JURNAL UPI

Jurnal Pendidikan Jasmani dan Olahraga

Journal homepage: http://ejournal.upi.edu/index.php/penjas/index

Development of Google Sites-Based Interactive Learning Media for Handball Instruction in Physical Education

Syafrialdi[1], Sepriadi[2], Arsil[2], Nugroho Susanto[2]*

[1]Study Program of Master's Degree in Sport Education, Universitas Negeri Padang, Indonesia
[2]Faculty of Sport Sciences, Universitas Negeri Padang, Indonesia
*Correspondence: E-mail: sepriadi@fik.unp

ABSTRACT

The rapid advancement of technology has encouraged innovation in educational practices through digital learning media. However, studies specifically developing and validating Google Sites-based interactive media for handball instruction in physical education at the junior high school level remain limited. Therefore, the novelty of this study lies in the systematic development and expert validation of an interactive Google Sites-based learning medium designed specifically for handball instruction to support active and problem-based learning. This study aimed to develop and assess the validity of the media implemented at a junior high school in Padang. The research employed a Research and Development approach using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. Needs analysis was conducted through classroom observations and teacher interviews. The product was developed using Google Sites by integrating text, images, videos, and evaluation components. Validation was carried out by media, language, and subject-matter experts using Likert-scale instruments, while the data were analyzed through percentage calculations. The results showed an overall validity score of 90.67%, categorized as very valid. These findings imply that validated web-based media can enhance student engagement and support more interactive physical education learning.

ARTICLE INFO

Article History:
Submitted/Received February 2026
First Revised March 2026
Accepted March 2026
Publication Date April 2026

Keyword:
google sites, handball, interactive learning media, physical education

INTRODUCTION

Education is a deliberate and systematic effort to create learning conditions that enable students to develop their potential optimally (Indramaya, 2025). Educational processes are not solely directed at the acquisition of knowledge and skills but also at the enhancement of character, spirituality, intelligence, self-regulation, and social competence needed in everyday life (Elias, 2025; Ridwan, Mochamad. & Nikmah, 2022). Through well-designed educational practices, students are expected to grow holistically and become individuals who contribute positively to society.

In line with rapid technological advancement, the educational sector has experienced significant changes, particularly in the way technology is utilized in learning activities (Pirdaus et al., 2021). Teachers are increasingly required to adopt instructional innovations to ensure that learning remains effective and relevant to the student needs. A teacher plays a role as a teacher and mentor so that students can achieve their learning objectives (Akin et al., 2023). One major challenge in the current digital era lies in selecting and using technology appropriately to improve the quality of teaching and learning (Theodorio et al., 2024). Technology integration should not only expand access to learning resources but also support the achievement of learning objectives in a responsible and meaningful manner (Daniela, 2025; Mekheimer, 2025).

Teachers have an essential role in applying technology effectively in classroom learning. The use of interactive learning media can serve as an alternative strategy to increase the student engagement and active participation during the learning process (Aswanda, Nadia., Rustandi., Farruh, 2024). The use of appropriate learning media has been shown to increase the student interest, engagement, and learning skills (Chugh et al., 2023). However, technology use must be accompanied by sound pedagogical considerations to support the development of critical thinking, problem-solving, and interpersonal communication skills. Therefore, learning media should not only be technologically advanced but also carefully designed to promote meaningful learning experiences (Fredy, Oscar & Ana, 2025). Learning media function as tools that assist teachers in delivering instructional content effectively in order to achieve learning goals. These media may take various forms, including web-based platforms that can be accessed through smartphones and computers, allowing students to learn flexibly and independently (Hamzah & Sosnovsky, 2023; Vilhunen et al., 2025).

One form of instructional innovation in the digital era is web-based learning media, which use internet technology to present learning materials in an interactive and integrated format (Marini et al., 2025). Such media can combine text, images, videos, animations, and interactive exercises, making learning activities more engaging and easier to understand (Salsabila, 2022). As a result, web-based learning media offer new learning experiences that may enhance the student motivation and academic achievement. Recent international studies further confirm that structured web-based media significantly improve conceptual understanding and learner autonomy when developed using systematic instructional models (Wahyuni et al., 2025).

