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DEVELOPMENT OF A TRADITIONAL GAME-BASED INTERACTIVE E-BOOK TO IMPROVE LEARNING MOTIVATION AND LONG JUMP SKILLS OF JUNIOR HIGH SCHOOL STUDENTS

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ABSTRACT
Long jump learning still faces challenges related to limited instructional media and students' mastery of movement techniques. This study aimed to develop an interactive e-book based on traditional games to improve students' learning motivation and long jump skills in junior high school. The study employed a research and development (R&D) method using the ADDIE model, consisting of five stages: analysis, design, development, implementation, and evaluation. The research was conducted among seventh-grade students at SMP Negeri 2 Madukara, involving 22 students in the experimental group and 22 students in the control group. Data were collected through expert validation, learning motivation questionnaires, long jump skill assessments, and documentation. Data analysis was performed using IBM SPSS Statistics 26, including validity testing, reliability testing, normality testing, homogeneity testing, the Mann–Whitney U Test, and effect size analysis. The results indicated that the interactive e-book based on traditional games was feasible for use based on material and media expert validation. The effectiveness test revealed that the experimental group achieved higher posttest scores than the control group. This difference was supported by a large effect size value (r = 0.85 for learning motivation and r = 0.83 for long jump skills). These findings indicate a substantial difference in learning outcomes after the implementation of the media, although learning motivation should be interpreted as students' perceptions measured through self-report instruments. Teachers can utilize interactive media integrated with traditional games as an alternative approach for creating more engaging and meaningful physical education learning experiences.

INTRODUCTIONS

Physical Education plays an important role in developing students' physical fitness, motor skills, character, and healthy lifestyles through planned physical activities (Hermansah et al., 2025). One of the learning

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materials that junior high school students need to master is long jump because this activity can train strength, speed, coordination, balance, and body movement control (Widiastuti & Hutomo, 2018; Ratnawati, 2021). Mastering long jump requires appropriate technical skills because successful performance is influenced by the integrated sequence of approach run, take-off, flight, and landing movements (Hall, 2015; Knudson, 2021). Therefore, long jump learning needs to be systematically designed so that students are able to understand and apply each stage of movement properly (Henjilito et al., 2024).

In addition to motor skill aspects, the success of long jump learning is also related to students' psychological factors, particularly learning motivation. Motivation is an important element that encourages students to actively participate in learning, practice consistently, and strive to improve their abilities. Rozi et al. (2023) explained that motivation plays an important role in increasing student engagement in Physical Education learning. In line with this statement, Satrio (2024) stated that learning motivation has a positive relationship with motor abilities and long jump learning outcomes; therefore, improving movement skills needs to be supported by learning activities that can foster students' motivation.

However, long jump learning at the junior high school level still faces challenges due to students' low mastery of basic techniques and learning motivation. Some students experience difficulties in understanding and applying basic long jump techniques (Fikri & Abid, 2025). Less varied learning activities cause students to have lower motivation to practice (Bete & Ingunau, 2021; Faradila et al., 2024). These problems were also found at SMP Negeri 2 Madukara based on preliminary observations. Long jump learning was still dominated by teacher explanations and demonstrations with limited learning resources, resulting in students' low enthusiasm, lack of confidence during practice, and difficulties in mastering approach run, take-off, flight, and landing techniques.

One of the solutions to overcome the low learning motivation and limited mastery of long jump techniques is the development of an interactive e-book as a learning medium. An interactive e-book combines text, images, audio, videos, and animations to help students learn about ideas and movement techniques in a more concrete and gradual way (Mayer, 2021). The presentation of engaging learning materials can also increase students' attention and involvement, thereby making the learning process more effective (Clark & Mayer, 2023). This finding is supported by previous studies indicating that interactive digital media can improve students' interest and learning outcomes in physical education learning (Wahyunni & Febrianta, 2023; Wulandari & Febrianta, 2024). However, previous digital media developments have generally focused on delivering learning materials and have not yet provided learning experiences that align with the characteristics of motor skill acquisition.

