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Development of Creative Play-Based Badminton Service Learning Model for Elementary School Students

Arman Fadillah[1A-E*], **Hernawan**[2B-D], **Moch. Asmawi**[3C-E]

[1,2,3] Physical Education Study Program/Postgraduate/Universitas Negeri Jakarta/DKI Jakarta/ Indonesia

ABSTRACT

This study aims to develop a creative play-based learning model for badminton tailored for elementary school students, focusing on the analysis of the development process, feasibility, and effectiveness of the model. The research was conducted in educational institutions in East Jakarta and South Jakarta, involving 60 upper-grade elementary school students as participants, using a Research and Development (R&D) approach with the ADDIE model. 1) The developed model integrates basic badminton serve techniques with creative play concepts, designed to align with the characteristics of 10–12-year-old students. 2) The validation process resulted in 16 learning models with specific objectives, appropriate media, and detailed implementation steps. 3) Effectiveness testing using the pretest-posttest design demonstrated a significant improvement in badminton serve skills, with the experimental group's average score increasing from 7.47 to 15.63 and an N-gain score of 0.78 (high category). A significance value of 0.000 indicates the model's effectiveness in enhancing badminton service skills while providing an interactive, enjoyable, and effective learning experience.

Keywords : Learning Model; Serve; Badminton; Creative Play

Correspondence:
***Arman Fadillah**, Universitas Negeri Jakarta, Jl. Rawamangun Muka Jakarta Timur 13220. Email: armanfadil123@gmail.com, hernawan@unj.ac.id, asmawi.moch1@gmail.com.

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C) Analysis and interpretation of data;
D) Manuscript preparation;
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INTRODUCTION

Education is the most important element in the development of a country's human resources, plus the current era where we are in the 21st century, increasing access to cyberspace is so easy and fast. Education in the 21st-century era is a transition from teacher-centred to student-centred learning where the demands of the future of students can have 21st-century skills, According to Samsudin & Subandi (2022) The skills that need to be possessed include critical thinking and problem-solving, creativity and innovation, cross-cultural understanding, media literacy, information and communication skills, as well as computer and ICT literacy, as well as life and career skills. To ensure that students acquire these skills, it is important to remember that these skills will not emerge by themselves, but through a process. Training must start early, especially at the elementary school level.

Elementary school is a basic education level that provides knowledge, skills, and values to

students to develop their potential and prepare for higher education. In elementary school, students are not only given academic provisions but are also guided in developing their potential as a whole, one of which is motor skills, there are two important parts in the development of motor skills, namely learning various skills and learning concepts about movement (Syahrial, 2015). Motor skills are physical movements that involve body parts and are aimed at achieving certain goals. Meanwhile, basic motor skills are fundamental skills that are generally taught or done through games. These skills reflect an individual's motor movement abilities, where a person is considered skilled if they have good coordination, motor control, and efficiency in moving (Pelana et al., 2021). If these basic motor skills are learned well, they can be adjusted or improved to form all or part of a particular sports skill. Children of elementary school age are in a phase of growth and development, where elementary school-aged children have enormous potential to optimize various aspects of development, especially in terms of motor skills or psychomotor. At the elementary school level, several subjects, especially physical education, teach these motor skills. Therefore, teaching motor skills is very important, especially through physical education subjects.

Physical education for students not only teaches about the importance of maintaining health and fitness through physical activities but also gives a strong foundation to develop essential motor skills to participate in various sports and physical activities in the future. The contribution made by physical education is to develop students' physical potential and abilities as a whole. This is because what is developed is not only the aspect of motor skills and physical fitness but also the cognitive aspect which is also developed through physical education (Saputra & Aguss, 2021). This aims for students to learn various types of sports, motor skills, and knowledge about the human body and have a good understanding of the importance of healthy living through physical activities (Mustafa, 2020). Furthermore, physical education not only focuses on the aspect of physical fitness but also places great emphasis on learning basic movements. Learning basic movements is a very important need and affects the growth and physical development of students (Parwata, 2021). Thus, physical education not only focuses on physical fitness but also places great emphasis on learning basic movements.

