

Development in the Game Activity Model in Physical Education Learning for Improving Locomotor Motoric Skills and Teamwork Skills of Senior Students of Elementary School

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ABSTRACT: This research aims to: 1) develop the format and construction of a game activity model to improve basic locomotor skills and teamwork skills of senior students of elementary school, 2) determine the feasibility and effectiveness of the game activity model developed to improve basic locomotor skills and teamwork skills of senior students of elementary school, and 3) produce game activities to develop basic locomotor skills and teamwork skills of senior students in elementary school. The process of developing a game activity model in Physical Education (PE) learning to improve locomotor skills and teamwork skills in this research used the 4D research and development model: Define, Design, Development, and Dissemination. The results of the validity and reliability tests indicate that the game activity model developed is valid and reliable, so that the product is suitable for use in learning models. Based on the results of teacher and student assessments, it shows that the game activity model in PE learning developed to improve locomotor motoric motions and overall teamwork skill is very good with the results, researchers obtain the following assessment results: the Safety Corridor game in terms of quality with a percentage value of 95% and in terms of feasibility with a percentage value of 95.56%, the Compact Sandals game in terms of quality with a percentage value of 92.22% and in terms of feasibility with a percentage value of 93.33%, the Snake VS Scorpion game in terms of quality with a percentage value of 93.88% and in terms of feasibility with a percentage value of 91.11%, the Take Over Opponent's Headquarters game in terms of quality with a percentage value of 93.88% with a category and in terms of feasibility with a percentage value of 92.22%, and the Traffic Lights game in terms of quality with a percentage value of 98.88% and in terms of feasibility with a percentage value of 96.67%. It can be concluded that the game model can be used to develop locomotor and teamwork skills for elementary school students.

KEYWORDS: Development, Physical Education (PE) game activity model, basic locomotor motions, cooperation

I. INTRODUCTION

Physical education is an integral part of the educational system, contributing significantly to the development of health, physical resilience, critical thinking, emotional balance, social skills, and the moral and character values of students. Structured physical activities in physical education have been shown to positively influence motor, cognitive, and affective development in a balanced manner (Mo, Y., 2024). Physical education is not merely about engaging in physical activities, but also a medium of education that emphasizes pedagogical values and must be implemented through appropriate methods in order to achieve these holistic goals (Molina Fizi, R., 2023).

One of the widely applied approaches in teaching physical education is game-based activity. Games are considered effective in creating enjoyable learning experiences while simultaneously enhancing children's fundamental motor skills (Komaini, A., Inarta, P., Kiram, Y., & Handayani, 2024). International studies have emphasized that game-based physical education programs significantly improve both motor skills and students' enjoyment of learning. At the elementary school level, children particularly need ample opportunities for active movement as part of their growth and developmental process. Movement, often referred to as motor activity, constitutes the foundation of children's physical skills (Dereli, A., & Erbaş, 2024).

Beyond its role in improving physical fitness, physical education also functions as a medium for character building. Cooperation, for example, is one of the essential values to be instilled early, as it enables students to work together to achieve shared goals. Cooperative games have been found to effectively develop teamwork and social interaction skills among students (Akbar,

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2019). Further confirmed that traditional games not only foster motor skills but also enhance social skills and cooperation. Similarly, a study in Bandung revealed that the integration of games in physical education had a positive effect on students' cooperative abilities. Thus, game-based approaches contribute not only to motor development but also to the social and emotional growth of students.

Nevertheless, challenges persist in the field. Observations conducted at SD Kristen PENABUR in Jababeka (Bekasi) and Kota Wisata (Bogor) revealed that students are increasingly more interested in digital activities through smartphones compared to physical activities. This phenomenon is consistent with the findings of (Ulrich, 2011), who argued that reduced physical activity negatively impacts children's motor development. Moreover, the transition from online learning during the Covid-19 pandemic to face-to-face instruction has further worsened the decline in students' motor skills (Thomas, E., 2020). Interviews with physical education teachers in these schools indicated that one-directional or command-based instructional approaches often result in low enthusiasm, with some students perceiving physical education as monotonous. This supports prior research which highlighted that cooperative and game-based teaching models are more effective than traditional instructional methods (Wahyudi, R., 2022).

