

GAME-BASED LEARNING TO IMPROVE GROSS MOTOR SKILLS AND JOYFUL

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ABSTRACT

The development of game-based learning is expected to be an innovative solution to improve the quality of physical fitness instruction. Observations and preliminary research on phase F vocational high school students majoring in physical fitness (MPLB) indicate that there has been no implementation of game-based sports learning or game-based learning. The results for the speed component of physical fitness obtained showed that 17 students (57%) were categorized as very poor, 5 students (17%) were categorized as poor, and 8 students (26%) were categorized as moderate. The majority of the speed component's physical fitness levels were categorized as very poor. The purpose of this research and development was to develop a design and determine the practicality, feasibility, effectiveness, and validity of innovative and applicable game-based learning for physical fitness. This study was a Research and Development (R&D) study. The research design used was a one-group pre-test post-test design. Data collection techniques included skills tests, activity observations, questionnaires, and interviews. Several research instruments used included: observation instruments, expert validation instruments, student response instruments, character instruments, joyful learning instruments, and gross motor skills instruments. The data obtained will be tested using instrument validity, instrument reliability, and product practicality.

Starting with the revised model process based on expert input, the product was tested at the implementation stage, achieving a practicality rating of 78.30% (Practical), indicating that GBL is easy to use, engaging, and relevant for both students and teachers. The effectiveness test also demonstrated a significant improvement in learning outcomes, indicated by a significance value of $0.000 < 0.05$ and an N-Gain value of 75.45% (Very Effective). Student responses (94.67%) and teacher character validation (3.51%) further reinforce the GBL model's practicality and ability to build good character. The joyful learning assessment achieved an average score of 3.60 (very valid). The average increase in running speed was 0.8 seconds. Thus, game-based learning has been proven valid, feasible, practical, and effective, making it suitable for use as a physical fitness learning model to improve gross motor skills and joyful learning.

KEYWORDS: game-based learning, gross motor skills, joyful learning

INTRODUCTION

Background

Learning is a process carried out by an educator so that students can learn anywhere, anytime, and with any means (Ilyas and Syahid 2018:58-85). Addressing various learning challenges requires a sound learning approach. A learning approach can be defined as a starting point for the learning process, referring to a general perspective on the process, which accommodates, inspires, strengthens, and provides the basis for learning methods with a specific theoretical scope (Festiawan 2020:1-17). Physical education is an integral part of education that plays a vital role in developing students' physical, motor, cognitive, and affective aspects. Physical education and health are essentially educational processes that utilize physical activity and health to produce holistic changes and individual quality, both physically, mentally, and emotionally (Bachtiar 2018:37-53). Physical education is an integral part of education in general, influencing students' cognitive, affective, and psychomotor potential through physical activity (Utama, 2011).

Along with the development of educational innovation, the game-based learning (GBL) approach has emerged as a strategy that integrates games into the learning process. This approach not only emphasizes cognitive aspects but also encourages active student participation through fun, competitive, and collaborative activities. GBL can make learning more exciting and increase student enthusiasm, encouraging students to be more creative (Astuti et al., 2017). Game-based learning offers various benefits. First, games can make learning materials more engaging and interactive. Second, games provide immediate feedback to students, which can help them understand their learning progress and quickly correct mistakes. Third, games can encourage collaboration and healthy competition among students, which can increase their motivation and engagement in the learning process (Lestari & Priyanto, 2023).