Learning basic movements in elementary schools has a very important role in developing students' basic movement skills. According to Hidayat, (2023) and Rudiansyah & Saputra (2023), the purpose of movement learning materials is to teach students about basic skills in movement such as walking, running, jumping, and throwing. Students will learn the correct techniques in doing these movements so that students can develop good motor skills and body coordination. Furthermore, improving students' basic movements can be done through various methods, one of which is playing activities. Research by Firmansyah & Faridha (2022) showed an increase in skills using the creative play activity method, namely net game activities carried out in elementary schools by 17.13%. Therefore, basic movement learning is very important in students' lives as a medium to improve students' motor skills and coordination and basic movement skills can be applied using creative play methods. Creative play can be a means of helping students develop fine and gross motor skills and activating students' potential as a whole, such as cognitive and social aspects with a play approach so that students are more interested in participating in these activities. Creative play is a play process that involves the use of imagination and creative skills to build understanding and knowledge in the environment and can also improve communication skills, cooperation, and social skills (Novriadi et al., 2023; Maarang et al., 2023). Play activities are very appropriate for developing and improving basic movements such as According to Afrengty et al. (2020) he explained that elementary school children are referred to as creative periods, namely the period in creating new works of movement in life in getting play activities, for that it is necessary to have a play that can stimulate imagination, innovation, and self-expression, one of which can be achieved by playing creatively.

Thus, the creative play approach not only makes the learning process more enjoyable but also more effective in developing basic badminton long-serve skills among elementary school students. By combining elements of creativity and play in learning, students will be more motivated, involved, and able to understand long-serve techniques better. The development of this learning model is expected to provide a significant contribution to improving the quality of physical education in elementary schools, especially badminton long serves.

Badminton is one of the sports games that is material in learning and is a game that is very popular with elementary school children because badminton is a very popular sport for Indonesian people. However, it is necessary to consider whether badminton material can be applied to elementary school-age students. According to Ardiwinata, Achamad L. et al., in Suryani (2023) games taught in elementary schools are divided into 2, namely games to play or fill free time (play) and games to compete (games), which means games are divided into 4, namely: games that require physical strength/skills, games that require physical and strategy, games that require a strategy, and games that are based on luck. According to the Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 57 of 2014 concerning the 2013 Curriculum for elementary schools/Islamic elementary schools, physical education subjects are included in the category of physical education, sports, and health (PJOK) which are included in the general subjects of Group B. This subject aims to develop students' attitudes, knowledge, and skills. In the book by George, et al. (2021) as a guidebook for elementary school teachers in grade V, badminton material is in section 4 of the concept of developing movement in unit 26 with the theme of hitting skills using a racket and paddle towards the target. Badminton material in grade V that will be taught is more specific to the basic movement skills of long service or hitting using a racket with a hitting movement from below/underhand and hitting from the side/forehand, service is an opening shot in a badminton game. Therefore, badminton learning, especially long service skills, can be taught and applied in upper grades at the elementary school level.

Badminton learning in elementary schools in the PJOK subject generally emphasizes mastery of basic badminton skills or techniques so sometimes students are not able to understand the relationship or relevance of these basic techniques to the actual game. However, research shows students' interest in learning badminton (Hamzah, 2022; Miko et al., 2023). However, if examined further in the research of Arduta et al., (2020), 2 factors influence students' interest in choosing badminton learning, namely internal and external factors, internal factors consist of pleasure, interest and external factors consist of coaches/teachers, family, each has a high category indicator for internal factors and a medium category for external factors. The results of the study above are also strengthened by a preliminary study conducted by the researcher.

Researchers conducted field observations at Elementary School 02 Rawamangun in physical education learning on racket game material, showing that badminton learning activities were carried out using conventional methods, where teachers gave more verbal instructions and demonstrations of basic techniques without involving many elements of creativity or play and student participation tended to be low, with most students only following instructions without showing high enthusiasm. This is supported by an interest survey questionnaire as a preliminary study conducted by the school with 52 respondents from upper-class students. Researchers distributed questionnaires in the form of Google Forms to upper-class students. The questionnaire was in the form of questions about students' interest in badminton. The following are the results of the questionnaire on students' interest in badminton in upper-class elementary schools:

