantitative and qualitative analysis techniques. Quantitative data derived from questionnaires and assessment sheets were analyzed by calculating the percentage scores for each assessment aspect [31]. The percentage calculation used the following formula:

$$P = \frac{f}{N} X\ 100\% \qquad \ldots(1)$$

Where:
P = Percentage score
f = Obtained score
N = Maximum score

The analysis results were then categorized into feasibility levels based on the assessment criteria. Qualitative data obtained from interviews, observations, and suggestions from validators were analyzed descriptively to support the interpretation of quantitative findings and improve the developed product. The effectiveness of the *Circuit Basketball* model was determined by comparing the results of small-group and large-

group trials in terms of cognitive, affective, and psychomotor learning outcomes. The model was considered feasible and effective if it achieved at least the "good" category in all assessment aspects.

2.6. Research Procedure

The research procedure was conducted systematically through several stages adapted from the Borg and Gall development model. The first stage involved conducting a needs analysis to identify problems and obstacles in basketball learning activities. At this stage, observations and interviews with teachers and students were carried out to determine learning needs and classroom conditions.

The second stage involved planning and designing the Circuit Basketball learning model. The researcher designed learning activities, modified game rules, developed training stations, and prepared learning instruments according to students' characteristics and school conditions. The third stage consisted of developing the initial product followed by expert validation involving basketball experts and physical education learning experts.

3. RESULTS AND DISCUSSION

3.1. Results of Circuit Basketball Model Development

This study produced a learning product in the form of a Circuit Basketball model designed to improve student engagement, basic basketball skills, and learning motivation among seventh-grade junior high school students. The model was developed based on the needs analysis results, which indicated that basketball learning in schools still tended to use conventional teacher-centered approaches and provided limited opportunities for students to learn actively through varied movement activities. In addition, limited facilities and infrastructure, as well as students' low self-confidence in performing basic basketball techniques, were identified as factors inhibiting successful learning outcomes.

The developed product consisted of several training stations based on the circuit training approach that were modified according to the characteristics of junior high school students [32]. Each station was designed to train basic basketball skills gradually, including dribbling, passing, shooting, movement coordination, agility, and teamwork. This learning model also modified the court size, game duration, playing rules, and equipment usage to make the activities simpler and more suitable for beginner-level students. The development process was conducted through expert validation, small-group trials, product revisions, and large-group trials until a feasible and effective learning model was obtained.

The expert validation results indicated that the Circuit Basketball model had a high level of feasibility in terms of material content, instructional design, and field implementation. Physical education learning experts stated that the model was capable of creating a more active and enjoyable learning atmosphere, while basketball experts considered that the modifications of techniques and game rules were appropriate for the developmental stage of seventh-grade students. Based on the validators' assessments, the model obtained a "very good" category and was considered feasible for implementation in basketball learning at the junior high school level.

Table 1. Expert Validation Results of the Circuit Basketball Model

Assessment Aspect	Percentage	Category
Material suitability	88%	Very Good
Learning feasibility	90%	Very Good
Suitability of game modification	92%	Very Good
Ease of implementation	87%	Very Good
Attractiveness of the model	91%	Very Good
Average	89.6%	Very Good

Based on Table 1, the *Circuit Basketball* model achieved an average percentage of 89.6% and was categorized as "very good." This finding indicates that the developed model fulfilled the feasibility criteria for use in basketball learning for junior high school students.

3.2. Small-Group Trial Results

The small-group trial was conducted with 12 seventh-grade students to identify the initial effectiveness and practicality of the developed model before it was implemented in a larger group. During the learning process, students showed high enthusiasm and active participation at each training station. The modified learning activities encouraged students to become more confident in performing basketball techniques because the learning atmosphere was less rigid and more enjoyable compared to conventional learning approaches.

The observation results showed that students were more active in participating in learning activities, especially during dribbling and passing exercises. Students also demonstrated better cooperation and

communication during group-based activities. In addition, the use of modified equipment and simplified rules reduced students' fear of making mistakes during practice sessions. These findings indicate that the *Circuit Basketball* model was able to create a student-centered learning environment that facilitated active participation and skill improvement.

