JPES 14 (3) (2025)

Journal of Physical Education and Sports

http://journal.unnes.ac.id/sju/index.php/jpes

Development of Interactive Volleyball Learning Media Using Smart Apps Creator in Junior High Schools

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Article Info

History Articles
History Articles
Received:
January 2025
Accepted:
Agustus 2025
Published:
September 2025

Keywords:
Development, Learning Media, Smart Apps Creator, Volleyball.

Abstract

This study addresses challenges in junior high school volleyball learning, including low student interest, substandard cognitive achievement, and teacher-centered instruction. The research aims to design and develop interactive learning media using Smart Apps Creator to enhance students' cognitive understanding of volleyball. Conducted in Dagangan District, Madiun Regency, the study employed research and development (R&D) with a mixed-methods approach and a quasi-experimental design (nonequivalent control group). Data were gathered from three experts (content, media, pedagogy), 200 eighth-grade students, and three physical education teachers from two public junior high schools. The development followed the ADDIE model: analysis, design, development, implementation, and evaluation. Results showed that the interactive media significantly improved students' cognitive understanding, with statistical analysis confirming a notable difference between experimental and control groups. Experts rated the media as "very good," while students and teachers responded positively. This study highlights the potential of Smart Apps Creator as an effective tool for enhancing learning outcomes, promoting technology integration in education, and serving as a reference for future research and development in digital learning media.

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p-ISSN 2252-648X
e-ISSN 2502-4477

INTRODUCTION

The rapid development of information and communication technology has driven a paradigm shift in the field of education (Abadi et al., 2024). Twenty-first century learning no longer relies solely on conventional methods but is required to be more innovative, interactive, and capable of actively engaging students. In the context of learning at the junior high school level, particularly in the subject of Physical Education, Sports, and Health (PJOK), a learning approach that aligns with the characteristics of the students is of paramount importance. PJOK, as a subject that emphasizes the mastery of motor skills and the understanding of movement concepts, requires learning media that can provide engaging and easily comprehensible learning experiences.

One of the essential topics in Physical Education, Sports, and Health (PJOK) is volleyball. This topic covers various fundamental techniques, such as serving, passing, spiking, and blocking, which require both theoretical understanding and practical skills. However, in practice, the learning process of volleyball still faces several challenges, particularly in terms of content delivery and student engagement.

Observations of the volleyball learning activities at a public junior high school in Dagangan Subdistrict, Madiun Regency, revealed several issues that directly impacted students' learning evaluation results. Based on the evaluation data, approximately 24 out of 30 students, or 75%, scored below the Minimum Mastery Criteria (KKTP) in the cognitive aspect. This indicates a low level of student understanding of the volleyball material that has been taught.

Further investigation revealed that the primary cause of the low learning outcomes was the teaching method employed by the PJOK teacher. The teacher still relied heavily on the lecture method as the main approach and used limited learning media, such as textbooks, PowerPoint presentations, and videos from YouTube. This teacher-centered learning model tended to make students passive and less actively engaged in the learning process. In addition, the teacher had not yet optimally integrated educational technology, particularly interactive media that could stimulate students' interest and direct involvement.

This condition highlights the importance of innovation in learning media, particularly those that can address the challenges of limited interaction, low student motivation, and restricted access to technology in schools. One potential solution is the use of media based on Smart Apps Creator (SAC), a software tool for developing interactive learning applications that operate offline, thereby eliminating the need for an internet connection (Kasna et al., 2023). Smart Apps Creator enables teachers to design learning media that integrates text, images, videos, animations, and quizzes into a single platform that is user-friendly for students.

Several previous studies have shown that the use of interactive application-based learning media can improve students' conceptual understanding and learning motivation. For example, (Hasibuan, 2024) found that interactive PJOK media significantly increased student participation. Meanwhile (Suhartati, 2021) demonstrated that Smart Apps Creator is effective in improving junior high school students' learning outcomes in science subjects. However, there is still a lack of research that specifically develops and evaluates the use of Smart Apps Creator-based media for volleyball material in the context of PJOK learning at the junior high school level, particularly in areas with limited internet connectivity.

Based on the background, this study aims to develop interactive learning media based on Smart Apps Creator for volleyball material for junior high school students, as well as evaluate the feasibility and effectiveness of the media as an alternative support for the PJOK learning process. This research is expected to contribute both theoretically, in the development of digital learning media models, and practically, in enhancing the quality of learning in junior high schools.