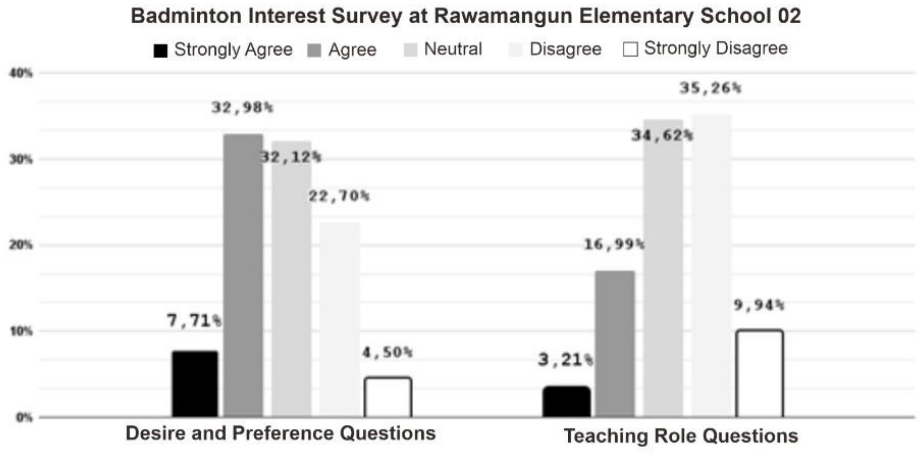

Figure 1. Diagram of Badminton Interest Survey Results in Elementary Schools

Based on the results in Figure 1, where most respondents to the question about desires and likes are in the "Agree" and "Neutral" categories. This shows that most students are indeed quite interested in badminton although there are still a large number of neutral students, while for the question about the role of teaching, most respondents are still in the "Neutral" and "Disagree" categories. This means that students feel that the role of teaching has not been maximized in arousing interest in badminton. This survey was reinforced in interviews with sports teachers at the school, which illustrated that although teachers had tried several teaching methods, such as demonstrations and repeated practice, students felt that this approach was not effective in attracting student interest. Teachers also identified several major challenges in teaching long-serve techniques, including the lack of variation in teaching methods and limited time to provide individual attention to each student. Teachers also stated that students had not tried many creative or game-based approaches in teaching badminton. Teachers believe that the integration of creative games in learning can increase student engagement and enthusiasm. As a solution, teachers propose to develop a more interactive and fun learning model, which can make students more interested and motivated to learn badminton. From these observations and interview data, it can be concluded that there is an urgent need to develop a badminton long-serve learning model based on creative play, to increase the interest and skills of elementary school students in badminton. The learning that will be developed is the basis for conducting research on the development of badminton learning models with the hope that students can enjoy badminton learning.

Learning needs to be innovative to produce learning that can be used according to current conditions and to eliminate boredom and saturation in learning (Hasibuan et al., 2020; Nurbadriyah, 2021). In this case, badminton learning needs a variety of models so that students do not feel bored and saturated so that learning objectives can be achieved. Several relevant studies show that varied learning models have a positive significance on learning outcomes (Hasibuan, 2022; Nurmansyah, 2019; Winatha & Setiawan, 2020). Furthermore, the researcher examined previous studies on whether the badminton learning model is effective in improving badminton skills. Several studies have proven that the application of learning or training models is effective in improving badminton skills (Apriyansyah et al., 2023; Hasibuan, 2022; Nurmansyah, 2019). The above research was conducted on middle and high school students. Furthermore, researchers also examined whether the badminton learning model can be applied at the elementary school level. Fauzalina Indira's (2023) research entitled "Learning Model for Badminton Lob Stroke Skills for Elementary School Students in Grade V" explains

that the badminton skills learning model is feasible and can be applied to elementary school students.

The researcher also examined whether the learning model can be applied using a creative play approach. Several studies have shown that there is a relationship between increasing motor skills through play methods at an early age and elementary school (Afrengty et al., 2020; Halifah, 2020; Inurwati, 2021; July, 2020). This study shows that playing can improve children's motor skills, but research has not been conducted on badminton learning.

METHOD

Characteristics of the Developed Model

The design and preparation of the learning model are carried out to provide clear guidance in the implementation of the research, as well as to explain the characteristics of the model being developed. Planning and preparation of the model are important elements that determine the success of a program. The designed product is the result of modification and creativity from various forms of learning models, which are applied to badminton service material in physical education learning for elementary schools with a play approach.

The characteristics of the game model and students who are the targets of the badminton service model development research are as follows:

1. The game is designed with the concept of knowledge to help students understand the technique of long badminton service based on creative play.
2. The target students are upper-grade elementary school students, both boys and girls.
3. The characteristics of the subjects are homogeneous, namely students aged 10-12 years, without taking into account the background of having repeated a class or not.

Each model item is implemented using a variety of badminton long-service games with creativity and equipment modifications to support technique mastery. This model is designed as a guideline for elementary school teachers to develop learning innovations so that the process of knowledge transfer becomes more interesting and effective.

Research Approach and Methods

The research on the development of the concept of playing in physical education learning for elementary schools uses a research and development approach with the ADDIE model. This approach aims to answer the problems that have been formulated in Chapter I, which focuses on physical education learning and its influence on students' learning outcomes. The final result of this study is the development of the concept of playing and physical education learning media that produces a product in the form of a badminton serve learning model design based on creative play. This product is designed to be a new model or improvement of the previous model with more complete, valid, and effective characteristics for elementary school students.

Model Development Steps

The model development steps explain each stage in the development process based on the ADDIE model. This model consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation. Each stage is interconnected to ensure the success of model development. A detailed explanation of these stages can be seen in the illustration or diagram presented in Figure 2.