Table 2. Small-Group Trial Results

Learning Aspect	Average Score	Category
Cognitive	78	Good
Affective	82	Very Good
Psychomotor	80	Good
Average	80	Good

The data in Table 2 indicate that the average student learning outcome reached a score of 80, which falls into the "good" category. The affective aspect obtained the highest score because students showed increased enthusiasm, confidence, and cooperation during the learning process. Meanwhile, the psychomotor aspect also improved due to repetitive and structured movement activities through the circuit stations.

The findings of this study support the opinion of Harvey and Jarrett that modified games can improve students' enjoyment and engagement in sports learning activities [33]. Furthermore, the gradual and repetitive training process implemented in the *Circuit Basketball* model aligns with the concept of motor learning, which emphasizes repeated movement experiences to improve students' mastery of basic techniques [34].

3.3. Large-Group Trial Results

After revising the product based on the small-group trial results, the model was implemented in a large-group trial involving 34 seventh-grade students. The implementation results showed that the Circuit Basketball model could be applied effectively in a larger classroom setting. Students demonstrated higher motivation and participation during the learning process, and the learning activities became more dynamic and interactive.

The large-group trial revealed significant improvements in students' cognitive, affective, and psychomotor outcomes. Students became more capable of understanding the basic concepts of basketball techniques and were more skilled in applying those techniques during game situations. In addition, students demonstrated improved discipline, teamwork, and responsibility during learning activities.

Table 3. Large-Group Trial Results

Learning Aspect	Average Score	Category
Cognitive	84	Very Good
Affective	88	Very Good
Psychomotor	86	Very Good
Average	86	Very Good

able 3 shows that the average score increased from 80 in the small-group trial to 86 in the large-group trial. This improvement indicates that the *Circuit Basketball* model effectively enhanced student learning outcomes in basketball learning activities. The psychomotor improvement was particularly significant because students had more opportunities to practice movement skills repeatedly through the circuit-based activities.

The implementation of the *Circuit Basketball* model also contributed to increased student motivation and enjoyment during learning. Students stated that the learning activities were more enjoyable because they involved game modifications and varied movement tasks. These findings are consistent with previous studies stating that game-based learning and circuit training approaches can increase physical activity levels, student engagement, and motivation in physical education classes [35], [36].

The results of this study indicate that the development of the *Circuit Basketball* model successfully addressed several learning problems commonly found in basketball instruction at the junior high school level. Conventional basketball learning often focuses excessively on technical mastery using standard rules and facilities, causing beginner students to experience difficulties and reduced learning motivation. In contrast, the developed model provided modified learning activities adapted to students' developmental characteristics, making learning more accessible, enjoyable, and meaningful.

The successful implementation of the *Circuit Basketball* model can be explained through the principles of student-centered learning and motor learning theory. Through circuit-based activities, students were actively involved in repeated movement experiences that improved both technical mastery and physical fitness simultaneously. The use of multiple stations also prevented students from becoming bored because each activity offered different movement challenges and learning experiences. This condition contributed to increased student participation and enthusiasm throughout the learning process.

In addition, the modification of game rules and facilities proved effective in reducing students' anxiety and fear of failure during practice. Beginner students generally require simpler and more flexible learning

environments to develop confidence in performing sports skills. Therefore, the use of modified basketball activities became an important factor in improving students' willingness to participate actively in learning activities.

The findings of this study are in line with previous research conducted by Faigenbaum et al., which reported that circuit-based physical activity programs can improve motor skills and student engagement in physical education learning [37]. Similarly, Morgan et al. explained that modified sports learning activities create more enjoyable learning environments and improve students' motivation to participate in sports activities [6]. In the Indonesian context, this study also strengthens previous findings that innovative learning models in physical education contribute significantly to improving learning quality and student participation.