METHODS

The method used in this study is Research and Development (R&D), with a mixed approach of qualitative and quantitative methods and a quasi-experimental design using a nonequivalent control group model. Data were collected from three experts (in content, media, and pedagogy), 200 eighth-grade students, and three physical education teachers from two public junior high schools in Dagangan Subdistrict. This study follows the ADDIE development model stages, consisting of three main phases: preliminary study, development, and evaluation.

RESULTS AND DISCUSSION

Analysis

The analysis in this study was conducted in two phases. The first phase involved a literature review to support the development of a conceptual model by studying the curriculum and volleyball material. The second phase was a field study conducted at two public junior high schools in Dagangan Subdistrict, namely SMP Negeri 1 and SMP Negeri 2, to assess the field conditions and identify the needs of teachers and students.

In the initial phase, the literature review served to develop a preliminary conceptual model by analyzing the junior high school curriculum and volleyball-related content. This review provided a theoretical foundation for the subsequent stages of product development.

To complement the literature review, data collection was also carried out using questionnaires. These were designed to gather information on current learning practices, the use of instructional media, and the availability of facilities and infrastructure in the schools. This combination of theoretical and field-based analysis ensured that the development of the learning media would be both pedagogically sound and practically applicable.

Students tend to prefer learning methods that are visual and interactive. Many of them struggle to understand material that is presented theoretically or in a monotonous way. The use of media such as images, diagrams, videos, and multimedia presentations is considered more engaging and capable of increasing learning motivation. Over 80% of students expressed a desire to use interactive application-based learning media. In addition, nearly all students already own devices such as smartphones or laptops that can be utilized to support the learning process. This is further supported by research (Nurfadhillah, 2021) Many students desire interactive learning media that utilize educational applications. The creation of interactive learning media using Smart Apps Creator aims to make volleyball learning more engaging, easier to understand, and capable of increasing student motivation. These findings align with the results of the needs analysis from both teachers and students, which emphasize the importance of integrating technology into the learning process to achieve more optimal outcomes (Jamun et al., 2023).

Design

Flowchart

Flowchart It contains an overview of the flow in the Smart Apps Creator based learning media.

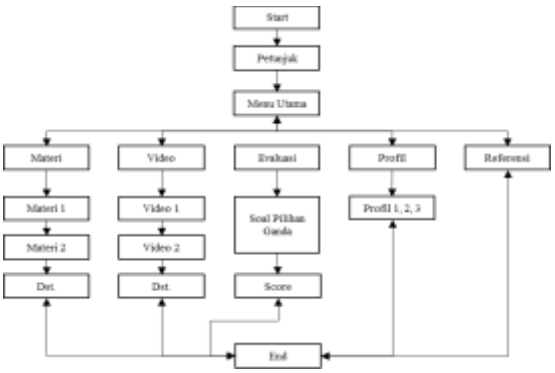

Figure 1. Flowchart

Storyboard

Storyboard It provides a more detailed description of the flow and visual display in the Smart Apps Creator based interactive learning media.

Figure 2. Storyboard

Initial Product Development

Figure 3. Initial Product

In the design phase, the Smart Apps Creator based learning media was developed with a focus on interactivity and ease of use, in order to support volleyball learning. The design process began with the creation of a flowchart to illustrate the overall workflow of the application, allowing users to navigate the app easily and intuitively. The media is divided into several menu sections, including the main menu, material menu, video menu, and evaluation. This division helps create a clear structure and system within the app, enabling students to learn independently (Senge, 2023).

The next step is the storyboard, which provides a more detailed outline of the presentation of material and the forms of interaction within the learning media. The creation of the storyboard also plays a crucial role in ensuring the smoothness of each display and interaction, so that they align with the established learning objectives. As stated by (Ramadhan et al., 2025) That all visual and auditory elements in interactive-based learning can significantly enhance students' understanding.

The process of creating the initial design of the Smart Apps Creator-based interactive learning media begins with the development of a prototype for the initial display of the learning material (Nugroho et al., 2025). Upon opening the application, the main page directly leads to a usage guide. In addition to the main menu, material menu, and video menu, this media also includes an evaluation menu, which tests students' understanding of volleyball material through multiple-choice questions and provides immediate feedback to the students. This process aligns with the research (Gan et al., 2021) That the principle of technology-based evaluation emphasizes the importance of feedback in improving students' learning outcomes.

Development

In this phase of development, the evaluation was conducted by three experts: a content expert, a media expert, and a pedagogy expert, and was supplemented with feedback from students and teachers.