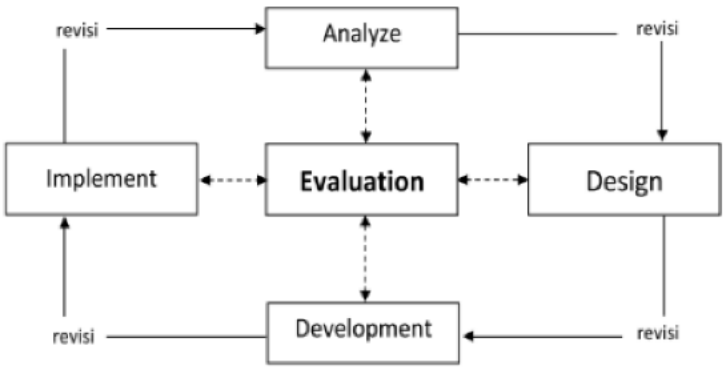

Figure 2. ADDIE Development Model
Source: *Instructional Design: The ADDIE Approach* (F. Hidayat & Nizar, 2021)

To make it easier to compile research, here is a description of the stages in research based on the ADDIE model as follows:

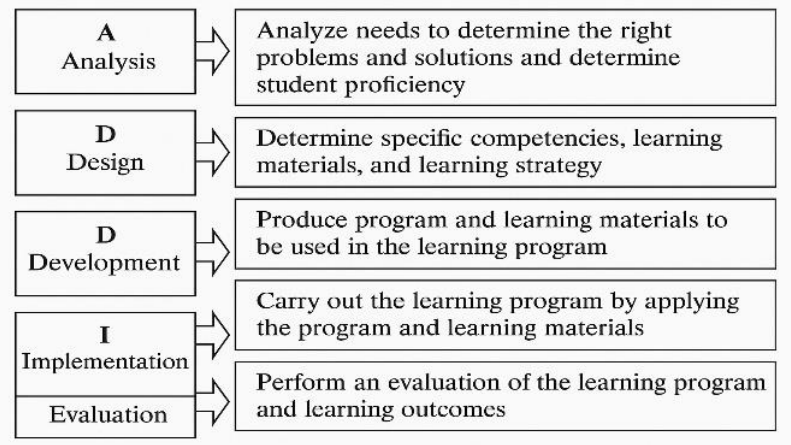

Figure 3. ADDIE Model Concept

Figure 3. provides ease in understanding and conducting research using the ADDIE development model. The method of developing a badminton service game model through the ADDIE approach is described as follows.

Analysis

The research product developed is a product determined based on the results of the identification carried out by the researcher. The identification is packaged through the assessment and needs analysis stages. The following are the steps in the analysis stage:

1. Literature Study: Collecting and reviewing literature related to badminton learning models, badminton serves, creative playing approaches and characteristics of elementary school students that are relevant to badminton learning
2. Needs analysis: needs analysis begins with obtaining data from initial observations. Researchers conduct observations with field studies, surveys and interviews with physical education teachers and students to identify obstacles and needs in badminton learning.
3. Analysis of Student Characteristics: collecting literature on the physical and psychological characteristics of students that are relevant to badminton learning

Design

The second stage is design. This stage aims to design detailed specifications of the components of the product item of the creative play-based badminton service learning model that suits the needs and characteristics of elementary school students. The following are the steps in the model design stage:

1. Determination of learning objectives: determining the basic competencies and indicators to be achieved in each item of the model to be created with specific references ABCD (Audience, Behavior, Condition, Degree).
2. Designing learning models: designing and integrating learning models with basic badminton service techniques with creative play games.
3. Designing teaching materials: creating a description of the learning design, basic learning competencies, core learning competencies, learning materials, strategies in providing learning such as methods, media, tools that will be practised by students, and evaluation of learning outcomes that determine success in this learning.
4. Assessment design: designing assessment instruments to measure the achievement of learning objectives

Development

The third stage is the development stage. This stage is carried out when the product model design has been designed, a creative play-based badminton service learning model is developed by combining the components of the results of the needs analysis and design that have been carried out in the previous stage. This model is a development of a new model and a development of a model from previous research that has studied badminton learning but adds elements of creative play to increase the appeal for elementary school students.