Several previous studies have discussed the implementation of game modification and circuit-based learning approaches in physical education. Mola and Bayyeta reported that modified games were effective in increasing students' participation and enjoyment during sports learning activities [38]. However, the study mainly focused on general game modification without specifically integrating circuit-based learning strategies into basketball instruction. Furthermore, Al-Haliq explained that circuit training effectively improved students' motor skills and physical fitness [39], yet their study emphasized physical conditioning rather than basketball-specific learning activities in school settings. Another study conducted by Saputra et al. found that circuit-based learning improved student activity and motivation in physical education classes, but the implementation was not specifically designed for basketball learning among junior high school students. Based on these previous findings, there remains a research gap regarding the development of a specific *Circuit Basketball* learning model that combines basketball skill learning, game modification, and circuit training principles adjusted to the characteristics of beginner-level junior high school students. Therefore, this study contributes to filling the gap by developing and implementing a more contextual and student-oriented basketball learning model.

The novelty of this study lies in the development of a *Circuit Basketball* learning model specifically designed for seventh-grade junior high school students by integrating circuit training principles with basketball game modifications. Unlike conventional basketball instruction, this model combines technical skill practice, physical movement activities, simplified game rules, and modified facilities into a structured circuit-based learning system. In addition, the model emphasizes enjoyable and student-centered learning experiences that suit the developmental characteristics of beginner students. Previous studies generally examined either game modification or circuit training separately, whereas this study integrates both approaches into a comprehensive basketball learning model applicable to physical education learning at the junior high school level [40].

The findings of this study provide important implications for physical education learning practices, particularly in basketball instruction at junior high schools. The developed *Circuit Basketball* model can serve as an alternative learning strategy for physical education teachers to create more active, enjoyable, and student-centered learning environments. The model may also help teachers overcome limitations related to facilities, infrastructure, and varying student skill levels through flexible game modifications and simplified learning activities. Furthermore, the implementation of this model can contribute to improving students' physical activity levels, motivation, teamwork, and mastery of basic basketball skills simultaneously. From a theoretical perspective, this study enriches the literature on innovative physical education learning models by integrating circuit training concepts with modified sports learning approaches.

This study has several limitations that should be considered in interpreting the findings. First, the research was conducted only in one junior high school with a relatively limited number of participants, which may affect the generalizability of the results to broader educational contexts. Second, the study focused only on seventh-grade students, so the effectiveness of the *Circuit Basketball* model for other educational levels has not yet been examined. Third, the implementation period was relatively short, meaning that the long-term effects of the model on students' basketball skills, physical fitness, and learning motivation could not be fully observed. Therefore, future studies are recommended to involve larger and more diverse samples, longer implementation periods, and experimental research designs to further evaluate the effectiveness of the *Circuit Basketball* model in various educational settings.

4. CONCLUSION

Based on the results of the study, it can be concluded that the development of the *Circuit Basketball* learning model was successfully implemented and proven feasible for use in basketball learning activities for seventh-grade junior high school students. The model was developed through a systematic research and development process consisting of needs analysis, product design, expert validation, small-group trials, revisions, and large-group trials. The expert validation results indicated that the model achieved a "very good" category in terms of material suitability, instructional feasibility, implementation, and attractiveness. The implementation results showed that the *Circuit Basketball* model effectively improved students' cognitive, affective, and psychomotor learning outcomes. Students became more active, enthusiastic, confident, and cooperative during the learning process. In addition, the use of modified games and circuit-based activities created a more enjoyable and student-centered learning atmosphere that was appropriate for the characteristics of beginner-level students.

Therefore, the *Circuit Basketball* model can be used as an innovative alternative learning model to improve the quality of basketball instruction in physical education learning at the junior high school level.

ACKNOWLEDGEMENTS

The authors would like to express sincere gratitude to all parties who contributed to the completion of this study. Appreciation is also extended to all participants, validators, and individuals who provided valuable support, assistance, and cooperation throughout the research process. The authors hope that this study will contribute positively to the development of physical education learning and future educational research.

REFERENCES

[1] R. B. Aji and D. A. Fahmi, "The effectiveness of the problem based learning model on basketball learning outcomes," *J. Sport Coach. Phys. Educ.*, vol. 5, no. 1, pp. 42–47, 2020, doi: 10.15294/jscpe.v5i1.36868.