Table 1. Expert Assessment

Evaluation	Indicator		Expert 1	Expert 2	Expert 3	Mean
Content Expert	Learning Content	9	3.88	3.77	4.00	3.88
	Language Use	2	4.00	4.00	4.00	4.00
Media Expert	Display Design	6	3.83	3.83	3.83	3.83
	Animation	3	4.00	3.66	4.00	3.88
	Ease of Operation	3	4.00	4.00	4.00	4.00
Pedagogy Expert	Curriculum	2	4.00	4.00	4.00	4.00
	Media Components	3	4.00	4.00	4.00	4.00
	Role of Media	3	4.00	4.00	3.00	3.66
	Evaluation Questions	2	3.00	4.00	4.00	3.66

The small-scale testing was conducted at SMP Negeri 2 Dagangan, involving one class consisting of 25 students. Before the assessment, the students were given a guide on how to use the Smart Apps Creator based interactive learning media. After understanding how to use it, they tried the media and filled out the evaluation sheet. The results indicated that the media functioned optimally and all features operated smoothly. Below are some comments and feedback from the students:

Student 1: "I really like this application; it's good and interesting."

Student 2: "The application is very good, easy to understand, and very useful."

Student 3: "I really like this application and feel very motivated to learn."
Student 4: "The application is very supportive for learning using a smartphone."
Student 5: "The videos are easy to understand and very engaging."

Based on the small-scale testing, the Smart Apps Creator-based interactive learning media received an average score of 82%, reflecting positive responses from students. The media was considered engaging, easily accessible, and effective in delivering the basic concepts of volleyball in an interactive manner.

After the large-scale testing in two schools with 85 students and 3 physical education teachers, the Smart Apps Creator-based interactive learning media received very positive feedback. No technical issues were encountered, with an assessment score of 88% from students and 96% from teachers, indicating that the media was well accepted by users. Below are some statements from the students:

Student 1: "This media is really fun. I can now learn how to play volleyball through my phone."
Student 2: "I think this media is great. It makes me more excited to learn."
Student 3: "It's perfect for learning volleyball. I hope there's media like this for other subjects."
Student 4: "I'm really happy to be able to learn with this media. It makes learning so much easier."
Student 5: "It's so fun to be able to learn while watching videos."

The positive responses from students reinforce that this learning media has high potential for further development and wider use. Not only students, but physical education teachers also gave positive feedback about the media. They assessed that the media is beneficial in assisting volleyball technique learning.

Teacher 1: "I assess that this media is effective for introducing basic volleyball techniques."

Teacher 2: "The visual presentation makes it easier for students to understand the material."
Teacher 3: "Adding features like videos, animations, and quizzes makes the learning process more engaging."

Overall, the Smart Apps Creator-based volleyball learning media was assessed as effective, interactive, and enjoyable. Both students and teachers gave positive feedback because the media was able to present basic volleyball techniques in an engaging and easy-to-understand manner.

In the feasibility phase, the Smart Apps Creator-based learning media for volleyball material was validated by content, media, and pedagogical experts (Wahyudi, 2024). The evaluation was conducted to assess the feasibility of the content, design, and learning aspects. The content expert evaluated the accuracy of the material, the media expert assessed the interface design and ease of use, while the pedagogical expert reviewed its alignment with the curriculum and the effectiveness of interaction. Based on the evaluation results, the media was deemed feasible for use with several improvements, such as button layout adjustments, color changes, the addition of icon labels, and optimization of interactive features. This aligns with previous research conducted by (Usmaedi et al., 2020) That the validation process by experts is a crucial stage to ensure the appropriateness of the content and design within the learning application, which in turn can enhance the quality of the developed media. This statement is supported by (Maher et al., 2024) which shows that the role of experts in content, media, and pedagogy is essential in ensuring that educational applications meet the principles of effective learning.

After being validated by experts, the application was tested on a small group involving students. The purpose of this trial was to obtain initial user feedback and input regarding the functionality and content of the application. The results of this limited trial provided an overview of how effective the media was during its initial use and helped identify issues that needed to be addressed before broader testing. Feedback from the students indicated a positive response, and no major problems were found.

Research conducted by (de Leonardis et al., 2025) It shows that limited trials involving students provide important insights in identifying both technical and aesthetic issues within the application. These findings support the effectiveness of small-scale testing as a method for obtaining more specific feedback before the application is introduced on a broader scale. In more detail (Punys, 2025) It also reinforces that small-scale testing is a strategic step to identify obstacles that may have been overlooked during the early stages of educational application development, while also serving as an important foundation for improvements in the subsequent stages.