Previous research has been conducted by Ishak (2023) with the title "Development of a smash and service training model in badminton for beginner students". However, this model has not targeted elementary school students and the model has not been in the form of elementary school learning. Research by Fauzalina Indira (2023) with the title Lob stroke model in badminton game learning for elementary school students in grade V". This model has included elements of learning for elementary school students and uses a creative play approach, but does not include basic badminton service skills. Therefore, the researcher developed a badminton service learning model with a creative play approach. The following are the steps in the model development stage:

1. Development of learning models: learning models are arranged in the form of guides that are easy to understand by teachers and students. The learning media used include printed media and game devices that support the learning process.
2. Expert Validation: in validating this product, researchers involved Material experts, Physical Education experts, and Media experts to provide input and validation on the design of the learning model product that has been designed.
3. Revision: After validating the experts, the product is revised based on input and suggestions from the experts so that the learning model is relevant to elementary school students' learning and contains elements of badminton service techniques.

Implementation

The implementation stage is an important stage in this development research, where the product of the badminton service learning model based on creative play is tested in the field to assess the effectiveness and feasibility of this product, the research was conducted in one of the educational units in East Jakarta and South Jakarta. The assessment of the effectiveness test of the model to determine how much the effectiveness value of this product is, a pretest is carried

out before this learning model is applied and a posttest after this learning model is applied. The pretest and posttest assessments are in the form of a badminton long service movement attitude assessment test with several predetermined assessment indicators.

Evaluation

The evaluation stage is the final step in this development research, where the results of the implementation of the creative play-based badminton long-serve learning model are analyzed to assess its effectiveness, efficiency, and feasibility. This evaluation aims to answer the question of whether there are deficiencies or weaknesses in the product, and whether the product is suitable for use and publication. The following are the steps in the evaluation stage:

1. Assessment analysis: assessment analysis is a summative assessment where after conducting an attitude assessment test, the data is collected and evaluated as a whole learning model by considering the data that has been collected
2. Data analysis: after the test data has been collected, the data is then processed using descriptive statistical analysis techniques to interpret the research results
3. Final revision: conducting a final revision to the learning model based on the results of the summative evaluation. If the revision has shown that the model no longer has significant deficiencies, then the badminton service learning model based on creative play is declared suitable for use and ready to be published.
4. Final recommendation: based on the results of the final revision, a proposal was made regarding the implementation of the badminton service learning model based on creative play, recommendations for further implementation

Validity and Data Analysis

The assessment instruments used in this study include a badminton long-service attitude assessment test. For data analysis, the results of the study were obtained through questionnaires, interviews, observations, and effectiveness tests.

Questionnaire

The questionnaire used a Likert scale as a guideline for analyzing the results. The questionnaire was arranged in the form of a closed questionnaire to save costs and implementation time (Roopa & Rany, 2012). The data analyzed included needs assessments and product validation results. The Likert scale was used with value intervals described in the table as follows:

- 5: Strongly Agree (SA)
- 4: Agree (A)
- 3: Undecided (U)
- 2: Disagree (D)
- 1: Strongly Disagree (SD)

The scale results are transformed into percentages using the formula:

Percentage = (maximum value ∑ value obtained) × 100

The percentage of success is categorized into the following interpretations:

- 84–100%: Very Good
- 68–83%: Good
- 52–67%: Moderate
- 36–51%: Low
- <36%: Very Low

The minimum success is set at 80%. If the product does not reach this threshold, revisions are made until it meets the criteria.

Interview

Interviews using the 5W 1H method (what, who, when, why, where, and how). The collected data is processed based on the problems to conclude. Interviews are conducted with teachers with questions that have been prepared to obtain supporting information related to the needs analysis and product models to be developed.

Observation

Observations are conducted by collecting evidence in the form of photos or videos that record important information to complete the needs analysis data. Data from observations are processed and concluded to support the development of game model products.

Effectiveness Test

This test was conducted using the pretest and posttest methods using the badminton long service skill instrument. The analysis of the results was conducted to determine the improvement of students' skills after the implementation of the learning model. Effectiveness was calculated using a paired sample test with the SPSS 26.0 program at a significance level of 0.05.

The paired sample test was used to see the difference in the average results of the pretest and posttest. The hypotheses tested are as follows:

- Ho: There is no significant increase in students' abilities after the application of the game model.
- H1: There is a significant increase in students' abilities after the application of the game model.

The test criteria are:

- If the p-value (Sig.) ≥ 0.05, then Ho is rejected and H1 is accepted.
- If the p-value (Sig.) < 0.05, then Ho is accepted and H1 is rejected.

The results of this analysis will determine the effectiveness of the learning model developed in improving students' skills.

RESULTS

Model Effectiveness Test Results

The product effectiveness test aims to determine the level of effectiveness of the badminton service learning model product based on creative play for elementary school students. The implementation process uses an experimental and control research design in the form of a pretest-posttest. The steps taken are as follows: The steps include the application of subject groups, implementation of pre-tests, application of learning models, implementation of post-tests, and statistical analysis (T-test) to measure the significant effect of using the learning model. The results of the model effectiveness test conducted in this study were the badminton service attitude skill test instrument for 60 elementary school students.