Therefore, interactive e-books need to be integrated with traditional games so that students understand movement techniques and apply them through meaningful activities. Traditional games involve physical activities that promote movement coordination, cooperation, and sportsmanship while simultaneously introducing local cultural values to students (Kurniati, 2016; Iswinarti, 2017; Suryani & Wibowo, 2020). Several studies have demonstrated that traditional game-based learning can improve students' learning motivation and engagement in physical education (Faradila et al., 2024; Jahya et al., 2025), particularly motivation in long jump learning (Mujriah & Susilawati, 2024). Furthermore, traditional games have also been proven effective in improving fundamental movement skills and long jump performance among students (Lou et al., 2022).

Previous studies have shown that digital media can enhance the quality of physical education learning, while other studies have confirmed that traditional games effectively improve students' motivation and long jump skills. However, these two approaches have generally been developed separately, resulting in a lack of learning media that integrates digital material delivery with traditional game activities in long jump learning. Based on this research gap, this study develops an interactive e-book based on traditional games as an innovative learning medium for physical education, particularly for long jump material in junior high schools. The novelty of this study lies in presenting multimedia-based learning materials combined with traditional game activities within a single learning medium. The e-book is designed to help students understand long jump techniques through texts, images, and videos and subsequently apply them through traditional game activities that support each stage of movement, including the approach run, take-off, flight, and landing. Thus, students not only gain conceptual understanding but also obtain gradual practical experiences through more engaging and contextual learning

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activities. Through this design, the e-book is expected to improve learning motivation based on the indicators of interest, persistence, self-confidence, independence, and active participation (Ryan & Deci, 2020), as well as enhance students' long jump skills through mastery of the learned techniques (Hall, 2015).

The purpose of this study is to develop an interactive e-book based on traditional games for long jump learning in junior high schools, evaluate the feasibility of the developed media and content, and examine its effectiveness in improving students' learning motivation and long jump skills. This study is expected to contribute theoretically to the development of physical education learning media based on technology and local culture. Practically, it may serve as an innovative alternative learning medium for teachers in improving the quality of athletic learning in schools.

RESEARCH METHOD

This study employed a research and development (R&D) approach aimed at developing an interactive e-book product based on traditional games for long jump learning and examining its effectiveness in improving students' learning motivation and long jump skills in junior high school. The R&D method was used to produce an instructional product while simultaneously evaluating its feasibility and effectiveness in the learning process (Mustofa, 2025). The product development process followed the ADDIE model proposed by Branch (2009), which consists of five stages: analysis, design, development, implementation, and evaluation. The ADDIE model was selected because it provides a systematic development procedure, beginning with needs analysis, product design, media development, product implementation, and evaluation of the developed product. The stages of the ADDIE development model are presented in the following figure.

Figure 1. Research and Development Design Based on the ADDIE Model
Source: Developed based on the ADDIE model proposed by Branch (2009)

In addition to product development, this study employed a quasi-experimental design using a pretest–posttest control group design to examine the effectiveness of the interactive e-book. This design involved a control group that received conventional learning and an experimental group that received learning activities using an interactive e-book based on traditional games. The research design is presented in table 1.

Table 1. Pretest–Posttest Control Group Design

Kelompok	Pretest	Perlakuan	Posttest
Kontrol	O_1	C	O_2
Eksperimen	O_3	X	O_4

O_1 and O_2 represent the pretest and posttest scores of the control group, while O_3 and O_4 represent the pretest and posttest scores of the experimental group. Symbol C indicates conventional learning, whereas X represents the treatment involving the use of an interactive e-book based on traditional games.

The study was conducted from January to May 2026 at SMP Negeri 2 Madukara. The research population consisted of all seventh-grade students in the 2025/2026 academic year, totaling 66 students. The sample was selected using purposive sampling based on considerations of learning needs analysis, student characteristics, and the relevance of long jump material to the research objectives. The sample consisted of 44 students, including 22 students from class VII B as the control group and 22 students from class VII A as the experimental group.

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The experimental group received learning activities using an interactive e-book based on traditional games, while the control group participated in conventional learning commonly implemented by the teacher. Product validation was conducted by two experts with relevant competencies, namely a media expert and a physical education, subject matter expert. All research procedures were conducted after obtaining permission from the school while maintaining the confidentiality of participants' data.

Data were collected through expert validation questionnaires, learning motivation questionnaires, long jump skill assessments, and documentation. The research instruments were tested for validity and reliability before being administered. Validity testing was conducted using the Pearson Product Moment correlation, while instrument reliability was analyzed using Cronbach's alpha to determine the internal consistency of the instruments. Instrument testing and data analysis were performed using IBM SPSS Statistics 26.