The use of the GBL learning method is expected to encourage students to be more proactive and actively involved in the learning process. This will inspire students to be more motivated in learning, and facilitate students' understanding of the subject matter. According to (Shellyna et al., 2023), some of the advantages of GBL are that it is interactive, facilitates learning, has its own appeal, and can measure understanding. It is concluded that game-based learning is a student-centered learning model that utilizes games to support effective learning, enhance knowledge, and evaluate the learning process. The application of game-based learning in Physical Education in other countries has developed more rapidly. For example, in the United States, the TGfU (Teaching Games for Understanding) model has developed. Students learn through situational games to understand tactics and problem-solving, not just basic techniques. Next, there are digital fitness games, an "exergaming" program used to improve student fitness. Furthermore, there is gamification of learning, where teachers provide achievement badges, level-ups, or leaderboards to encourage student participation (Samsudin et al. 2022). In Indonesia, GBL has become widely used, especially since the 2013 Curriculum and the Merdeka Curriculum, which emphasize student-centered learning, active learning, project-based learning and games, and character building. Physical education teachers use traditional games such as gobak sodor, engklek, bentengan, and galasin. These games are considered relevant because they are culturally relevant and easy to implement. In addition to traditional games, there are also modified games to teach sports techniques. Furthermore, digital game-based learning is still limited, as only top schools have it (Hartono, Suherman, and Rusdiana 2014:213-226). Currently, Indonesia has begun implementing game-based learning in physical education, primarily through traditional and modified games. Developed countries use modern pedagogical approaches such as TGfU, digital games, and more structured game sense. The implementation of GBL itself has been shown to increase student motivation, creativity, cooperation, and tactical understanding. In the context of physical education, GBL can create a joyful learning atmosphere (Lestari & Priyanto, 2023). A joyful learning atmosphere will reduce boredom and increase student motivation and enthusiasm during learning. Furthermore, the game activities in GBL naturally require physical engagement, coordination, and cooperation, making it highly relevant for improving gross motor skills. Therefore, the development of game-based learning is expected to be an innovative solution to improve the quality of physical fitness learning (Bachtiar 2018:37-53).

A study conducted by (Utomo 2021:197-202) entitled "Literature Review Study: The Role of Game-Based Learning Media in Learning" shows that the use of Game-Based Learning media in learning can increase student enthusiasm, motivation, and learning outcomes. Game-Based Learning media can encourage all students to play an active role, attract attention, and facilitate student understanding of the material due to the enjoyable learning process. Based on previous research, the use of Game-Based Learning media can increase students' enthusiasm for learning in a subject. For example, research conducted by (Adi & Ramadhani, 2025), showed that Game-Based Learning is effective as a solution for creating engaging and enjoyable learning, as well as increasing student interest and motivation through game-based learning activities. Research by (Mercan & Selçuk, 2024), entitled "Investigating the Impact of Game-Based Learning and Gamification Strategies in Physical Education: A Comprehensive Systematic Review," demonstrated the substantial role of GBL and gamification as effective educational tools, particularly noting their positive impact on student engagement, academic achievement, and improved health and physical fitness levels. Subsequent research by (Camacho-Sánchez et al., 2023), entitled "Game-Based Learning and Gamification in Physical Education: A Systematic Review," identified GBL and gamification as significant learning methods due to their impact on student motivation, academic achievement, and commitment to improving health and physical performance.

GBL media can encourage all students to play an active role, attract attention, and facilitate students' understanding of the material because the learning process is enjoyable. The results of observations and initial research on SMK phase F students majoring in MPLB showed that there had not been any implementation of game-based sports learning or game-based learning. The results of the physical fitness component of speed obtained showed, 17 students were categorized (57%) / very poor, 5 students (17%) were in the poor category, and 8 students (26%) were in the moderate category. Most of the physical fitness levels of the speed element were classified as very poor. Based on this description, it is important to develop a model regarding game-based learning to improve gross motor skills and joyful learning in physical fitness material, so that physical education goals can be achieved more optimally and provide a meaningful learning experience for students.

The purpose of this research and development is to develop a design and determine the practicality, feasibility, effectiveness, and validity of innovative and applicable game-based learning for physical fitness. The following is a description of the novelty of the Game-Based Learning (GBL) development to improve gross motor skills and joyful learning in physical fitness: (1) Integration of GBL into physical fitness learning; (2) Focus on structured gross motor skills development; (3) Realizing authentic joyful learning; (4) Contextual and adaptive educational game design

MATERIALS AND METHODOLOGY

This development research will be conducted by SMK Negeri 3 Serang City, which has a major in Office Management and Business Services (MPLB). The research period is December 2025.