Before determining the effectiveness of the badminton service learning model based on creative play for elementary school students, there were several prerequisite tests carried out previously, namely the Normality Test and the Homogeneity Test. Descriptive data results from the normality and homogeneity tests of the badminton service learning model based on creative play for elementary school students.

Descriptive Statistics of Badminton Service Attitude Skills Test

The research was conducted on 60 students and produced scores as in the following table:

Table 1. Descriptive Statistics Pretest and Posttest

	N	Min.	Max.	Sum	Mean	Std. Deviation
Pretest_Experiment	30	4	10	224	7.47	1.634
Posttest_Experiment	30	12	18	469	15.63	1.377
Pretest_Control	30	5	10	213	7.10	1.296
Posttest_Control	30	9	14	343	11.43	1.455
Valid N (listwise)	**30**					

Based on the table above shows the measurement results of the experimental group and the control group, both before (pretest) and after (posttest) treatment. The pretest of the experimental group has a minimum value of 4, and a maximum of 10, with an average of 7.47 and a standard deviation of 1.634. After treatment, the posttest of the experimental group increased with a minimum value of 12, a maximum of 18, an average of 15.63, and a standard deviation of 1.377. Meanwhile, the pretest of the control group has a minimum value of 5, and a maximum of 10, with an average of 7.10 and a standard deviation of 1.296. The posttest of the control group also showed an increase with a minimum value of 9, a maximum of 14, an average of 11.43, and a standard deviation of 1.455. Overall, the average posttest value is higher than the pretest, both in the experimental and control groups, indicating an increase after treatment. The higher average posttest of the experimental group compared to the control group indicates the possibility of a positive effect of the treatment given to the experimental group.

Normality Test Results

Before conducting the effectiveness test, the data normality test is the first step of the data obtained from the normality test carried out with the SPSS 22 program for Windows 11 with a significance level of α (0.05) and the following hypotheses:

H0 = Data is normally distributed

H1 = Data is not normally distributed

The criteria for hypothesis testing are as follows:

If P-value / Sig> α (significant level), then H0 is accepted (Normal)

If P-value / Sig <α (significant level), then H0 is rejected (Not Normal)

The results of the normality test calculation in this study are as follows:

Table 2. Uji Normalitas Data

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Post_Control	.185	30	.010	.932	30	.056
Pre_Experiment	.179	30	.015	.939	30	.086
Post_Experiment	.177	30	.017	.934	30	.062
Pre_Control	.197	30	.004	.934	30	.064

a. *Lilliefors Significance Correction*

Based on the results of the normality test using the Shapiro-Wilk test, all data groups are in a normal distribution, with a significance value (Sig.) of more than 0.05 each. The pretest of the experimental group has a Sig. of 0.086, the posttest of the experimental group is 0.062, the pretest of the control group is 0.064, and the posttest of the control group is 0.056. This shows that all data in this study can be considered normally distributed according to the Shapiro-Wilk test which can then be continued for the homogeneity test.

Homogeneity Test Results

Homogeneity test refers to the variance or diversity of statistically equal values (homogeneity). The homogeneity test is a prerequisite test after the normality test to conduct a parametric hypothesis test in comparative technique (comparing) (Lestari & Yudhanegara, 2018 p. 248). Homogeneity test of pretest and post-test data of the experimental group and control group was conducted using IBM Statistic 22 software, with significance level α (0.05) and hypothesis as follows:

H0 = Data is homogeneous.

H1 = Data is not homogeneous.

The criteria for hypothesis testing are as follows:

If P-value / Sig> α (significant level), then H0 is accepted (Homogeneous)

If P-value / Sig <α (significant level), then H0 is rejected (Not Homogeneous).

The result of the homogeneity test calculation in this study is as follows:

Table 3. Uji Homogenitas

Levene Statistic	df1	df2	Sig.
.869	3	116	.460

Based on the table above, the results of the homogeneity test show that the Sig. The value is 0.460 > 0.05. This means that the overall pretest and posttest data of the experimental group and the control group are homogeneous. Therefore, the pretest and posttest data of the experimental group and the control group are normally distributed and homogeneous, and then the hypothesis testing is continued using parametric inferential data analysis.

Paired Sample T-Test Results

Based on the results of the normality and homogeneity tests that were met, a parametric test was carried out using the paired sample t-test to determine the effect of the pre-test with the post-test of each experimental group and control group. The data obtained were then analyzed using the SPSS 22 program for Windows 11 with a significance level of α (0.05) and the following hypotheses:

H0 = there is an effect.

H1 = there is no effect.