Google Sites is one web-based platform that can be utilized as interactive learning media (Alfan et al., 2025). This platform is relatively easy to use and is integrated with various Google services, including Google Docs, Google Forms, Google Drive, and YouTube (Prayoga & Suryadi, 2025). In addition, Google Sites can be accessed free of charge and securely through different devices without requiring additional applications, making it a practical option for classroom learning (Gessa, A. O., Martha, A., 2025). Empirical research also indicates that

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

Google Sites–based learning media positively influence engagement and learning outcomes when aligned with problem-based and student-centered learning approaches (Ratnawati. et al., 2024).

In physical education learning at the junior high school level, learning activities do not only emphasize physical practice but also require students to master theoretical concepts. One of the Grade IX physical education topics that demands strong theoretical understanding is handball. This material includes the history of the game, basic rules, court dimensions and equipment, number of players, competition systems, and fundamental playing techniques. A solid understanding of these concepts is essential to ensure that students can perform practical activities correctly, safely, and in accordance with official regulations (Farias et al., 2018).

Based on observations and interviews conducted at SMPN 28 Padang, theoretical learning in physical education, particularly in handball material, still faces several challenges. The instruction is generally dominated by lecture-based methods and the use of whiteboards, which makes the learning process less engaging and difficult for students to understand. The use of presentation media has also been limited due to time constraints, facility availability, and technical issues. Furthermore, handball theory materials cannot be accessed by students outside classroom hours, resulting in limited opportunities for review and deeper understanding. These conditions are reflected in the student learning outcomes, with the average physical education theory score reaching only 55.30 in the Odd Semester Summative Assessment of the 2025/2026 academic year, far below the Minimum Mastery Criteria of 80. These findings clearly emphasize the research problem that current instructional strategies and media have not adequately supported effective theoretical learning.

Although numerous studies have examined digital learning media, most of them focus on general subjects such as science or mathematics. Limited research specifically addresses the development and validation of structured web-based interactive media for theoretical components in physical education, especially handball at the junior high school level. This condition indicates a clear research gap that needs to be addressed through systematic development and empirical validation.

Low theoretical learning outcomes indicate that the instructional strategies and learning media that are currently used have not fully supported effective learning. Therefore, innovation in learning media is needed to present theoretical material in a more systematic, engaging, and accessible manner that aligns with the characteristics of students in the digital era. Interactive learning media based on Google Sites are expected to provide an alternative solution by offering structured content supported by visual materials, instructional videos, and interactive evaluations that can be accessed flexibly (Shakhzoda, 2025).

Therefore, this study aimed to develop and examine the validity of Google Sites–based interactive learning media for handball material in physical education at the junior high school level. The novelty of this study lies in the systematic development and expert validation of a needs-based, pedagogically designed Google Sites learning product specifically tailored for handball theory. The findings of this study are expected to contribute theoretically by addressing the identified research gap in physical education digital media development and practically by providing an innovative and validated learning resource that enhances instructional quality and the student theoretical understanding and engagement.

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

METHODS

Research Design

This study employed a Research and Development (R&D) approach, which is widely used to develop educational products and to examine their feasibility and effectiveness in learning contexts (Daryanes et al., 2023). The product developed in this study was an interactive learning medium based on Google Sites designed to support physical education instruction on handball material for Grade IX students at SMPN 28 Padang.

The development process followed the ADDIE model, which consists of five stages, including Analysis, Design, Development, Implementation, and Evaluation. This model was selected because it provides a systematic and structured framework for learning media development and allows for evaluation and revision at each stage to ensure that the resulting product is valid, practical, and feasible for instructional use.

Participants

The participants involved in this study consisted of two groups. The first group included three expert validators, comprising one subject-matter expert, one learning media expert, and one language expert, who were responsible for assessing the validity of the developed learning media. The second group consisted of 30 Grade IX students of SMPN 28 Padang who participated in a small-scale implementation to evaluate the comprehensibility, usability, and attractiveness of the learning media. All participants were selected from the same school environment to ensure contextual relevance to the instructional setting. The sample size of 30 students was considered appropriate for a limited field trial in development research, as small-group trials typically involve 20–30 participants to identify usability issues and obtain initial practicality data before broader implementation.