The learning motivation instrument consisted of a five-point Likert scale questionnaire developed based on indicators of learning interest, persistence, self-confidence, independence, and active participation, referring to the concept of self-determination theory (Ryan & Deci, 2020). The long jump skill instrument used a performance assessment sheet covering the components of approach run, takeoff, flight posture, landing technique, and students' jump distance (Hall, 2015). Skill assessments were conducted by assessors with expertise in PJOK to ensure objectivity in the measurement process.

The feasibility of the product was evaluated through validation by two experts, namely a media expert and a PJOK subject matter expert. The assessment focused on media appearance, presentation quality, material suitability, and instructional feasibility. Validation results were analyzed using descriptive quantitative analysis with a five-point Likert scale and calculated using the following percentage formula:

$$P = \frac{f}{N} \times 100\%$$

P indicates the feasibility percentage, f represents the obtained score, and N indicates the maximum score. The resulting feasibility percentage was then categorized based on the product feasibility level, namely 0%–20% as not feasible, 21%–40% as less feasible, 41%–60% as moderately feasible, 61%–80% as feasible, and 81%–100% as highly feasible (Hamzah, 2020).

The effectiveness analysis of the interactive e-book was conducted based on pretest and posttest results from both the experimental and control groups. Data were initially analyzed using descriptive statistics to describe students' learning motivation scores and long jump skill performance before and after treatment. Furthermore, students' improvement was analyzed using the Normalized Gain Score (N-Gain) developed by Hake (1999), using the following formula:

$$g = \frac{Posttest - Pretest}{scor\ Maximum - Pretest}$$

g represents the normalized gain score, while posttest refers to the score obtained after the treatment and pretest refers to the score obtained before the treatment. The N-Gain values were classified into three categories: high when $g \geq 0.70$, medium when $0.30 \leq g < 0.70$, and low when $g < 0.30$ (Hake, 1999).

Before hypothesis testing, prerequisite analyses were conducted, including the Shapiro–Wilk normality test and Levene's Test for homogeneity. The data were considered normally distributed when the significance value was > 0.05 and considered homogeneous when the significance value was > 0.05. Hypothesis testing was conducted to determine differences between the experimental group using the interactive e-book based on traditional games and the control group using conventional learning. If the data met the assumptions of normality and homogeneity, hypothesis testing was performed using the Independent Samples t-Test. However, if the data did not meet the normality assumption, the Mann–Whitney U Test was applied as a nonparametric alternative.

In addition to significance testing, effect size analysis was conducted to determine the magnitude of the effect of the interactive e-book on students' learning motivation and long jump skills. The effect size for the Mann–Whitney test was calculated using the following formula:

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$$r = \frac{|Z|}{\sqrt{N}}$$

Z represents the Mann–Whitney test statistic and N represents the total number of research participants. The interpretation of effect size followed Cohen's criteria as described by Field (2018), where r values of $0.10 \leq r < 0.30$ indicate a small effect, $0.30 \leq r < 0.50$ indicate a moderate effect, and $r \geq 0.50$ indicate a large effect (Field, 2018).

RESULTS AND DISCUSSION

RESULT

The development of the traditional game-based interactive e-book was carried out using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. Each stage produced findings that became the basis for improving the product until a learning medium that was feasible, practical, and effective for long jump learning at the junior high school level was obtained. The findings from each stage were interconnected, beginning with the identification of learning needs, media design, product development, implementation with students, and evaluation of media use. The research findings are presented based on the ADDIE development stages as follows.

1. Analysis

The analysis stage provided an overview of the initial conditions of physical education learning, media requirements, and student characteristics as the foundation for developing an interactive e-book based on traditional games. The identification results showed that long jump learning at SMP Negeri 2 Madukara still applied conventional approaches, dominated by teacher explanations, direct demonstrations, and the use of textbooks as learning resources. This condition resulted in the presentation of long jump technique materials not fully providing visual experiences that support students' understanding of movement sequences.

In terms of learning processes, students were found to experience difficulties in understanding the stages of long jump techniques, particularly the relationship between the approach run, take-off, flight phase, and landing. The limited availability of media capable of presenting detailed movement examples caused some students to have lower confidence during practical activities. Therefore, learning media that can present materials more clearly through a combination of text, images, and instructional videos are needed.