The criteria for testing the hypothesis are as follows:

If P-value / Sig <α (0.05), then H0 is accepted (there is a significant difference between the pre-test and post-test results)

If P-value / Sig> α (0.05), then H0 is rejected (there is no significant difference between the pre-test and post-test results)

The results of the paired sample t-test calculation in this study are as follows:

Table 4. Uji *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_Experiment - Post_Experiment	-8.167	1.289	.235	-8.648	-7.685	-34.708	29	.000
Pair 2	Pre_Control - Post_Control	-4.333	.884	.161	-4.663	-4.003	-26.847	29	.000

The results of the paired sample t-test show that the sig. (2-tailed) value of the experimental group and the control group obtained a value of 0.000, so it can be concluded that there is an influence between the experimental group and the control group from the pretest to the posttest results.

N-gain Score Test

The calculation of the NGain Score can refer to Table 5, where it refers to the NGain Score, namely high, medium, and low.

Table 5. NGain Score

Nilai *N-gain*	Interpretation
> 0,7	High
0,3 – 0,7	Medium
< 0,3	Low

Source: Meltzer & David, 2002

Table 6. Uji *NGain Score*

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
NGain_Score_Experiment	30	.57	1.00	23.55	.7850	.11452	.013
NGain_Score_Control	30	.20	.56	12.02	.4007	.08917	.008
Valid N (listwise)	30						

The NGain Score test result between the pre-test and post-test of the experimental group was 0.78, indicating that the increase in the pre-test and post-test results of the experimental group was in the high category.

The NGain Score test result between the pre-test and post-test of the control group was 0.40, indicating that the increase in the pre-test and post-test results of the control group was in the moderate category.

N-Gain Percent Test

The calculation of NGain Percent can refer to the table below, where if referring to NGain Percent, namely effective, quite effective, less effective, and ineffective.

Table 7. *NGain Percent*

Nilai *N-gain*	Interpretation
< 40	Not Effective
40 – 55	Less Effective
56 – 75	Quite Effective
> 76	Effective

Source: Hake, R R, 1999

Table 8. Uji *NGain Percent*

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
*NGain_Percent*_Experiment	30	57	100	2355	78.50	11.452	131.155
*NGain_Percent*_Control	30	20	56	1202	40.07	8.917	79.513
Valid N (listwise)	30						

The results of the NGain Percent test between the pretest and posttest of the experimental group showed an average NGain Percent value of 78.50%. Referring to Table 8. Ngain Percent, the results of this study are in the effective category.

The results of the NGain Percent test between the pretest and posttest of the control group showed an average Ngain Percent value of 40.07%. Referring to the Ngain Percent table, the results of this study are in the less effective category.

Uji Independent Sample T Test

The independent sample t-test or t-test is used to test two different groups. The independent sample t-test is carried out using IBM Statistics 22 software, with a significance level of α (0.05) and the decision-making criteria are as follows:

If P-value / Sig <α (significant level), then there is a significant difference

If P-value / Sig> α (significant level), then there is no significant difference.

The results of the calculation of the difference test for the experimental group and the control group in this study are as follows:

Table 9. Independent Sample T Test

		Levene's Test for Equality of Variances		*t-test for Equality of Means*						
		F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*	*95% Confidence Interval of the Difference*	
									Lower	*Upper*
N_Gain_ Per cent	*Equal variances assumed*	1.647	.204	14.503	58	.000	38.433	2.650	33.129	43.738
	Equal variances are not assumed.			14.503	54.712	.000	38.433	2.650	33.122	43.745

Based on the table above, the Sig. (2-tailed) value is 0.000. Therefore, the Sig. (2-tailed) value is smaller than the real level of 0.05, it can be concluded that there is a difference between the samples given the action of the creative play-based badminton long service learning model and those using the conventional method.

The value for t count shows a value of 14.503 and the t table value with df = 58 shows 2.001. Thus, because t count (14.503) > t table (2.001), the increase in badminton long service skills is in the experimental group.

Descriptive Conclusion of Creative Play-Based Badminton Service Learning for Elementary School Students

Creative play-based badminton serves learning for elementary school students and is designed to improve badminton long-serve skills in an interesting and fun way. A series of validated game models, this approach emphasizes the development of motor skills, coordination, and understanding of basic badminton techniques. This learning model uses creative games designed to attract students' interest, by including story elements and movement variations. The results of the analysis showed a significant increase in racket-holding skills, arm swings, and ball contact techniques.

This study used an experimental design with a pretest-posttest approach involving 60 students. The results of the statistical analysis showed a significant increase in the experimental group that applied the new learning model, with an average post-test score reaching 15.63, compared to the pre-test score of only 7.47. Meanwhile, the control group that did not use this model also showed an increase, but with an average post-test of 11.43, which was lower than the experimental group.