Sampling Procedures

The student participants were selected using a purposive sampling technique, considering their involvement in physical education learning and their relevance to the handball material being developed. The research was conducted at SMPN 28 Padang, while the data collection took place in January 2026. Participation in the study was voluntary and no financial compensation was provided to participants. The expert validators were selected based on their academic background, teaching experience, and expertise in curriculum, instructional media, and language evaluation.

Materials and Apparatus

The primary material developed in this study was an interactive learning medium based on Google Sites. The media contained structured handball learning materials, including theoretical explanations, images, instructional videos, and interactive evaluation components. Google Sites was chosen because of its ease of use, accessibility across devices, and integration with other Google services.

Data collection instruments included expert validation sheets designed to assess the quality of the learning media in terms of content/material accuracy, media design, and language use. The validation sheets employed a five-point Likert scale ranging from 1 (very poor) to 5 (excellent) (Arikunto, 2019).

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

To address the need for detailed description, the validation instrument consisted of 15 indicators distributed across three aspects, namely Content/Material Aspect (6 indicators: curriculum alignment, conceptual accuracy, depth of material, clarity of explanation, relevance to learning objectives, and suitability for Grade IX students), Media Design Aspect (5 indicators: layout consistency, navigation clarity, visual quality, interactivity, and technical functionality), and Language Aspect (4 indicators: readability, grammatical accuracy, clarity of instructions, and appropriateness of terminology). Before being used for validation, the instrument underwent content review by two senior lecturers to ensure its clarity and relevance.

To ensure reliability, internal consistency of the instrument was tested using Cronbach's Alpha coefficient. The reliability analysis showed an Alpha value above 0.70, indicating that the instrument had acceptable reliability for research purposes.

Procedures

The research procedures followed the five stages of the ADDIE model. During the Analysis stage, learning needs were identified through an analysis of student characteristics and available facilities and infrastructure as well as a review of the applicable curriculum to ensure the alignment with instructional objectives (Spatioti et al., 2022). In the Design stage, the initial framework of the learning media was prepared by determining the content structure, navigation flows, and interactive elements suitable for Google Sites.

The Development stage involved creating the learning media according to the design plan and integrating digital content into a web-based format (Muhammad, I. et al., 2025). The developed product was then reviewed and validated by expert validators to assess its quality and suitability.

The Implementation stage was conducted through a limited trial involving 30 students to examine the usability, clarity, and engagement level of the media in an authentic learning context. Observations and short response questionnaires were used to collect the student feedback.

The Evaluation stage consisted of formative evaluation conducted throughout the development process for continuous improvement and summative evaluation conducted after implementation to assess the overall feasibility and instructional support of the media (Irmawan, Mering & Astuti, 2022). Prior to participation, students were informed about the purpose of the study and provided their consent to take part in the research with approval from the school.

Data Analysis Techniques

Data analysis focused on determining the validity and reliability level of the developed learning media based on expert judgment. Validation scores obtained from the experts were tabulated, divided by the maximum possible score, and multiplied by 100% to obtain a percentage value using the following formula (Arikunto, 2019):

$$\text{Validation Percentage} = \frac{\text{Obtained Score}}{\text{Maximum Score}} \times 100\%$$

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

The resulting percentages were interpreted using validity criteria adapted from (Boduroglu & Yigiter, 2025), which classify scores of 81–100% as highly valid, 61–80% as valid, 41–60% as moderately valid, 21–40% as less valid, and 0–20% as invalid.

In addition to percentage analysis, descriptive statistics (mean and standard deviation) were calculated to provide a clearer explanation of expert agreement levels across indicators. Reliability was analyzed using Cronbach's Alpha to ensure internal consistency of the instrument.

Ethical Considerations

This study was conducted with permission from the school authorities. All participants were informed about the purpose and procedures of the research and their participation was voluntary. Data were collected and analyzed anonymously to protect the privacy of participants.

RESULTS

Analysis

At the analysis stage, learning needs related to Grade IX physical education handball material at SMPN 28 Padang were systematically examined. The findings revealed that theoretical instruction remained predominantly teacher-centered, relying heavily on lectures and board explanations. This instructional pattern limited student interactions and reduced opportunities for conceptual reinforcement. Students demonstrated difficulty in understanding essential theoretical concepts such as court dimensions, rules, and player positions.