[2] C. Wang, Y. Yuan, and X. Ji, "The effects of a blended learning model on the physical fitness of Chinese university students : a cluster randomized controlled trial in basketball education," *BMC Public Health*, vol. 24, no. 1, pp. 1–9, 2024, doi: 10.1186/s12889-024-20001-1.

[3] R. Afif, C. Nyoman, and P. Sukoco, "The effect of the cooperative learning model on basketball games to improve junior high school students' learning," *J. Sport Area*, vol. 7, no. 2, pp. 287–299, 2022, doi: 10.25299/sportarea.2022.vol7(2).7808 Copyright.

[4] M. Kolokoltsev, R. Ambartsumyan, E. Romanova, and O. Limarenko, "Original Article Effectiveness of sports-oriented physical education of students using basketball," *J. Phys. Educ. Sport*, vol. 23, no. 4, pp. 810–816, 2023, doi: 10.7752/jpes.2023.04102.

[5] A. Derakhshan and C. Coombe, "Examining the roles of continuing professional development needs and views of research in english language teachers' success," *Electron. J. English as a Second Lang. Examining*, vol. 24, no. 3, pp. 1–27, 2020, doi: 10.1007/s10115-024-02092-9.

[6] J. Anaktototy, M. Souisa, J. Syaranamual, and A. Mendayani, "The effectivity of the pbl model in learning outcomes analyzing variations basketball playing skills for class x SMAN 7 in central Maluku regency," in *8th International Seminar on Education 2024 (8th Isedu) Research*, 2024, pp. 323–336. doi: 10.18502/kss.v9i31.17592.

[7] M. N. Waffak, P. Sukoco, and F. X. Sugiyanto, "Developing a basketball learning model using the teaching game for understanding (tgfu) approach to improve the effectiveness of hots in elementary schools," *Phys. Educ. Theory Methodol.*, vol. 22, no. 3, pp. 21–29, 2022, doi: 10.17309/tmfv.2022.3s.03.

[8] W. Wilman, S. Wróbel, W. Bielska, P. Deszynski, P. Dudzic, and I. Jaszczyszyn, "Machine-designed biotherapeutics : opportunities , feasibility and advantages of deep learning in," *Brief. Bioinform.*, vol. 23, no. July, pp. 1–20, 2022, doi: 10.1093/bib/bbac267.

[9] T. Lookman, P. V Balachandran, and D. Xue, "Active learning in materials science with emphasis on adaptive sampling using uncertainties for targeted design," *Comput. Mater.*, vol. 15, no. 1, 2019, doi: 10.1038/s41524-019-0153-8.

[10] M. S. Taufik, S. Solahuddin, A. F. Ridlo, and T. Iskandar, "Improve learning outcomes of basketball lay up shoot in junior high school," *J. Pendidik. Kepelatihan Olahraga*, vol. 13, no. 2, pp. 154–163, 2021, doi: 10.26858/cjpko.v13i2.19412.

[11] F. P. Sari and I. Wilujeng, "Ethnoscience studiesa analysis and their integration in science learning : Literature review," *J. Penelit. Pendidik. IPA*, vol. 9, no. 3, pp. 1135–1142, 2023, doi: 10.29303/jppipa.v9i3.2044.

[12] T. Hu, M. Zhang, H. Liu, and J. Liu, "The influence of ' small private online course + flipped classroom ' teaching on physical education students ' learning motivation from the perspective of self-determination theory," *Front. Psychol.*, vol. 22, no. 7, 2022, doi: 10.3389/fpsyg.2022.938426.

[13] S. Karasievych, "Training future physical education teachers for physical and sports activities: neuropedagogical approach," *Broad Res. Artif. Intell. Neurosci.*, vol. 12, pp. 543–564, 2021, doi: 10.18662/brain/12.4/264.