The teacher needs analysis indicated the necessity of practical and engaging digital learning media that can be used to support classroom instruction as well as independent learning. Meanwhile, the characteristics of seventh-grade students showed a greater interest in learning activities involving visual elements, interactive features, and games related to their experiences.

Based on the characteristics of the material, the long jump requires gradual movement understanding because each phase is interconnected in producing optimal jumping performance. Therefore, learning media should be able to present technical concepts, movement examples, and practice activities that systematically support skill mastery. The findings from this analysis stage served as the basis for developing an interactive e-book based on traditional games.

2. Design

The design stage was conducted based on the needs analysis results obtained from the previous stage. The product design was developed by considering the learning objectives, characteristics of junior high school students, and the requirements for presenting materials that support conceptual understanding and the gradual development of movement skills.

The first step involved formulating learning objectives aligned with the learning outcomes of physical education for the long jump topic. The e-book was designed to assist students in understanding the concepts and basic techniques of long jump systematically while improving learning motivation through engaging and interactive material presentation.

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Furthermore, the structure and content of the e-book were developed, consisting of an opening page, user instructions, learning outcomes, learning objectives, basic long jump technique materials, movement demonstration videos, introductions to relevant traditional games, interactive exercises, learning evaluations, and feedback on students' learning performance. The materials were arranged systematically to enable students to learn each stage of the long jump technique sequentially. At this stage, a storyboard was also developed as a guideline for media development. The storyboard included the layout design of each page, the sequence of material presentation, navigation between menus, placement of images and videos, and the user interaction flow during e-book utilization. The development of the storyboard aimed to ensure that all media components were organized coherently, easy to understand, and capable of providing a more engaging learning experience for students.

The next stage involved determining the software used for media development. Based on the planning results, Canva was selected as the main platform because it provides various interactive design features, supports the integration of images, videos, icons, and hyperlinks, and produces a responsive interface that can be accessed through computers and smartphones. The selection of this application also considered the ease of development, design flexibility, and usability for both teachers and students. The output of the design stage was a complete design of an interactive e-book based on traditional games, including interface design, content structure, navigation system, supporting media, and evaluation instruments. This design was then used as a reference for the product development process in the development stage.

3. Development

The development stage resulted in an interactive e-book product based on traditional games for long jump learning among junior high school students. Product development was carried out based on the storyboard and content structure designed in the previous design stage. The e-book was developed using Canva by utilizing multimedia features, including text, illustrative images, instructional videos, hyperlinks, interactive navigation, and evaluation exercises to support the physical education learning process.

The developed product contains basic long jump technique materials, including fundamental concepts, approach run, take-off, flight phase, and landing techniques. The material presentation was systematically designed by combining written explanations, movement visualizations, and demonstration videos, allowing students to understand each movement phase more concretely. In addition to technical materials, the e-book integrates traditional games, namely, *engklek* and jump rope, which were modified according to the learning objectives. The integration of these games aims to provide a more engaging learning experience through activities that develop coordination, balance, leg strength, and movement skills supporting long jump performance.

The design development process began with selecting templates that matched the characteristics of digital books and interactive learning media, followed by adjustments according to product requirements through the arrangement of colors, fonts, illustrations, icons, and page layouts. The design process started with the creation of the cover page containing the title *"Lompat Jauh: E-Book interaktif Berbasis Permainan Tradisional*" accompanied by illustrations representing long jump activities and traditional games.

Furthermore, the e-book content was organized systematically to enable students to follow the learning process sequentially, consisting of an introduction page, user instructions, learning objectives, basic long jump technique materials, traditional games, demonstration videos, interactive exercises, evaluations, and references. The product was also equipped with navigation features between menus, instructional video links, and evaluation exercises that allow students to interact directly with various learning resources within a single medium. The developed product display is presented in figure 2.

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Figure 2. Traditional Game-Based Interactive E-Book

Source: Researcher's Documentation (2026)

Before being validated by experts, the initial product underwent an internal review process to ensure the suitability of the content, appearance, navigation functions, and usability of interactive features. The review results indicated several aspects requiring improvement, including simplifying the material presentation, adjusting the layout, and enhancing the visual appearance. Revisions were made based on these findings to produce an e-book prototype ready for feasibility testing by validators. The results of the product validation by experts are presented in the following table.