Furthermore, learning materials were not accessible outside classroom hours, restricting independent reviews and contributing to low theoretical achievement scores. These findings indicate a structural instructional gap rather than merely a lack of resources. Therefore, the development of an accessible, structured, and interactive web-based learning medium was pedagogically justified to address both engagement and conceptual understanding issues.

Design

The design stage produced a structured instructional blueprint integrating pedagogical principles with multimedia elements. Content organization, navigation flow, interface layout, and interactive components were intentionally aligned with cognitive load theory and student-centered learning principles.

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

Figure 1. The Main Interface of The Google Sites–Based Physical Education Learning

The homepage was intentionally designed to provide direct access to essential menus, including Home, Learning Objectives, Materials, Videos, Assessments, and Profile. This structure supports independent navigation and allows students to access learning resources efficiently. The consistent visual design, readable typography, and organized layout were implemented to reduce unnecessary cognitive load, enabling students to focus on understanding the learning material rather than navigating complex interfaces.

Figure 2. Handball Learning Material Menus

This menu was designed to display instructional content in a visually appealing and well-organized format, allowing students to access the material more easily. The use of relevant illustrations, clear headings, and structured information helps students focus on the key concepts being discussed. Such a design not only improves the visual attractiveness of the learning interface but also supports the student comprehension of the material by presenting

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

information in a more accessible and engaging way.

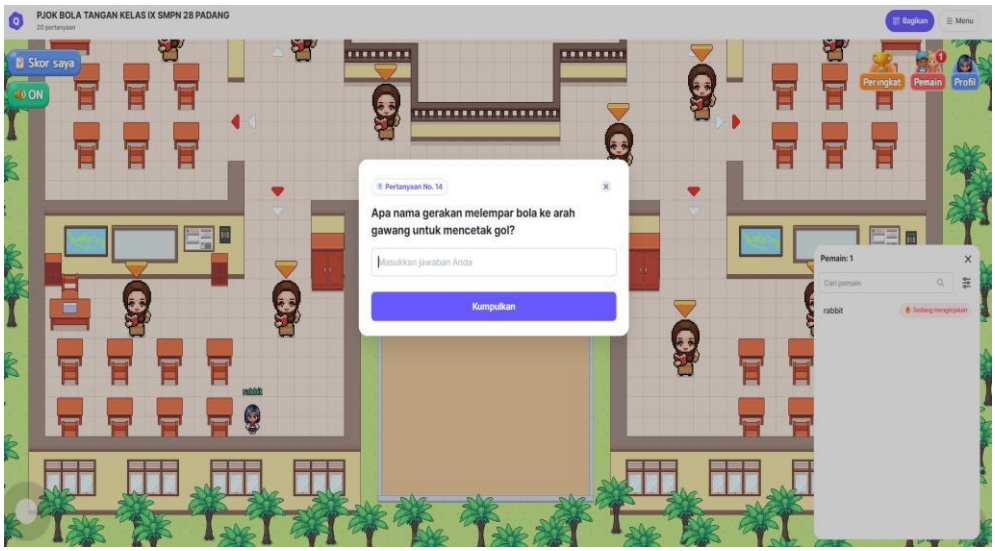

Figure 3. Interactive Assessment Features

This feature allows students to answer questions related to the learning material and receive immediate feedback on their responses. The instant feedback helps students identify their level of understanding and recognize areas that still require improvement. By encouraging reflections on their answers, the interactive assessment supports formative learning and enables students to evaluate their own progress during the learning process.

Overall, the design phase emphasized not only visual presentation but also instructional coherence. By aligning multimedia elements, navigation structure, and assessment features with learning objectives, the developed media aims to enhance student engagement and support a deeper understanding of theoretical concepts in physical education learning.

Development

The completed product underwent expert validations across three dimensions, including content, media design, and language dimensions.

Table 1. Expert Validation Results

Aspect Assessed	Score (%)	Criteria
Content	90.61	Highly Valid
Media	89.42	Highly Valid
Language	92.00	Highly Valid
Average Score	90.67	Highly Valid

The average score of 90.67% indicates a very high level of expert agreement. More importantly, these scores demonstrate that (a) the content aligns strongly with curriculum standards and conceptual accuracy, (b) the media structure supports instructional clarity and

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

usability, and (c) the language level is developmentally appropriate for Grade IX students. Thus, the validation results are not merely descriptive percentages but also confirm theoretical soundness and instructional alignment of the developed product.