After ensuring there were no technical issues, the next step was large-scale testing involving more students and teachers. This trial aimed to evaluate the effectiveness of the media in a real-world context and to identify any shortcomings that had not previously been revealed. The results of this field trial would provide comprehensive information about the role of the media in supporting vollyball learning in junior high schools and serve as a basis for final adjustments before broader implementation.

Research conducted by (Gooch et al., 2024) It shows that large-scale field testing is effective in identifying weaknesses that were not apparent in previous stages. The involvement of both teachers and students provides a more comprehensive perspective on the strengths and weaknesses of the application, which serves as the basis for improvements before wide-scale implementation. Similar findings were also presented by (Ullah et al., 2025) which states that field testing allows the application to be tested in conditions that more closely resemble real-world usage.

Large-scale trials showed a positive response from students and teachers. Students felt more motivated to learn through the animation features, which according to (Michel & Förster, 2025) increased engagement and learning effectiveness. These findings are supported by (Pan et al., 2025) which states that game elements enhance concept understanding. Teachers assess that this media helps explain movements visually better than conventional methods, in line with (Nikula et al., 2024) which mentions that interactive multimedia enhances student understanding. This media also addresses the limitations in volleyball learning. (Wu et al., 2025) emphasizes that technology in physical education enables students to learn independently, and (Rao, 2024) shows that a enjoyable learning environment can enhance students' intrinsic motivation. (Schneider et al., 2023) also concludes that animation in sports education enhances the effectiveness and efficiency of teaching.

Implementation

The implementation stage was carried out by measuring the impact of using interactive learning media based on Smart Apps Creator on volleyball material for eighth-grade students. This study used a quasi-experimental method with a nonequivalent control group design. In this stage, two schools were involved, namely SMP Negeri 1 Dagangan and SMP Negeri 2 Dagangan, with each serving as a control class and a treatment class, with each class consisting of 30 students.

Before the learning process began, a pretest was conducted to assess students' initial cognitive abilities, using instruments that had been tested for validity and reliability. Based on the pretest results, the class with the lowest scores was chosen as the experimental class, which used the Smart Apps Creator interactive learning media, to assess whether this media could improve cognitive knowledge compared to conventional methods. The learning process was carried out in three sessions. In the first session, both groups took the pretest. During the learning process, the experimental class used interactive media, while the control class used conventional methods. After the session, both groups took a post-test. The class without the Smart Apps Creator media was labeled "A," while the class that used it was labeled "B."

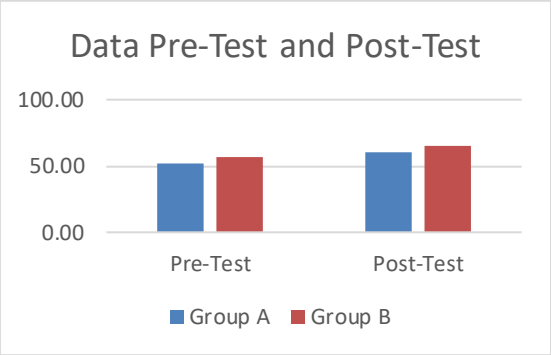

Figure 4. Pre-Test and Post-Test

The results of the implementation stage of learning, as shown in the image, display the outcomes for the control group, where the average (mean) score for the cognitive aspect in the pre-test indicates that both groups had relatively balanced abilities. This is evident from the nearly identical average scores, which suggest that both groups were homogeneous before the treatment. After the post-test, a significant improvement was observed in the cognitive aspect, with the treatment class recording the highest average scores in every criterion.

This stage focuses on evaluating the effectiveness of the interactive learning media based on *Smart Apps Creator* in teaching volleyball to eighth-grade junior high school students. The study employed a quasi-experimental method with a nonequivalent control group design, conducted at SMP Negeri 1 and 2 Dagangan, involving 30 students. Prior to the learning activities, a pretest was administered to assess students' initial cognitive abilities. The pretest results were used to determine the experimental group, consisting of students with lower initial scores. This approach aligns with the findings of (Mueller et al., 2024) This approach aligns with the findings of previous studies that emphasize the importance of conducting initial assessments to ensure that the experimental and control groups have comparable levels of ability before receiving the treatment.

The learning process took place over three sessions. In the experimental group, students used interactive media based on *Smart Apps Creator*, while the control group participated in lessons using traditional teaching methods without the aid of interactive technology. Previous studies (Indarto et al., 2024) Previous studies have shown that the use of technology-based media can enhance students' understanding by enabling more active engagement with the learning material. After all learning sessions were completed, a posttest was conducted to evaluate students' cognitive understanding. The results indicated that students in the experimental class experienced a significant improvement in cognitive aspects compared to those in the control class. These findings are consistent with (Setiawan et al., 2020) These findings are consistent with research stating that interactive technology not only supports cognitive understanding but also helps develop practical skills, such as those related to psychomotor aspects.