Table 1. Product Feasibility Test Results

No.	Validator	Number of Assessment Aspects	Obtained Score	Maximum Score	Percentage	Category
1	Media Expert	18	71	90	78.89%	Feasible
2	Material Expert	13	53	65	81.54%	Highly Feasible

Source: Primary research data (2026)

Based on the validation results, the interactive e-book based on traditional games obtained a feasibility score of 78.89% from the media expert, categorized as feasible, and 81.54% from the material expert, categorized as highly feasible. These results indicate that the product has fulfilled the feasibility aspects related to visual presentation, media delivery, and the suitability of physical education learning materials. However, several suggestions provided by the validators were used as a basis for product refinement before implementation in the learning process.

4. Implementation

The implementation stage involved applying the interactive e-book based on traditional games that had undergone validation and revision processes, making it ready for use in physical education learning on the long jump topic for seventh-grade students. The implementation involved two groups, namely the control group and the experimental group. At this stage, both groups were administered a pretest to obtain an overview of students' initial conditions in terms of learning motivation and long jump skills before the treatment was applied.

Subsequently, learning activities in the control group were conducted using a lecture-based method, including teacher explanations, movement technique demonstrations, and practical exercises without the use of an interactive e-book based on traditional games. Meanwhile, the experimental group participated in learning activities using the interactive e-book as a learning resource. Students studied basic long jump techniques through the presentation of text, images, movement illustrations, and demonstration videos provided in the e-book. After

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understanding the materials, students engaged in practical activities by implementing modified traditional games, namely *engklek* and jump rope, as supporting activities to train movement components related to long jump skills.

The implementation results showed that the interactive e-book based on traditional games provided a more engaging learning experience and was applicable in physical education learning because it was easy to use, supported visual material delivery, and helped students connect technical understanding with enjoyable practical activities. Documentation of the implementation stage is presented in the following figure:

Figure 3. Implementation of an Interactive E-Book Based on Traditional Games to Improve Learning Motivation and Long Jump Skill Practice

Source: Researcher's Documentation (2026)

After the completion of all learning activities, both groups were administered a posttest to determine changes in learning motivation and long jump skills after the treatment. All implementation data were subsequently analyzed in the evaluation stage to determine the effectiveness of using the interactive e-book based on traditional games.

5. Evaluation

The evaluation stage was conducted by analyzing changes in students' learning motivation and long jump skills based on the pretest and posttest results of the control and experimental groups. The effectiveness of the developed product was examined using a quasi-experimental design with a pretest–posttest control group design. The control group received conventional instruction, whereas the experimental group used the interactive e-book based on traditional games. The descriptive statistical results for learning motivation and long jump skills are presented in this table.

Table 3. Descriptive Statistics of Pretest and Posttest Scores

	Group	N	Total Score	Min	Max	Mean	Std. Deviation
Learning Motivation (Pretest)	Control	22	261	9	15	11.86	2.167
	Experimental	22	354	9	16	11.82	2.281
Learning Motivation (Posttest)	Control	22	260	11	20	16.09	2.114
	Experimental	22	474	20	24	21.55	1.224
Long Jump Skills (Pretest)	Control	22	260	9	15	11.82	1.943
	Experimental	22	358	9	15	11.91	2.223
Long Jump Skills (Posttest)	Control	22	262	12	20	16.27	2.229
	Experimental	22	479	19	24	21.77	1.412

Source: Primary data processed using IBM SPSS Statistics 26.

The results presented in table 3 indicate that the control and experimental groups had relatively comparable baseline conditions before the intervention. Following the implementation of the learning intervention, the experimental group demonstrated higher posttest mean scores than the control group in both learning motivation and long jump skills. These findings suggest that the interactive e-book based on traditional games was more effective than conventional instruction in improving students' learning motivation and long

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jump skills. The integration of digital learning materials, movement visualizations, and traditional game-based activities provided a more engaging learning experience and promoted greater student participation throughout the learning process.

After comparing the pretest and posttest mean scores, the Normalized Gain Score (N-Gain) was calculated to determine the magnitude of improvement in each group for both learning motivation and long jump skills. The N-Gain values were obtained by comparing students' scores before and after the learning intervention in the control and experimental groups. This analysis provides an initial overview of students' learning improvement before conducting further inferential statistical analyses. The N-Gain results are presented in table 4.