Implementation

Teacher practicality assessment provided further evidence of instructional feasibility. The high practicality score (89.55%) indicates that teachers found the media easy to implement in real classroom contexts. The significance of this finding lies in its confirmation that the product is not only valid in theory but also operationally feasible. This strengthens the instructional relevance of the media beyond expert validations.

Table 2. Teacher Validation Results

Aspect Assessed	Validator I (%)	Validator II (%)	Average (%)	Criteria
User Assistance	80.00	90.60	85.30	Highly Valid
User-Friendliness	91.42	96.19	93.80	Highly Valid
Average Score	—	—	**89.55**	**Highly Valid**

Evaluation

The consistently high scores across expert and practitioner evaluations indicate strong convergence of theoretical validity and practical usability. The overall average of 90.11% demonstrates that the developed Google Sites–based learning media meet academic, pedagogical, and technical standards. The significance of these findings lies in their contribution to digital physical education learning innovation. The product not only addresses identified instructional gaps but also provides a validated model for integrating structured web-based media into theoretical components of physical education. Redundant explanations were minimized to maintain analytical clarity and focus on instructional implications.

Table 3. Summary of Validation Results

Validator Group	Average Validity Score (%)	Criteria
Expert Validators	90.67	Highly Valid
Teacher Validators	89.55	Highly Valid
Overall Average	**90.11**	**Highly Valid**

DISCUSSION

The findings of this study indicate that the Google Sites-based interactive learning media demonstrates a high level of validity across content, media design, and language aspects, as evaluated by both experts and physical education teachers. These results suggest that the developed media meets essential pedagogical and technical standards required to support effective physical education learning, particularly for handball material at the junior high school level.

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

The high validity of the content aspect reflects strong alignment among learning objectives, instructional materials, and presentation structure. Well-organized and systematically arranged content plays a crucial role in ensuring that students can understand learning materials effectively. This finding is consistent with previous research emphasizing that content feasibility is determined by the coherence among learning components, material accuracy, and language clarity in interactive media development (Annisa & Darussyamsu, 2023). It also aligns with international instructional design research highlighting constructive alignment as a determinant of learning effectiveness (O. Holland, 2023) and multimedia learning principles emphasizing structured content integrations (Mayer, 2014; Al-Khalidi, 2021). These comparisons indicate that the developed product adheres not only to local validation standards but also to internationally recognized instructional design principles.

In terms of media presentation, the results indicate that the visual and technical design of the learning media is appropriate and supportive of the learning process. A consistent visual layout, clear typography, and well-structured navigation contribute to improved learner engagement and comprehension. This supports earlier findings that an effective media design enhances the usability and instructional quality of digital learning media (S et al., 2025). International studies similarly confirm that usability, interface clarity, and interaction design significantly influence learner engagement and cognitive processing in web-based environments (Al-Fraihat et al., 2019). Therefore, the present study strengthens global evidence that interface consistency and navigational logic are essential components of successful digital learning platforms.

The language aspect also demonstrated strong validity, indicating that the instructional language used is clear, communicative, and in accordance with standard Indonesian language conventions. The use of correct grammar, appropriate terminology, and coherent sentence structure facilitates effective message delivery and supports the student understanding of learning materials. These results align with studies highlighting the importance of language clarity and accuracy in educational media to improve learning effectiveness (Mardiyana et al., 2023). International research also emphasizes that readability and linguistic precision significantly affect knowledge transfer in digital instructions (Singhal et al., 2020). Thus, linguistic quality remains a fundamental component of technology-mediated pedagogy.

Furthermore, teacher validation results indicate that the media is practically feasible for classroom implementation. High evaluations in user assistance and user-friendliness suggest that the media is easy to operate and provides sufficient guidance for both teachers and students during the learning process. This finding reinforces previous studies stating that ease of use and clear user support are critical factors in determining the applicability of digital learning media in school settings (Maulyda et al., 2025). From an international perspective, this result is consistent with the Technology Acceptance Model (TAM), which posits that perceived ease of use and perceived usefulness strongly influence technology adoptions in educational contexts (Scherer et al., 2018; Teo et al., 2018). Therefore, the practicality findings support broader educational technology adoption frameworks.