Furthermore, PENABUR schools emphasize character education through the PKBN2K program (Christian Value-Based Character Education). Within this context, it becomes urgent to develop a game-based model in physical education that not only enhances fundamental locomotor skills but also cultivates cooperation among upper elementary students. The integration of game activities in physical education is expected to address the challenges of declining motor skills and student motivation, while also supporting the school's mission of strengthening character education.

The decline in children's engagement with physical activity also raises concerns about long-term health implications. Sedentary behavior, such as excessive use of digital devices, has been associated with obesity, poor posture, and decreased cardiovascular fitness among school-aged children (Stodden, D. F., 2008). At the same time, these behaviors limit opportunities for social interaction and teamwork, both of which are crucial in elementary education. Therefore, physical education must be positioned as not only a medium for skill development but also as a preventive measure against the negative impact of sedentary lifestyles. In addition, research has shown that game-based learning environments foster higher levels of motivation and student enjoyment compared to traditional approaches (Casey, A., & Goodyear, 2015). Games create meaningful contexts for learning, where children are actively engaged in problem-solving, collaboration, and decision-making. In the setting of PENABUR schools, this model could be designed to align with the PKBN2K program, ensuring that the values of respect, discipline, and cooperation are internalized during play. By embedding character values within physical education games, students are more likely to develop holistic competencies beyond physical skills.

Moreover, the psychological aspect of motivation in physical education must not be overlooked. According to self-determination theory, students are more motivated when they feel autonomy, competence, and relatedness in learning activities (Deci, E. L., & Ryan, 2000). Traditional command-style teaching often neglects these psychological needs, whereas game-based models allow for choice, feedback, and meaningful peer interaction. Consequently, students are more inclined to participate actively, resulting in improved motor development and sustained interest in physical activity.

The integration of innovative teaching models in physical education also has implications for teachers' professional development. Studies indicate that teachers who adopt cooperative and game-based pedagogies report higher teaching satisfaction and improved classroom dynamics (Kirk, 2010). Therefore, equipping PENABUR's physical education teachers with training and resources to implement such models is essential. This approach ensures not only improved student outcomes but also contributes to the broader goal of enhancing the quality of education in Indonesia.

Finally, given the global emphasis on 21st-century skills, physical education must be redefined as a platform that develops creativity, collaboration, critical thinking, and communication. The use of simple, structured games can bridge the gap between motor skill development and character formation, making learning more relevant and enjoyable. As PENABUR schools strive to balance academic excellence with character education, adopting a game-based model in physical education offers a strategic pathway to achieve both goals.

II. METHOD

The research method used was the 4D Research and Development (R&D) model. (Sugiyono, 2017) states that development research aims to examine the patterns and stages of growth and change that occur within a certain period of time. This research was used to develop a model of game activities in PJOK learning. This research was limited to limited trials aimed at obtaining information on whether the product to be produced was more effective and efficient. The results of this study were in the form

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of a flipbook product of game activity models in PJOK learning to improve the locomotor movements and cooperation of upper elementary school students.

The procedure for developing a model of game activities in PJOK learning to improve locomotor movement and cooperation consists of four stages, namely Define, Design, Develop, and Disseminate.

The Define (Definition) is the initial step. In the initial stage, an analysis of learning problems at SDK PENABUR Kota Jababeka was conducted. The researcher conducted preliminary observations to understand the situation of teachers and students, particularly in basic movement learning. Information was obtained from various sources and analyzed. The analysis process was carried out through direct observation and interviews with elementary school teachers.

Design At this stage, the design stage was carried out by designing a learning game model tailored to the characteristics of the motor development of elementary school children. The process of designing the game activity model was as follows: Safety Lane, Compact Sandals, Snake VS Scorpion, Capture the Opponent's Base, Traffic Lights.

Development, the objective of this stage is to develop a model of game activities to support the development of locomotor movement and cooperation among children. This stage takes into account expert assessments and trials, which are then used as a basis for revision.

Dissemination is the final stage of the development process, which aims to expand the scope of the product that has been developed. If deemed feasible, the next process is the dissemination stage.

Data collection techniques Data collection through a qualitative approach, data is collected through literature studies, direct observation in the field and in-depth interviews. Meanwhile, the quantitative approach uses questionnaires or surveys filled out by experts to provide input on the activity model being developed.