A. Research Design

his research is a Research and Development (R&D) study. Research and development (R&D) is the process of producing a specific product and testing its effectiveness (Sugiyono, 2013). This research and development was conducted to produce a game-based learning model for physical fitness. The development in this study used the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Branch & Varank, 2009).

After the analysis stage, the next step is planning, namely designing the learning model. The model design is still conceptual and will serve as the basis for the development process. Teaching materials and learning guides in the form of physical fitness teaching modules are compiled before development. This design includes designing a game-based learning model that aligns with the physical fitness learning objectives, including game design, rules, and media used. Some simple games that the researchers designed as initial designs are as follows: "Green-Black" Game I, "Green-Black" Game II, "Bread-Rattan" Game, "Fox-House" Game, "Switching Star" Game I, "Switching Star" Game II, "Ball Relay" Game, "Sequencing Numbers" Game, and Gobak Sodor Game. The research design used was a one-group pre-test post-test design. The sample was first given a pre-test before treatment. After treatment, the sample was given a post-test. This design was created to determine improvements in gross motor skills and joyful learning.

Table 1. One-Group Pre-Test Post-Test Design

Pre-test	Treatment	Post-test
Q1	X	Q2

Source: Adapted from (Tuckman, 1999)

Description:

Q1: initial test before treatment

X: treatment with a physical fitness learning model

Q2: final test after treatment

B.Data Collection Techniques

Data collection techniques used skills tests, activity observations, questionnaires, and interviews.

C.Research Instruments

This research will use a closed-ended questionnaire. A closed-ended questionnaire is a research questionnaire whose answer items are already provided on the questionnaire sheet. The following are some of the research instruments used:

1. Observation Instrument
2. This measurement tool is an observation sheet of student activities during the lesson.
3. Expert Validation Instrument
4. Expert validation is used to assess the feasibility of the game-based learning design by physical education and learning experts.
5. Student Response Instrument
6. This instrument is given to students to provide an evaluation as a response to the feasibility of the learning model.
7. Character Instrument
8. This instrument is a questionnaire to assess improvements in the development of cooperation, independence, and creativity. In addition to the cognitive and psychomotor domains, affective assessments in the form of character must also be included in the learning.
9. Joyful Learning Instrument
10. Using a Likert-scale questionnaire to measure students' enjoyment, motivation, and engagement in learning.
11. Gross Motor Instrument
12. Used to conduct a speed motor skills test as a measure of students' gross motor development.

D.Data Analysis

The data obtained will be tested using instrument validity, instrument reliability, and product practicality.

RESULTS

The validation results conducted by learning material experts showed that the GBL model obtained a total score of 274, or 91.33%. Therefore, this model is categorized as valid. The conclusion given is "Suitable for Use without Revision."

Table 2. Learning Expert Validation

No	Assessment Aspect	Score
1	Learning Design	43
2	Material Completeness	67
3	Material Coherence	58
4	Motivation Quality	57
5	Game Use Quality	51
Total Score		274
Percentage		91,33%
Category		Very Adequate

Validation results conducted by physical education experts showed that the GBL model obtained a total score of 217, with a percentage of 93.6%. The conclusion was "Suitable for Use with Revision." Suggestions included simplifying the game guide, adding safety and warm-up instructions, and gradually increasing the time to increase the game's speed.

Table 3. Validation by Physical Education Experts

No	Assessment Aspect	Score
1	Effectiveness	10
2	Relevance	37
3	Efficiency	70
4	Usefulness	70
5	Contextuality	30
Total Scores		217
Percentage		93,6%
Category		Very Adequate

Based on the results of a student questionnaire conducted by representatives from three different schools: SMKN 3 Serang City, SMKN 4 Serang City, and SMKN 5 Serang City, an average score of 73 was obtained, with a percentage of 94.67%, which falls into the "Very Practical" category. These results indicate that the GBL model can be easily used in physical fitness learning.