From a theoretical standpoint, this study contributes to strengthening the integration between instructional design theory and digital pedagogy in physical education contexts. While digital learning research has been widely conducted in science and mathematics education, fewer studies focus on structured web-based media for theoretical components of physical education. By demonstrating that Google Sites can function as a validated instructional system rather than merely a content repository, this study supports constructivist learning theory and learner-centered frameworks emphasizing autonomy, accessibility, and interactive engagement (Hrastinski, 2009; Hrastinski, 2019; Hollister et al., 2022).

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

Practically, the findings provide actionable implications for teachers. The developed media enables blended learning implementation, facilitates independent student review outside classroom hours, and supports formative assessment through embedded quizzes. Teachers can integrate the media into existing lesson plans without requiring advanced technical expertise. This practical applicability addresses one of the major barriers to educational technology integration-teacher readiness and operational simplicity.

In terms of contribution to educational technology, this study offers three important contributions. First, it extends empirical research on web-based interactive media into the domain of physical education theoretical instructions. Second, it demonstrates that accessible platforms such as Google Sites can achieve high pedagogical validation when developed using systematic instructional models. Third, it provides a replicable development framework that may inform future digital learning innovation in practical subject areas.

Despite demonstrating high validity, this study also identifies limitations related to internet dependency and the absence of offline functionality. These constraints highlight the importance of considering infrastructural readiness when implementing digital learning innovations. Future development could integrate hybrid delivery modes to enhance accessibility across diverse educational environments.

Overall, the discussion confirms that the Google Sites–based interactive learning media is not only valid and feasible but also theoretically grounded, internationally comparable, and practically relevant. The study strengthens the intersection between instructional design, digital pedagogy, and physical education innovation.

CONCLUSION

Based on the overall findings, this study indicates that the Google Sites–based interactive learning media is not only feasible but also educationally valuable for physical education instructions at SMPN 28 Padang. The developed media demonstrates how well-organized learning content, clear instructional guidance, and an interactive web interface can create a supportive digital learning environment. Such integration helps students better understand the theoretical aspects of handball material, which are often considered less engaging in physical education classes.

The results from the expert validation and the limited student trial suggest that the effectiveness of the media is closely related to the consistency between learning objectives, content structure, and ease of access for users. When these elements are aligned, the learning process becomes more meaningful and encourages greater student involvement during classroom activities. Therefore, the contribution of this media goes beyond meeting technical feasibility standards. It also offers a practical approach for promoting more student-centered learning in physical education, particularly in delivering theoretical content.

More broadly, this study highlights the potential of accessible web-based platforms to support the teaching of theoretical materials in physical education. Digital learning media that are carefully designed can help bridge the gap between instructional delivery and student interaction, allowing learners to explore learning materials more independently and flexibly.

Future studies should extend this work in several ways. Experimental research involving control and experimental groups is needed to examine the impact of the media on student learning outcomes more rigorously. In addition, implementing the media in a wider range of schools and educational contexts would help strengthen the generalizability of the findings.

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

Further development could also incorporate richer multimedia components, integrated formative assessments, and simple learning analytics to enhance the instructional experience. Finally, exploring alternative access models, such as offline or hybrid formats, would be beneficial for schools with limited internet connectivity, ensuring that the use of digital learning media in physical education remains inclusive and sustainable.

Authors' Note

The authors state that there is no conflict of interest related to the publication of this article. The authors also confirm that this manuscript is an original work and does not contain any form of plagiarism.

Acknowledgments

The authors would like to thank Lembaga Penelitian dan Pengabdian Masyarakat, Universitas Negeri Padang, for funding this work under contract No. 2055/UN35.15/LT/2026.

References

Akin, Y., Suherman, A., Safari, I., Susilawati, D., Sudrazat, A., Nugraha, R., & Brilian, M. (2023). Effectiveness of Modified Learning Media on Student Creativity. *TEGAR: Journal of Teaching Physical Education in Elementary School*, *7*(1), 7-12.

Al-Fraihat, D., Joy, M., Masa'deh, R. E., & Sinclair, J. (2020). Evaluating E-learning systems success: An empirical study. *Computers in human behavior*, *102*, 67-86.

Al-Khalidi, I. (2021). How to make learning effectiveness with mayer's multimedia instructional model. *International Journal of Sciences: Basic and Applied Research*, *60*, 123-139.