Data analysis. In this study, the approach applied to analyze the data includes quantitative and qualitative descriptive methods. The quantitative descriptive approach is used to analyze several components. The next step is to analyze the percentage of each aspect and average the overall validation results, and convert them into assessment scores as follows:

Table 1. Conversion of Actual Scores to a 5-Point Scale

No	criteria	Score Formula
1	Very Good	$X > X_i + 1,80 S_{bi}$
2	Good	$X_i + 0,60 S_{bi} < X \leq X_i + 1,8 S_{bi}$
3	Fairly Good	$X_i - 0,60 S_{bi} < X \leq X_i + 0,60 S_{bi}$
4	Not Very Good	$X_i - 1,80 S_{bi} < X \leq X_i - 1,80 S_{bi}$
5	Very Poor	$X \leq X_i - 1,80 S_{bi}$

The final score of the developed product is obtained through a conversion process. Based on these results, an assessment can be made regarding the suitability of the product for use.

III. RESEARCH RESULT

1. Define

Based on interviews with teachers and direct observations conducted by researchers in the field, a number of findings were obtained in the needs analysis, including:

- During the learning process, it was observed that students' enthusiasm for participating in physical education classes, especially basic movement material, was still low.
- Students' character in terms of cooperation was still not optimally developed.
- The approach used by teachers is still one-sided. A game-based learning model is considered suitable because it can encourage the development of motor skills and strengthen cooperation among students.
- Based on observations, the motor skills of elementary school students in urban areas are not yet optimal, so efforts are needed to further develop them.

2. Define

The results of interviews and observations show that based on these things, it can be concluded that students need the development of a PJOK learning game activity model to improve basic locomotor movements and cooperation. Based on these indicators, several game models were created, namely the safety corridor game, compact sandals, snake vs. scorpion, capture the opponent's base, and traffic lights.

3. Design Based on the results of the analysis in the previous stage, the researcher then determined a draft model of game

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activities in PJOK learning to develop the locomotor movement skills and cooperation of students. The format includes the title, core competencies, how to play, game rules, game objectives, and game flow.

4. Development (Development)

During the development stage, the researcher tested the validity with subject matter experts and media experts before conducting field trials.

The product trial was conducted on upper grade students, namely grades 4A, 4B, and 5B at PENABUR Christian Elementary School in Jababeka City. This large-scale trial was conducted on teachers (homeroom teachers) and students. The results of the large-scale trial can be described as follows:

Table 2. Results of Large-Scale Quality Assessment Trials Safety Corridor Game

No	Items assessed	Teacher		
		4A	4B	5B
1	Game models are in line with core competencies and basic competencies.	5	4	4
2	Models are in line with the characteristics of elementary school students.	5	5	5
3	Game models can develop motor skills.	5	5	5
4	Game models can develop cooperation skills.	5	5	5
5	Game instructions are clear and easy for teachers to understand.	4	4	5
6	Game instructions are clear and easy for students to practice.	4	4	4
7	The game instructions used are clear.	5	5	5
8	The safety level of the equipment is in line with safety standards.	5	5	5
9	The equipment needed is easy to obtain.	4	4	5
10	The equipment setup is clear.	5	5	5
11	Equipment that is interesting for elementary school students	5	5	5
12	Equipment settings that are easy for children to understand	5	5	5
Score Total		57	56	58
Percentage		95%	93.33%	96.67%
Average Score		4.75	4.66	4.83
Criteria		VG	VG	VG

Table 3. Results of Large-Scale Trials to Assess the Feasibility of the Safety Lane Game

No	Items assessed	Teacher		
		4A	4B	5A
1	Students can move the hula hoop forward.	5	4	4
2	Students can develop the ability to jump/leap quickly.	5	5	5
3	Students successfully reach the finish line.	5	5	5
4	Students can jump/leap from hula hoop to hula hoop.	4	5	4
5	Students can develop teamwork skills with their group.	5	5	5
6	Students can communicate well with their groupmates.	5	5	5
Score Total		29	29	28
Percentage		96.67%	96.67%	93.33%
Average Score		4.83	4.83	4.66
Criteria		VG	VG	VG

Based on the teacher's assessment above, both in terms of quality and feasibility, the Safety Lane game activity model is rated as "excellent."