Table 4. Student Response Questionnaire

No	Assessment Indicators	Score		
		M1	M2	M3
1	Pembelajaran Kebugaran Jasmani	10	10	12
2	Physical Fitness Learning	13	15	13
3	Game Based Learning	10	10	10
4	Joyful Learning	19	18	19
5	Utilization	18	19	20
Average Score		73		
Average Percentage		94,67%		
Category		Very Practical		

The character validation results conducted by three physical education teachers showed that the GBL model obtained an average score of 3.51. Overall, the character assessment instrument for the aspects of cooperation, independence, and creativity was categorized as highly valid, making it suitable for use in research without revision.

Table 5. Character Validation

No	Assessment Aspect	Average Value	Category
1	Collaboration	3,60	Very Valid
2	Independent	3,45	Very Valid
3	Creative	3,50	Very Valid
Average Score		3,51	
Category		Very Valid	

The results of the Joyful Learning validation conducted by three student representatives from each school showed that the GBL model obtained an average score of 3.60. Overall, the Joyful Learning assessment instrument was categorized as highly valid, making it suitable for use in research without revision.

Table 6. Joyful Learning Validation

No	Assessment Aspects	Average Score	Category
1	Classroom Atmosphere	3,50	Very Valid
2	Teacher-Student Relationships	3,55	Very Valid
3	Learning Methods	3,55	Very Valid
4	Learning Media and Resources	3,65	Very Valid
5	Learning Relevance	3,70	Very Valid
6	Motivation and Satisfaction	3,70	Very Valid
Average Score		3,60	
Category		Very Valid	

Referring to the data, there was a decrease in run time, indicating an increase in speed. The average increase was 0.8 seconds. This indicates an increase in students' running speed abilities. Based on the results of the 60-meter run pretest

and posttest, there was an increase in running speed ability, as indicated by a decrease in the average run time from 10.98 seconds to 10.18 seconds. Thus, the applied learning model was effective in improving students' running speed.

Table 7. Pretest and Posttest Results

No	School Name	Average Pretest (seconds)	Average Posttest (seconds)	Difference
1	SMKN 3 Serang City	10,5	9,8	0,7
2	SMKN 4 Serang City	11,2	10,4	0,8
3	SMKN 5 Serang City	10,8	10,0	0,8
Average		10,98	10,18	0,8

Based on the results of the Paired Sample t-Test, the calculated t-value obtained was -62.178 and the significance value (Sig. 2-tailed) was $0.000 < 0.05$, so it can be concluded that there is a significant difference between student learning outcomes before and after using game-based learning. Furthermore, it is stated that the use of this model has been empirically proven effective in improving student learning outcomes.

Table 8. Paired Sample t-test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Pre Test - Post Test	-48,880	8,170	,786	-50,438	-47,321	-62,178	107	,000

Sumber: output SPSS (2025)

Based on the N-Gain test analysis, the average N-Gain score was 0.7545, or 75.45%. This result indicates that the effectiveness of game-based learning is in the "high" category, thus concluding that this learning model is "Very Effective" in improving gross motor skills and joyful learning in vocational high school students.

Table 9. N-Gain Test Analysis Results

	N	Minimum	Maximum	Mean	Std. Deviation
N-Gain Skor	108	.53	.93	.7545	.08485
N-Gain Persen	108	53.23	92.86	75.4538	8.48530
Valid N (listwise)	108				

Sumber: output SPSS (2025)

DISCUSSION

The decrease in run time indicates an increase in running speed, as in a running test, the shorter the run time, the better the student's performance. Individually, most students experienced improvement, as indicated by a positive difference in time between the pretest and posttest. This improvement was influenced by the implementation of the game-based learning approach, which created a more active, enjoyable learning environment and increased student engagement in physical activity. This motivated students to learn, resulting in improved gross motor skills, particularly running speed. Based on the study results, it can be concluded that there was an increase in students' 60-meter run speed, as indicated by a decrease in the average run time from the pretest to the posttest. The implementation of the learning model proved effective in improving students' gross motor skills, particularly speed.