Alfan, M., Faisal, R., & Aprilianto, P. (2025). Development of interactive web-based learning media using a differentiated approach in information and communication technology elements with a problem-based learning model. *Pedagonal: Jurnal Ilmiah Pendidikan*, *9*(1), 1-14.

Annisa, N., & Darussyamsu, R. (2023). Validitas dan praktikalitas pengembangan multimedia interaktif pada materi sistem koordinasi untuk kelas XI SMA/MA. *Jurnal Biologi Dan Pembelajarannya (JB&P)*, *10*(1), 49-57.

Arikunto, S. (2010). Prosedur penelitian suatu pendekatan praktek. *(No Title)*.

Aswanda, N., Rustandi, R., & Ahmedov, F. Improving Motivation and Football Learning Achievement of Junior High School Students by Using Canva-Based Learning Videos. *Jurnal Pendidikan Jasmani dan Olahraga*, *9*(2), 237-246.

Boduroglu, E., & Yigiter, M. S. (2026). Artificial intelligence scoring attitudes: scale development and validation. *Education and Information Technologies*, *31*(3), 701-726.

Chugh, R., Turnbull, D., Cowling, M. A., Vanderburg, R., & Vanderburg, M. A. (2023). Implementing educational technology in Higher Education Institutions: A review of technologies, stakeholder perceptions, frameworks and metrics. *Education and Information Technologies*, *28*(12), 16403-16429.

Daniela, L. (2025). Integrating Technology for Pedagogical, Technological, and Socio-Ethical

Sustainability in Education. *Technology, Knowledge and Learning*, 1-10.

Daryanes, F., Darmadi, D., Fikri, K., Sayuti, I., Rusandi, M. A., & Situmorang, D. D. B. (2023). The development of articulate storyline interactive learning media based on case methods to train student's problem-solving ability. *Heliyon*, *9*(4).

Elias, M. J. (2025, October). Social–emotional competencies and character are at the foundation of education regardless of technology. In *Frontiers in Education* (Vol. 10, p. 1607639). Frontiers Media SA.

Farias, C., Valério, C., & Mesquita, I. (2018). Sport education as a curriculum approach to student learning of invasion games: Effects on game performance and game involvement. *Journal of sports science & medicine*, *17*(1), 56.

Fredy, L. D., Oscar, B., & Ana, V. S. (2025). Pedagogical mediation with ICT for the development of critical thinking in primary education: A systematic review. *Thinking Skills and Creativity*, 102085.

Gessa, A. O., & Martha, A. (2025). Google Sites Media with High Validity and Student Engagement in Learning: Media Google Sites dengan Validitas Tinggi dan Keterlibatan Siswa dalam Pembelajaran. *Indonesian Journal of Innovation Studies*, *26*(3).

Hamzah, A., & Sosnovsky, S. (2023). Providing students with mobile access to an assessment platform: Lessons learned. *International Journal of Mobile and Blended Learning (IJMBL)*, *15*(2), 1-16.

Hollister, B., Nair, P., Hill-Lindsay, S., & Chukoskie, L. (2022, May). Engagement in online learning: Student attitudes and behavior during COVID-19. In *Frontiers in education* (Vol. 7, p. 851019). Frontiers Media SA.

Hrastinski, S. (2009). A theory of online learning as online participation. *Computers & Education*, *52*(1), 78-82.

Hrastinski, S. (2019). What do we mean by blended learning?. *TechTrends*, *63*(5), 564-569.

Indramaya, S. (2025). Peningkatan Prestasi Belajar Pendidikan Agama Islam Melalui Pemanfaatan Sumber Belajar Multimedia. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *10*(03), 309-320.

Irmawan, I., Mering, A., & Astuti, I. (2022). The Development of Interactive Learning Multimedia Based on The Website for Mathematics' Subject in Junior High School. *Journal of Education, Teaching and Learning*, *7*(1), 108-119.

Mardiyana, T., Fauziati, E., Prastiwi, Y., & Minsih, M. (2023). A content analysis of the language quality of thematic textbooks for elementary school students. *Journal of Education and Learning (EduLearn)*, *17*(2), 229-240.