Compact Sandal Game

Table 4. Results of Large-Scale Trials to Assess the Quality of Kompak Sandals

No	Items assessed	Teacher		
		4A	4B	5B
1	Game models are in line with core competencies and basic competencies.	5	4	4
2	Models are in line with the characteristics of elementary school students.	5	5	5

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3	Game models can develop motor skills.	5	5	5
4	Game models can develop cooperation skills.	5	5	5
5	Game instructions are clear and easy for teachers to understand.	4	4	4
6	Game instructions are clear and easy for students to practice.	4	4	4
7	The game instructions used are clear.	5	5	5
8	The safety level of the equipment is in line with safety standards.	4	4	4
9	The equipment needed is easy to obtain.	4	4	4
10	The equipment setup is clear.	5	5	5
11	Equipment that is interesting for elementary school students	5	5	5
12	Equipment settings that are easy for children to understand	5	5	5
Score Total		56	55	55
Percentage		93.33%	91.67%	91.67%
Average Score		4.67	4.58	4.58
Criteria		VG	VG	VG

Table 5. Results of Large-Scale Trials to Assess the Feasibility of the Compact Sandal Game

No	Items assessed	Teacher		
		4A	4B	5A
1	Students can move the hula hoop forward.	5	4	4
2	Students can develop the ability to jump/leap quickly.	5	5	5
3	Students successfully reach the finish line.	5	4	5
4	Students can jump/leap from hula hoop to hula hoop.	4	4	4
5	Students can develop teamwork skills with their group.	5	5	5
6	Students can communicate well with their groupmates.	5	5	5
Score Total		29	27	28
Percentage		96.67%	90%	93.33%
Average Score		4.83	4.5	4.67
Criteria		VG	VG	VG

Based on the teacher's assessment above, both in terms of quality and suitability, it shows that the Sendal Kompak game activity model is in the "very good" category.

Snake VS Scorpion Game

Table 6. Results of Large-Scale Trials Assessing the Quality of the Snake VS Scorpion Game

No	Items assessed	Teacher		
		4A	4B	5B
1	Game models are in line with core competencies and basic competencies.	5	4	4
2	Models are in line with the characteristics of elementary school students.	5	5	5
3	Game models can develop motor skills.	5	5	5
4	Game models can develop cooperation skills.	5	5	5
5	Game instructions are clear and easy for teachers to understand.	5	4	4
6	Game instructions are clear and easy for students to practice.	4	4	4
7	The game instructions used are clear.	4	5	5
8	The safety level of the equipment is in line with safety standards.	4	4	4
9	The equipment needed is easy to obtain.	5	5	5
10	The equipment setup is clear.	5	5	5
11	Equipment that is interesting for elementary school students	5	5	5
12	Equipment settings that are easy for children to understand	5	5	5
Score Total		57	56	56
Percentage		95%	93.33%	93.33%
Average Score		4.75	4.67	4.67
Criteria		VG	VG	VG

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Table 7. Results of Large-Scale Trials to Assess the Feasibility of the Snake VS Scorpion Game

No	Items assessed	Teacher		
		4A	4B	5A
1	Students can move the hula hoop forward.	5	5	5
2	Students can develop the ability to jump/leap quickly.	5	5	5
3	Students successfully reach the finish line.	4	4	4
4	Students can jump/leap from hula hoop to hula hoop.	4	4	4
5	Students can develop teamwork skills with their group.	5	5	5
6	Students can communicate well with their groupmates.	5	4	4
Score Total		28	27	27
Percentage		93.33%	90%	90%
Average Score		4.67	4.5	4.5
Criteria		VG	VG	VG

Based on the teacher's assessment above, both in terms of quality and suitability, it shows that the Snake VS Scorpion game activity model is in the "very good" category.