Table 4. N-Gain Analysis

Variable	Group	Pretest	Posttest	N-Gain
Learning Motivation	Control	11.86	16.09	0.32
	Experimental	11.82	21.55	0.74
Long Jump Skills	Control	11.82	16.27	0.34
	Experimental	11.91	21.77	0.75

Lilliefors Significance Correction

Source: Primary research data processed using IBM SPSS Statistics 26

The N-Gain analysis revealed differences in the magnitude of improvement between the control and experimental groups. For learning motivation, the experimental group achieved a higher N-Gain score (0.74, high category) than the control group (0.32, medium category). A similar pattern was observed for long jump skills, with the experimental group obtaining an N-Gain score of 0.75 (high category), compared with 0.34 (medium category) in the control group. These findings indicate that the interactive e-book based on traditional games was more effective than conventional instruction in improving students' learning motivation and long jump skills.

Before hypothesis testing, a normality test was conducted to examine the distribution of the research data. The normality test was performed on the learning motivation and long jump skill data from both the experimental and control groups. Since the sample size in each group was fewer than 50 participants, normality was assessed using the Shapiro–Wilk test. The data were considered normally distributed when the significance value exceeded 0.05. The results of the normality test are presented in table 5.

Table 5. Normality Test Results

Tests of Normality

	Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Learning Motivation (Pretest)	Control	0.169	22	0.104	0.899	22	0.028
	Experimental	0.151	22	0.200*	0.907	22	0.041
Learning Motivation (Posttest)	Control	0.154	22	0.193	0.947	22	0.276
	Experimental	0.173	22	0.084	0.899	22	0.029
Long Jump Skills (Pretest)	Control	0.189	22	0.040	0.912	22	0.052
	Experimental	0.168	22	0.106	0.893	22	0.021
Long Jump Skills (Posttest)	Control	0.185	22	0.048	0.923	22	0.086
	Experimental	0.162	22	0.136	0.942	22	0.220

*. This is a lower bound of the true significance.

Lilliefors Significance Correction

Source: Primary research data processed using IBM SPSS Statistics 26

The normality test using the Shapiro–Wilk test showed that some datasets had significance values below 0.05, while others had significance values above 0.05. These results indicate that the data distribution for learning motivation and long jump skills did not fully satisfy the assumption of normality.

After conducting the normality test, the next step was the homogeneity test to determine whether the variances between the experimental and control groups were equal. The homogeneity test was performed using

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the Levene test, with the decision criterion that the data were considered homogeneous if the significance value was greater than 0.05. The results of the homogeneity test for learning motivation and long jump skills are presented in the following table.

Table 6. Homogeneity Test Results

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Learning Motivation (Pretest)	Based on Mean	0.010	1	42	0.921
	Based on Median	0.018	1	42	0.895
	Based on Median and with adjusted df	0.018	1	40.927	0.895
	Based on trimmed mean	0.009	1	42	0.924
Learning Motivation (Posttest)	Based on Mean	4.745	1	42	0.035
	Based on Median	4.196	1	42	0.047
	Based on Median and with adjusted df	4.196	1	31.594	0.049
	Based on trimmed mean	5.083	1	42	0.029
Long Jump Skills (Pretest)	Based on Mean	1.119	1	42	0.296
	Based on Median	1.191	1	42	0.281
	Based on Median and with adjusted df	1.191	1	41.790	0.281
	Based on trimmed mean	1.109	1	42	0.298
Long Jump Skills (Posttest)	Based on Mean	4.232	1	42	0.046
	Based on Median	2.935	1	42	0.094
	Based on Median and with adjusted df	2.935	1	34.428	0.096
	Based on trimmed mean	4.364	1	42	0.043

Lilliefors Significance Correction

Source: Primary research data processed using IBM SPSS Statistics 26

Based on the Levene test results, some datasets showed homogeneous variances, while others did not. The pretest data for learning motivation and long jump skills had significance values greater than 0.05, indicating that both groups had relatively similar data distributions. However, the posttest data for learning motivation and long jump skills obtained significance values below 0.05 based on the mean test, indicating differences in variance between the control and experimental groups.

Based on the results of the prerequisite tests, the research data did not completely meet the assumptions of normality and homogeneity. Therefore, the comparison between the control and experimental groups was analyzed using the non-parametric Mann–Whitney U Test, which does not require normally distributed data or equal variances. This test was conducted to determine the differences in the effectiveness of the interactive e-book based on traditional games on students' learning motivation and long jump skills. The results are presented in the following table.