Marini, A., Safitri, D., Niladini, A., Zahari, M., Dewiyani, L., & Muawanah, U. (2025). Developing a website integrated with project-based learning: Evidence of stimulating creativity among elementary school students in Indonesia. *Social Sciences & Humanities Open*, *11*, 101402.

Maulyda, M. A., Wuryandani, W., Sulistyani, N., & Annizar, A. M. R. (2025). Investigating the role of digital capabilities on the relationship between teacher readiness and teacher skills using augmented reality media in elementary schools: A mediation and moderation analysis. *Social Sciences & Humanities Open*, *11*, 101411.

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X

Mayer, R. E. (2005). Introduction to multimedia learning. *The Cambridge handbook of multimedia learning*, *2*(1), 24.

Mekheimer, M. A. (2025). Effective technology integration in higher education: a mixed-methods study of professional development. *Education and Information Technologies*, *30*(17), 25013-25058.

Muhammad, I., Jupri, A., & Herman, T. (2025). Development of web-based learning media with a realistic mathematics education approach to increase student self-determination. *Infinity Journal*, *14*(2), 303-322.

Holland, R. O. (2023). Modeling Constructive Alignment, Integration and Differentiation in Science Modules: A Blended Learning Tool in a Flexible Educational Landscape. *American Journal of Educational Research*, *11*(6), 381–388.

Pirdaus, A. R., Mahendra, A., & Lubay, L. H. (2021). Physical Education Teacher Ability to Utilize Technology for Conducting Distance Learning in New Normal Period. *TEGAR: Journal of Teaching Physical Education in Elementary School*, *4*(2), 118-124.

Prayoga, T. I., & Suryadi, A. (2025). Pengembangan Media Pembelajaran Interaktif Sejarah Menggunakan Google Sites pada Materi Proklamasi Kemerdekaan untuk Siswa Sekolah Menengah Atas. *Didaktika: Jurnal Kependidikan*, *14*(3 Agustus), 4937-4952.

Ratnawati, K., Artini, N. L. P., & Kusuma, I. P. I. (2024). Interactive E-Modules Assisted By Google Sites In Efl: Its Effect On Students'critical Thinking And Learning Engagement. *Indonesian Journal of Educational Development (IJED)*, *5*(2), 194-207.

Ridwan, M., & Nikmah, R. A. A. (2022). Effects of interactive media on critical and creative thinking. *Jurnal Pendidikan Jasmani Dan Olahraga*, *7*(2), 256-261.

Salsabila, F., & Aslam, A. (2022). Pengembangan media pembelajaran berbasis web google sites pada pembelajaran IPA Sekolah Dasar. *Jurnal basicedu*, *6*(4), 6088-6096.

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & education*, *128*, 13-35.

Shakhzoda, A. (2025). *Utilizing Google Sites As An Interactive Platform For Experience Sharing And Collaborative Inquiry Between Students And Teachers*. *3*(3), 3–6.

Singhal, S., Anand, A., & Singh, O. (2020). Studying dynamic market size-based adoption modeling & product diffusion under stochastic environment. *Technological Forecasting and Social Change*, *161*, 120285.

Spatioti, A. G., Kazanidis, I., & Pange, J. (2022). A comparative study of the ADDIE instructional design model in distance education. *Information*, *13*(9), 402.

Teo, T., Sang, G., Mei, B., & Hoi, C. K. W. (2019). Investigating pre-service teachers' acceptance of Web 2.0 technologies in their future teaching: a Chinese perspective. *Interactive Learning Environments*, *27*(4), 530-546.

Theodorio, A. O., Waghid, Z., & Wambua, A. (2024). Technology integration in teacher education: challenges and adaptations in the post-pandemic era. *Discover Education*, *3*(1), 242.

Vilhunen, E., Vesterinen, V. M., Äijälä, M., Salovaara, J., Siponen, J., Lavonen, J., ... &

Riuttanen, L. (2025). Promoting university students' situational engagement in online learning for climate education. *The Internet and Higher Education*, *65*, 100987.

Wahyuni, S., Dewi, I., & Nasution, H. (2025). Development of Web-Based Mathematics Learning Media to Improve Reasoning Ability and Self-Efficacy of High School Students. *Jurnal Perspektif*, *9*(2), 244-257.

DOI: https://doi.org/10.17509/jpjo.v11i1.96939
p- 2085-6180 e- ISSN 2580-071X