The normality and homogeneity tests of the data showed that the data were normally distributed and homogeneous, so the analysis was continued with a paired sample t-test. The

test results showed a significance value of 0.000, which means there is a significant difference between the pre-test and post-test results for both groups. In addition, the calculation of the N-gain score showed that the experimental group obtained a value of 0.78 which is in the high category, while the control group obtained a value of 0.40, which is in the medium category. These results indicate that the badminton service learning model based on creative play is effective in improving the long-service skills of elementary school students. This study emphasizes the importance of a creative approach in learning to achieve optimal results.

DISCUSSION

Development of a Badminton Long Service Learning Model Based on Creative Play

The results of the needs analysis for a creative play-based badminton long-serve learning model indicate an urgent need to develop a more interactive and fun approach for elementary school students. Through field observations, interviews with teachers, and distributing questionnaires to students, it was revealed that the conventional teaching methods currently applied tend to be less effective in attracting student interest. Students showed a neutral response to badminton learning, with most feeling that the role of teaching was not optimal in arousing student interest. Therefore, the development of a more innovative and game-based learning model is expected to increase student involvement and enthusiasm.

The design stage of the learning model includes determining learning objectives that follow the physical education curriculum and creating detailed specifications for the learning model. This model is designed to integrate basic badminton long-serve techniques into creative games so that it can attract students' attention and improve students' skills. Each game design is adjusted to the characteristics of elementary school students, to create a more interesting and effective learning environment. With this approach, it is hoped that students will not only be able to master the basic badminton serve techniques, but also enjoy a fun learning process.

Feasibility of Learning Models

In this study, researchers developed a badminton serve learning model based on creative play for elementary school students, which involved validation from material experts, learning experts, and practitioners. The validation process was carried out to ensure that the designed model was following student characteristics and learning objectives. The validation results showed that the learning model needed to be adjusted by adding elements of play and challenges to increase student motivation. Some models, such as models that were ineffective or had overlapping objectives, were eliminated, while other models were improved with clearer instructions and competitive elements.

Suggestions from the validators were accepted, and the researchers compiled a final model consisting of 16 learning models. Each model has specific objectives, appropriate media, and detailed implementation steps. The emphasis on basic techniques, variations in equipment, and social interaction are expected to increase the effectiveness of students' learning and physical skills. Thus, this model not only aims to develop badminton skills but also to prepare students for more competitive sports activities in the future.

Effectiveness of Learning Models

This study tested the effectiveness of the badminton service learning model based on creative play for elementary school students. The implementation process used an experimental research design with a pretest-posttest approach, involving 60 students as research subjects. The steps taken included the application of subject groups, implementation of pre-tests, application of learning models, implementation of post-tests, and statistical analysis using the T-

test to measure the significant effect of the learning model. The results of the analysis showed a significant increase in students' badminton service skills, with an average post-test score for the experimental group being higher than the pre-test.

The results of descriptive statistics showed that the experimental group experienced an average increase from 7.47 in the pre-test to 15.63 in the post-test, while the control group increased from 7.10 to 11.43. The normality and homogeneity tests of the data showed that the data were normally distributed and homogeneous, which allowed the hypothesis testing to be continued with the paired sample t-test. The test results showed a significance value of 0.000, which indicated a significant difference between the pre-test and post-test in both groups. In addition, the calculation of the N-gain score shows that the experimental group has a score of 0.78, which is in the high category, while the control group obtained a score of 0.40, which is in the medium category. This finding confirms that the developed learning model is effective in improving students' badminton service skills while creating a more interactive and enjoyable learning experience.

CONCLUSION

This study resulted in the development of a creative play-based badminton serve-learning model designed to meet the needs of elementary school students. Based on the needs analysis, conventional methods have proven to be less effective in arousing students' interest and enthusiasm, so a more interactive, creative, and student-characteristic learning approach is needed. The developed model integrates basic badminton serve techniques into creative games, creating an interesting and effective learning environment in improving students' skills.

The validation results showed that the learning model needed to be adjusted by adding elements of games and challenges to motivate students. After revision, the final model consisted of 16 learning designs with detailed objectives, media, and implementation steps. This model not only improves students' badminton technical skills but also prepares students to face more competitive sports activities.

The effectiveness test showed significant results, where the experimental group experienced a greater increase than the control group, both in post-test scores and N-gain scores. With a significant value in the T-test of 0.000, this model has proven effective in improving badminton serve skills, creating a more enjoyable learning experience, and encouraging active student participation. This learning model is expected to be widely applied as an innovative approach to physical education learning.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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