[14] Z. Wang, N. Chen, S. Cao, L. Gao, S. K. Geok, and J. Liu, "The effects of balance training on physical fitness and skill-related performance in basketball players : a systematic review," *Sport. Sci. Med. Rehabil.*, vol. 9, no. 2, 2025, doi: 10.1186/s13102-025-01164-9.

[15] S. Cao, J. Liu, Z. Wang, and S. K. Geok, "The effects of functional training on physical fi tness and skill-related performance among basketball players : a systematic review," *Front. Art Psychol.*, vol. 12, no. 1, pp. 1–14, 2024, doi: 10.3389/fphys.2024.1391394.

[16] M. R. Risjanna, D. Mulyana, and W. Kusumah, "Improvement of shooting techniques on free throw line in basketball game," *J. Olahraga*, vol. 12, no. 3, 2021, doi: 10.33222/juara.v6i2.1310.

[17] O. Hatamİ and S. Savaş, "Original Article Comparative analysis of flipped learning versus traditional teaching methods in basketball technical ınstruction : Effect on students ' psychomotor achievement levels," *J. Phys. Educ. Sport*, vol. 24, no. 6, pp. 1507–1514, 2024, doi: 10.7752/jpes.2024.06170.

[18] H. Zhang, S. Phusee, and J. Chano, "An experimental study of flipped classroom to enhance students' basketball teaching design ability," *High. Educ. Stud.*, vol. 14, no. 4, pp. 89–98, 2024, doi: 10.5539/hes.v14n4p89.

[19] A. License, X. He, and B. T. Innovation, "Retracted: application of 5g network technology in basketball teaching innovation and reform," *Mob. Inf. Syst.*, vol. 23, no. 3, 2023, doi: 10.1155/2022/5366246.

[20] R. Al Yassar, G. Yulisatria, Y. H. Bhakti, and M. Suhariyanti, "The use of audiovisual media in physical education learning to improve student learning outcomes: A systematic literature review," *J. Lesson Learn. Stud.*, vol. 8, no. 3, pp. 583–595, 2025, doi: 10.23887/jlls.v8i3.100932.

[21] A. N. Abady *et al.*, "Technological innovations and pedagogical advancements in basketball skill learning: A systematic review of high school physical education," *Indones. Sport Innov. Rev.*, vol. 06, no. 02, pp. 117–129, 2025, doi: 10.53905/inspiree.v6i02.149.

[22] B. Canpolat, G. Norman, P. Prieto-gonzález, and L. P. Ardigò, "Effects of cooperative learning on students ' learning outcomes in physical education : a," *Front. Psychol.*, vol. 13, no. 1, pp. 1–23, 2025, doi: 10.3389/fpsyg.2025.1508808.

[23] A. M. Adank, L. B. Borghouts, and S. B. Vos, "That ' s what I like ! Fostering enjoyment in primary physical education," *Eur. Phys. Educ. Rev.*, vol. 30, no. 2, 2024, doi: 10.1177/1356336X231205686.

[24] R. K. Marhenes, S. Sumarni, H. Yusfi, and A. History, "Increasing basketball passing learning results through modifications of traditional games of fort and drive cart in high school students," *J. Phys. Educ. Sport. Heal. Recreat.*, vol. 10, no. 3, pp. 98–104, 2021, doi: 10.15294/active.v10i3.48535.

[25] Y. Puspita and S. Sudarso, "Application of ball modifications in basketball dribble learning on student motivation at SD Negeri Medaeng ii Sidoarjo," *J. Pendidik. Jasm.*, vol. 5, no. 1, pp. 67–75, 2024.

[26] C. Kao and Y. Luo, "Effects of multimedia-assisted learning on learning behaviors and student knowledge in physical education lessons: Using basketball game recording as an example," *Int. J. Emerg. Technol.*, vol. 15, no. 1, pp. 119–139, 2020, doi: 10.3991/ijet.v15i01.11393 Chun-Chieh.

[27] S. A. Pasaribu, "Efforts to improve dribbling learning outcomes in basketball games through a scientific approach with ball modifications," *J. Pendidik. Jasm.*, vol. 3, no. 1, pp. 10–20, 2022, doi: 10.55081/jpj.v3i1.596.