Evaluation

The evaluation stage aims to analyze the effect of the Smart Apps Creator learning

media on students' cognitive outcomes before and after its use. The analysis was conducted using the Paired Sample t-Test to examine significant differences between the pretest and post-test scores within the same group. Before performing this test, two prerequisite tests were required: the normality test and the homogeneity test. The normality test aims to ensure that the data is normally distributed, in accordance with the basic assumption of the Paired Sample t-Test. Meanwhile, the homogeneity test is used to determine the similarity of variances, although it is not a primary requirement for this analysis.

Normality Test of Data

Normality testing is used to ensure that the data follows a normal distribution, which is one of the fundamental assumptions in the Paired Sample t-Test.

Table 2. Normality Test

Variable	Statistic	df	Sig.
Pre Test Group A	.968	30	.497
Pre Test Group B	.958	30	.270
Post Test Group A	.934	30	.068
Post Test Group B	.971	30	.555

The results of the normality test indicate that all variables have a normal distribution, as evidenced by the significance values greater than 0.05.

Homogeneity Test

The homogeneity test is conducted to determine whether there is similarity in variances, although it is not a primary requirement in this analysis.

Table 3. Homogeneity Test

Variable	Statistic	df1	df2	Sig.
Pre Test Group AB	1.904	1	58	.173
Pre Test Group AB	2.514	1	58	.118

The results of the homogeneity test indicate that the variances between groups in the pre-test and post-test are homogeneous, as evidenced by significance (Sig) values greater than 0.05 for all variables. Therefore, the data meet the requirements for conducting a Paired Sample t-Test.

Paired Sampel t-test

The Paired Sample t-Test is a statistical test aimed at determining whether there is a significant difference between the mean values of the pre-test and post-test within the same group.

Table 4. Paired Sampel t-Test

Variabel	Group A			Group B		
	t	*df*	*Sig.*	*t*	*df*	*Sig.*
Cognitive	3.061	29	.005	1.936	29	.063

The results of the Paired Sample t-Test indicate that Group A experienced a significant improvement in cognitive abilities, with a t-value of 3.061 and a significance level of 0.005. Meanwhile, Group B did not show a significant improvement (t = 1.936; sig. = 0.063). This demonstrates that the interactive learning media based on Smart Apps Creator has a positive impact on enhancing students' cognitive learning outcomes.

In the evaluation stage, an analysis was conducted on students' cognitive results to assess the contribution of the interactive learning media based on *Smart Apps Creator* in enhancing learning abilities. The purpose of this evaluation is to assess the effectiveness of the media in developing cognitive aspects. The results showed that *Smart Apps Creator* was more effective compared to conventional methods. This is supported by research (Subekti & Raharjo, 2023) This is supported by research stating that interactive technology can increase student engagement and assist in understanding concepts that are difficult to learn through traditional approaches.

Students who used this media experienced a significant improvement, with the majority reaching a high achievement category, in line with the findings of (Hadad Salahuddin,

2021) This is supported by research stating that technology-based media can significantly improve learning outcomes, particularly in physical education. Further analysis through statistical testing showed that the data were normally distributed and homogeneous, allowing for the application of the t-test. The test results revealed a significant difference between the experimental and control groups, proving that *Smart Apps Creator* has a strong positive impact on enhancing students' cognitive abilities. This is reinforced by studies (Elviana & Julianto, 2022) This is reinforced by studies stating that this media is capable of improving students' understanding, attitudes, and skills overall.

CONCLUSION

The conclusion of this study indicates that the interactive learning media based on *Smart Apps Creator* is more effective than conventional teaching methods in enhancing students' cognitive aspects in volleyball education at the junior high school level. This media received an "excellent" rating from subject matter experts, media experts, and pedagogical experts. The trial also showed that both students and teachers accepted the use of this media positively, with high scores in terms of effectiveness and enjoyment of use. This learning media has great potential in the field of sports education and is expected to continue being developed to support the teaching of other subjects.

ACKNOWLEDGEMENT

The author would like to express gratitude to all parties who have provided support in the implementation of this research. Special thanks are extended to the teachers and students of SMP Negeri 1 Dagangan and SMP Negeri 2 Dagangan for their willingness to participate in this study.

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