Capture the Enemy Base Game

Table 8. Results of Large-Scale Trials to Assess the Quality of the Capture the Enemy Base Game

No	Items assessed	Teacher		
		4A	4B	5B
1	Game models are in line with core competencies and basic competencies.	5	4	4
2	Models are in line with the characteristics of elementary school students.	5	5	5
3	Game models can develop motor skills.	5	5	5
4	Game models can develop cooperation skills.	5	5	5
5	Game instructions are clear and easy for teachers to understand.	4	4	4
6	Game instructions are clear and easy for students to practice.	4	4	4
7	The game instructions used are clear.	5	5	5
8	The safety level of the equipment is in line with safety standards.	4	4	4
9	The equipment needed is easy to obtain.	5	5	5
10	The equipment setup is clear.	5	5	5
11	Equipment that is interesting for elementary school students	5	5	5
12	Equipment settings that are easy for children to understand	5	5	5
Score Total		57	56	56
Percentage		95%	93.33%	93.33%
Average Score		4.75	4.67	4.67
Criteria		VG	VG	VG

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Table 9. Results of Large-Scale Trials to Assess the Feasibility of Capturing the Opponent's Headquarters

No	Items assessed	Teacher		
		4A	4B	5A
1	Students can move the hula hoop forward.	5	5	5
2	Students can develop the ability to jump/leap quickly.	5	5	5
3	Students successfully reach the finish line.	5	5	5
4	Students can jump/leap from hula hoop to hula hoop.	4	4	4
5	Students can develop teamwork skills with their group.	5	4	4
6	Students can communicate well with their groupmates.	5	4	4
Score Total		29	27	27
Percentage		96.67%	90%	90%
Average Score		4.83	4.5	4.5
Criteria		VG	VG	VG

Based on the teacher's assessment above, both in terms of quality and feasibility, the Capture the Enemy Base game activity model is rated as "very good."

Traffic Light Game

Table 10. Results of Large-Scale Trials to Assess the Quality of the Traffic Light Game

No	Items assessed	Teacher		
		4A	4B	5B
1	Game models are in line with core competencies and basic competencies.	5	4	4
2	Models are in line with the characteristics of elementary school students.	5	5	5
3	Game models can develop motor skills.	5	5	5
4	Game models can develop cooperation skills.	5	5	5
5	Game instructions are clear and easy for teachers to understand.	5	5	5
6	Game instructions are clear and easy for students to practice.	5	5	5
7	The game instructions used are clear.	5	5	5
8	The safety level of the equipment is in line with safety standards.	5	5	5
9	The equipment needed is easy to obtain.	5	5	5
10	The equipment setup is clear.	5	5	5
11	Equipment that is interesting for elementary school students	5	5	5
12	Equipment settings that are easy for children to understand	5	5	5
Score Total		60	59	59
Percentage		100%	98.33%	98.33%
Average Score		5	4.91	4.91
Criteria		VG	VG	VG

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Table 11. Results of Large-Scale Trials to Assess the Feasibility of Traffic Light Games

No	Items assessed	Teacher		
		4A	4B	5A
1	Students can move the hula hoop forward.	5	5	5
2	Students can develop the ability to jump/leap quickly.	5	5	5
3	Students successfully reach the finish line.	5	5	5
4	Students can jump/leap from hula hoop to hula hoop.	4	4	4
5	Students can develop teamwork skills with their group.	5	5	5
6	Students can communicate well with their groupmates.	5	5	5
Score Total		29	29	29
Percentage		96.67%	96.67%	96.67%
Average Score		4.83	4.83	4.83
Criteria		VG	VG	VG

Based on the teacher's assessment above, both in terms of quality and suitability, the TrafficLight game activity model is rated as "very good."

5. Disseminate

Researchers have obtained the final draft of the game activity model development. The game activity model in PJOK learning is printed in the form of a flipbook.

IV. DISCUSSION

Based on these results, all game activity models developed in PJOK learning to improve basic locomotor motor skills and cooperation for upper elementary school students fall into the "Very Good" category. Based on the findings of the research on the development of game activity models in physical education aimed at improving locomotor motor skills and cooperation among upper elementary school students, it was revealed that all the developed games achieved a "very good" category in terms of quality and feasibility. The *Safety Lane* game received an average quality score of 95% and a feasibility score of 95.56%, both rated as "excellent." The *Compact Sandal* game was rated "very good" with a quality score of 92.22% and feasibility of 93.33%. The *Snake VS Scorpion* game achieved "very good" ratings with a quality score of 93.88% and feasibility of 91.11%. Similarly, the *Rebut Markas Lawan (Capture the Enemy Base)* game obtained a quality score of 93.88% and a feasibility score of 92.22%, both in the "very good" category. Finally, the *Traffic Lights* game demonstrated the highest ratings, with a quality score of 98.88% and a feasibility score of 96.67%, also categorized as "very good." Overall, all game activity models developed in this study were found to be feasible and effective for use in physical education to support locomotor motor skills and cooperative learning.