CONCLUSION

Starting with the model revision process based on expert input, the product was tested at the implementation stage, achieving a practicality rating of 78.30% (Practical), indicating that GBL is easy to use, engaging, and relevant for both students and teachers. The effectiveness test also showed a significant improvement in learning outcomes, marked by a significance value of $0.000 < 0.05$ and an N-Gain of 75.45% (Very Effective). Student responses (94.67%) and teacher character validation of 3.51 also reinforced the fact that the GBL model is highly practical and can build good character. The joyful learning assessment obtained an average score of 3.60 (very valid). The average increase in running speed was 0.8 seconds. Thus, game-based learning has proven valid, feasible, practical, and effective, making it suitable for use as a physical fitness learning model to improve gross motor skills and joyful learning.

REFERENCES

1. Adi, H. P., & Ramadhani, N. F. (2025). Utilizing Game-Based Learning Methods to Increase Interest and Motivation in Learning. *Cemerlang Multidisciplinary Science and Technology*, 1(1), 7–15..
2. Astuti, I. A., Suyanto, S., & Sukoco, S. (2017). Application of User-Centered Design Methods in Game-Based Learning to Student Learning Motivation. *Interactive Information*, 2(1), 10–20.
3. Bachtiar, W. B. (2018). Efforts to Improve Physical Fitness Through a Play-Based Approach in Physical Education Learning for Grade X Students at SMA Negeri 1 Cianjur. *Maenpo Journal*, 8(1), 37–53.
4. Branch, R. M., & Varank, I. (2009). *Instructional Design: The ADDIE Approach* (Vol. 722). Springer.
5. Camacho-Sánchez, R., Manzano-León, A., Rodríguez-Ferrer, J. M., Serna, J., & Lavega-Burgués, P. (2023). Game-based learning and gamification in physical education: a systematic review. *Education Sciences*, 13(2), 183.
6. Festiawan, R. (2020). Learning and learning approaches. *Jenderal Soedirman University*, 11, 1–17.
7. Hartono, R., Suherman, A., & Rusdiana, A. (2014). The influence of the Sport Education model on students' motivation and intensity of movement learning in physical education. *Edusentris*, 1(3), 213–226.
8. Ilyas, M., & Syahid, A. (2018). The importance of learning methodology for teachers. *Al-Aulia: Journal of Education and Islamic Sciences*, 4(1), 58–85.
9. Lestari, S., & Priyanto, A. (2023). The Effect of Game-Based Learning on Elementary School Students' Motivation and Achievement. *Journal of Education and Learning*, 12(4), 210–223.
10. Mercan, G., & Selçuk, Z. V. (2024). Investigating the impact of game-based learning and gamification strategies in physical education: A comprehensive systematic review. *Journal of Interdisciplinary Education: Theory and Practice*, 6(1), 1–14.
11. Samsudin, D. R., PD, M., Setiawan, D. R. I., & PD, M. (2022). *Learning Media And Physical Education*. Alungdan Mandiri.
12. Shellyna, S., Sari, D. P., & Suryani, N. (2023). The Benefits of Game-Based Learning in Increasing Student Activeness in Class. *Journal of Student Creativity*, 3(2), 45–56.
13. Sugiyono, D. (2013). *Educational Research Methods: Quantitative, Qualitative, and R&D Approaches*.
14. Tuckman, B. W. (1999). A tripartite model of motivation for achievement: Attitude/drive/strategy. Annual Meeting of the American Psychological Association, Boston, MA.
15. Utama, A. M. B. (2011). Character Building in Children Through Play Activities in Physical Education. *Indonesian Journal of Physical Education*, 8(1).
16. Utomo, G. M. (2021). Application of Traditional Games to Improve Physical Fitness in Physical Education Students of the 2019 Class of PGRI Adi Buana University, Surabaya. *Journal of Physical Health and Sports*, 6(1), 197–202.