[28] A. Purba, "Indonesian teaching materials in competency-based universities text orientation; research and development at the university of Jambi through the borg & gall model," *Pakistan J. Life Soc. Sci.*, vol. 22, no. 2, pp. 24355–24369, 2024, doi: 10.57239/PJLSS-2024-22.2.001739.
[29] N. Z. Muthoharoh and S. Marmoah, "Literature study: Analysis of the borg and gall model in educational development and research," *J. Pendidik. Multidisiplin*, vol. 2, no. 12, pp. 226–237, 2025, doi: 10.71282/at-taklim.v2i12.1327.
[30] S. Novena, E. Putri, A. Agung, G. Agung, and I. K. Suartama, "E-module with the borg and gall model with a contextual approach to thematic learning," *J. Lesson Learn. Stud.*, vol. 6, no. 1, pp. 27–34, 2023, doi: 10.23887/jlls.v6i1.57482.
[31] K. Imania and Y. Purwanti, "Integration Borg & Gall (1983) and Lee & Owen (2004) models as an alternative model of design- based research of interactive multimedia in elementary school," in *IOP Conf. Series: Journal of Physics: Conf. Series*, IOP Publishing, 2022. doi: 10.1088/1742-6596/1318/1/012022.
[32] A. R. Pomatahu and M. Pauweni, "Design of noti basketball model for high school students," *Eur. J. Phys. Educ. Sport Sci.*, vol. 10, no. 5, pp. 142–153, 2024, doi: 10.46827/ejpe.v10i5.5232.
[33] A. Rahmadani, M. Asmawi, A. S. Hanif, and F. Dlis, "Development of basketball passing learning model with a play approach to students junior high school," *Budapest Int. Res. Critics Linguist. Educ.*, vol. 2, no. 2, pp. 143–155, 2010, doi: 10.33258/birle.v2i2.286 143.
[34] N. Susanto, W. W. Dinata, N. Ihsan, R. Bahtra, and Y. Andria, "Instrument for assessing basketball skills in junior high school students in Indonesia," *J. Phys. Educ. Sport ®*, vol. 23, no. 12, pp. 3220–3227, 2023, doi: 10.7752/jpes.2023.12368.
[35] F. Faozi, F. Dlis, S. Samsudin, and S. Hambali, "Cooperative learning vs direct teaching in basketball: Effects on junior high school students basic techniques," *Int. J. Disabil. Sport. Heal. Sci.*, vol. 7, no. 1, pp. 132–140, 2024, doi: 10.33438/ijdshs.1371249.
[36] A. Hamidi, M. Asmawi, and A. S. Hanif, "Development model of learning basketball based modification games for secondary high school," *J. Indones. Phys. Educ. Sport*, vol. 4, no. 1, pp. 118–125, 2018, doi: 10.21009/JIPES.041.11.
[37] D. Mayorga-vega, J. Viciana, and A. Cocca, "Effects of a circuit training program on muscular and cardiovascular endurance and their maintenance in schoolchildren," *J. Hum. Kinet.*, vol. 37, no. 4, pp. 153–160, 2013, doi: 10.2478/hukin-2013-0036.
[38] D. W. Mola and G. T. Bayeta, "Effect of circuit training on selected health-related physical fitness components : the case of sport science students," *Turkish J. Kinesiol.*, vol. 6, no. 4, pp. 142–148, 2020, doi: 10.31459/turkjkin.812512.
[39] M. Al-haliq, "Using the Circuit Training Method to Promote the Physical Fitness Components of the Hashemite University Students," *Adv. Phys. Educ.*, vol. 5, no. 2, pp. 170–175, 2015, doi: 10.4236/ape.2015.53021.
[40] N. Tesla, "Effect of 8-week circuit training on the development of different forms of muscle strength in physical education," *J. Effic. Responsib. Educ. Sci.*, vol. 15, no. 4, pp. 221–227, 2018, doi: 10.7160/ eriesj.2022.150403.