These findings are consistent with the work of (Li, Q., Fang, Q., Tang, X., & Wan, 2024), who emphasized that integrating *small-sided games* into physical education significantly enhanced students' motor skill development, including locomotor and object control, while simultaneously fostering social and emotional growth. Similarly, (Fizi, R. M., Winarni, S., Guntur, & Hartanto, 2023) demonstrated that structured game models in physical education effectively improved students' motor skills, cooperation, and discipline in primary schools, reinforcing the pedagogical value of game-based learning.

In addition, (Maher, A. J., & Haegele, 2022) highlighted the inclusive benefits of physical education games, showing that game-based activities promote both motor and social skills even among children with disabilities. This broadens the implication that games can serve as an equitable pedagogical tool for diverse student populations. Supporting this perspective, Harvey and (Harvey, S., & Jarrett, 2014) reviewed the literature on game-centered approaches, confirming their effectiveness in developing tactical understanding, motor competence, and cooperative abilities among students.

From a theoretical perspective, (Bailey, R., Armour, K., Kirk, D., Jess, M., Pickup, I., & Sandford, 2009) noted that the educational benefits of physical education extend beyond physical fitness to include social, emotional, and cognitive development. Therefore, the integration of structured and purposeful games in elementary physical education does not only improve locomotor skills but also enhances students' cooperation, discipline, and learning motivation.

Taken together, these findings and theoretical underpinnings suggest that the game activity models developed in this study align strongly with the educational needs of the 21st century. Games in physical education should not merely be seen as recreational tools, but as pedagogical instruments that promote holistic student development physically, socially, and cognitively while fostering adaptability to modern educational challenges.

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V. CONCLUSIONS

Based on the development process, it can be concluded that the designed game model for elementary school students is aligned with the curriculum and tailored to the developmental characteristics of children at this age. The design reflects the core and basic competencies required by the curriculum and adopts a play-based approach that corresponds with the natural learning tendencies of elementary school learners. Play-oriented methods have been widely recognized as more effective in fostering engagement, motivation, and cooperative learning compared to conventional approaches.

These conclusions are consistent with international evidence. (Sun, S., & Chen, 2024) found that sports game interventions significantly improve fundamental motor skills among children aged 3–12 years, emphasizing the importance of structured play in supporting motor development. (Melo, J. C. N., Tejada, J., Silva, E. C. M., 2025) demonstrated that integrating physically active lessons and active breaks enhances health indicators and cognitive performance in elementary students. Together, these findings reinforce that play-based models in physical education not only improve locomotor and cooperative skills but also promote holistic development, making them a vital pedagogical approach for contemporary elementary education.

This game activity model can be used by educators in physical-motor learning to develop basic locomotor skills such as walking, running, jumping, and leaping, as well as to improve cooperative characteristics such as communication with peers, encouraging competition to achieve goals, creating healthy practices and discussions, and boosting team spirit.

Based on the research results, the researchers obtained the following assessment results: the Safety Lane game scored 95% in terms of quality and 95.56% in terms of feasibility, the Compact Sandal game scored 92.22% in terms of quality and 93.33% in terms of feasibility, the Snake VS Scorpion game scored 93.88% in quality and 91.11% in feasibility, the game Rebut Markas Lawan (Capture the Enemy Base) scored 93.88% for quality and 92.22% for feasibility, and the game Lampu Lalu Lintas (Traffic Lights) scored 98.88% for quality and 96.67% for feasibility. Based on these results, all game activity models developed in PJOK learning to improve basic locomotor motor skills and cooperation for upper elementary school students are of "Very Good" quality and feasibility in the game category.

Product Recommendations

Based on the results of this study, several suggestions can be made as follows:

1. This study has practical benefits as a reference for educators in designing appropriate game activities for elementary school students. Through the application of these activities, students can actively hone their basic locomotor skills while fostering a spirit of cooperation. More broadly, this application also supports the achievement of overall educational goals.
2. For future researchers, further research and development are needed to add to the knowledge base for developing basic manipulative movement and cooperation skills in elementary school students so that they can achieve their educational goals and live in interaction with their environment.

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