Table 7. Hypothesis Testing Results (Mann–Whitney U Test)

Test Statistics[a]

	Learning Motivation (Pretest)	Learning Motivation (Posttest)	Long Jump Skills (Pretest)	Long Jump Skills (Posttest)
Mann-Whitney U	239.500	2.500	239.000	8.500
Wilcoxon W	492.500	255.500	492.000	261.500
Z	-0.059	-5.659	-0.071	-5.512
Asymp. Sig. (2-tailed)	0.953	0.000	0.943	0.000

Grouping Variable: Group

Source: Primary data processed using IBM SPSS Statistics 26

The Mann–Whitney U test results indicated no significant differences between the control and

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experimental groups in the pretest scores of learning motivation and long jump skills, suggesting that both groups had comparable initial abilities before the intervention. In contrast, the posttest scores showed significant differences between the two groups for both variables ($p < 0.05$). These findings indicate that students who learned using the interactive e-book based on traditional games achieved better improvements in learning motivation and long jump skills compared with students who received conventional instruction.

Tabel 8 Effect Size

Test	Z	N	Effect Size (r)
Learning Motivation (Pretest)	-0,059	44	0,01
Learning Motivation (Posttest)	-5,659	44	0,85
Long Jump Skills (Pretest)	-0,071	44	0,01
Long Jump Skills (Posttest)	-5,512	44	0,83

Source: Primary data calculated based on Mann–Whitney U test results from IBM SPSS Statistics 26.

The effect size analysis showed that the treatment effect on the pretest data was categorized as very small, indicating that the initial abilities of both groups were relatively equivalent before the intervention. In contrast, the posttest results demonstrated a large effect size, with values of 0.85 for learning motivation and 0.83 for long jump skills. These findings indicate that the use of an interactive e-book based on traditional games had a strong effect on improving students' learning motivation and long jump skills. The results suggest that the effectiveness of the developed product was not only demonstrated through statistically significant differences but also through the magnitude of its impact on the learning process.

DISCUSSION

The development of an interactive e-book based on traditional games for long jump learning demonstrated that students who used the interactive e-book achieved higher posttest scores in learning motivation and long jump skills compared with those who received conventional instruction. The Mann–Whitney U test revealed significant differences in both research variables ($p < 0.05$). These differences also showed practical significance, as indicated by the large effect size values of 0.85 for learning motivation and 0.83 for long jump skills. Furthermore, the experimental group obtained higher posttest improvements and N-Gain scores than the control group in both variables. These findings indicate that the use of an interactive e-book based on traditional games has the potential to support improvements in students' learning motivation and long jump skills. However, because this study employed a quasi-experimental design without random assignment, the findings should be interpreted as an association between the use of the interactive e-book and improvements in learning motivation and long jump skills rather than as absolute evidence of causal relationships.

The differences between the experimental and control groups became more evident because the pretest results showed that both groups had relatively similar initial abilities. After the learning intervention, the experimental group demonstrated greater improvements in learning motivation and long jump skills. This condition suggests that learning through more interactive media provides a different learning experience compared with conventional instruction. Mustofa (2025) explained that changes in students' achievement can be understood by comparing outcomes before and after the learning process, allowing improvements to be associated with the learning experiences obtained by students. In this study, the interactive e-book provided a richer learning experience because students were not only exposed to textual information but also observed movement demonstrations, engaged in traditional game activities, and developed conceptual understanding before performing physical practice.

The improvement in long jump skills among students in the experimental group indicates that the interactive e-book helped students understand movement phases more clearly. The materials covering approach, run, take-off, flight, and landing techniques were presented through a combination of text, images, and demonstration videos, enabling students to visualize each phase of the movement. This finding aligns with the

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principles of motor skill learning, which emphasize that movement mastery requires understanding movement patterns, observing demonstrations, and conducting repeated practice (Hall, 2015; Knudson, 2021). In long jump performance, success is not solely determined by physical strength but also by the coordination of approach speed, take-off accuracy, body position during flight, and landing technique (Nasser et al., 2021). Therefore, the presence of videos and illustrations in the e-book provided visual support that helped students understand the relationship among the different phases of the movement.

The findings are also supported by Bete & Ingunau (2021), who found that the traditional game *tali merdeka* improved students' achievement in squat-style long jump performance. Their study emphasized that jumping-based traditional games can serve as an effective strategy for developing students' physical abilities. However, their research primarily focused on traditional games as movement training activities, whereas the present study provides an additional contribution by developing an interactive e-book that integrates traditional games with technical explanations, instructional videos, and learning evaluations. Thus, traditional games in this study function not only as physical activities but also as structured components of a learning medium.

A different perspective was presented by Kristina et al. (2025), who utilized *engklek* and jumping rope games as approaches to support students' long jump abilities. Their findings strengthen the argument that traditional games have potential in physical education learning, particularly for activities requiring coordination and jumping ability. Nevertheless, the present study extends this approach by positioning traditional games not merely as exercise methods but as components of an interactive digital learning medium. Through this approach, students gained both physical experiences from movement activities and conceptual understanding of techniques through various visual representations.

This finding is further supported by Faradila et al. (2024), who reported that traditional games in physical education learning could increase student motivation by creating enjoyable learning environments and encouraging active participation. However, their study used traditional games primarily as a learning strategy, whereas the present study developed a digital learning medium that combines traditional games with interactive technology. This distinction indicates that the novelty of the current study lies not only in the use of traditional games but also in their integration into a flexible digital learning resource.

The advantages of interactive e-books can also be explained through Mayer's Multimedia Learning Theory (2021), which states that the combination of text, images, and multimedia elements can support students' understanding through more effective cognitive processing. Clark and Mayer (2023) further emphasized that well-designed multimedia learning can improve engagement and learning effectiveness because students receive information through multiple representations. In this study, presenting long jump techniques through illustrations and videos enabled students to obtain clearer representations of movement compared with relying solely on verbal explanations or textbooks. Therefore, the contribution of the interactive e-book does not merely lie in the use of technology but in how technology is utilized to clarify concepts and support learning activities. Multimedia designed based on pedagogical principles plays an important role in physical education learning, particularly for materials requiring both conceptual understanding and motor skill mastery.

Although the findings demonstrated positive effects of the interactive e-book, differences were observed in the magnitude of improvement between the two aspects studied. In long jump skills, the experimental group showed greater improvement because the media directly supported movement understanding and practice. Meanwhile, improvements in learning motivation may have been influenced by other factors, such as teacher instructional methods, previous learning experiences, classroom environment, and individual student characteristics. This indicates that changes in motivation are not solely determined by learning media but also influenced by various internal and external factors supporting the learning process.

Overall, this study demonstrates that an interactive e-book based on traditional games represents an innovative physical education learning medium capable of improving students' learning motivation and long jump skills. Unlike previous studies that generally employed traditional games as training activities or instructional approaches, this study developed a digital medium integrating local cultural elements, multimedia, and interactive activities within a single learning product. Therefore, the interactive e-book based on traditional

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games functions not only as an information source but also as a learning tool that creates a more engaging, contextual, and meaningful physical education experience for junior high school students.

CONCLUSION

The development of an interactive e-book based on traditional games for long jump learning produced a physical education learning medium that was considered feasible based on expert validation. The effectiveness test revealed significant differences, with the experimental group achieving higher posttest scores and larger effect sizes than the control group in terms of learning motivation and long jump skills. These differences were further supported by large effect size values, indicating a strong difference in achievement after the implementation of the learning medium. However, learning motivation outcomes should be interpreted carefully because they represent students' perceptions measured through self-report instruments; therefore, the interpretation should consider other factors that may contribute to the learning process.

Theoretically, this study strengthens the view that digital learning media integrated with traditional games can serve as an innovative approach in physical education by connecting conceptual understanding of movement with direct practical experiences. Practically, an interactive e-book based on traditional games can be utilized by physical education teachers as an alternative learning medium to assist students in understanding long jump techniques and increasing their engagement during the learning process.

This study has limitations related to the use of a quasi-experimental design; therefore, the relationship between the use of the interactive e-book and learning outcomes should be interpreted proportionally. In addition, the limited sample size and involvement of only one school restrict the generalizability of the findings. The measurement of learning motivation using self-report instruments may also be influenced by students' subjective perceptions. Future studies are recommended to involve larger samples, include multiple schools with diverse characteristics, and apply advanced research approaches, such as mixed-methods or longitudinal studies, to obtain deeper insights into the sustainability of the interactive e-book's effects on students' learning motivation and motor skills.

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