



Development of an Interactive Video-Based E-Book to Improve Motivation and Learning Outcomes in Physical Education

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Abstract:

The integration of digital technology into physical education has created new opportunities to improve students' learning experiences through interactive learning media. This study aimed to develop an interactive video-based e-book for Grade VII Physical Education, Sports, and Health (PJOK) learning and to examine its validity, practicality, and effectiveness. The study employed a Research and Development (R&D) approach using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation. Data were collected through expert validation, questionnaires administered to teachers and students, and learning outcome assessments. The developed e-book integrates learning materials, visual illustrations, instructional videos, practice activities, and interactive evaluations within a single digital platform. The e-book achieved high validity (93.89%) and practicality (95.63% for teachers; 93.78% for students). Learning outcomes and motivation improved with N-Gain scores of 0.64 and 0.66, respectively, both in the moderate category, indicating that the e-book is a valid and practical digital learning resource. The integration of multimedia elements enabled students to better understand movement techniques while supporting independent learning beyond classroom instruction. For teachers, the e-book served as an effective instructional resource that optimized classroom practice by allowing more time for guided physical activities. These findings suggest that an interactive video-based e-book can serve as a practical and innovative digital learning resource to support more engaging and student-centered physical education. Overall, the developed interactive video-based e-book provides an alternative digital learning resource for supporting engaging and student-centered Physical Education learning.

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Introduction (مقدمة)

Digital transformation has changed various aspects of life, including learning practices in schools. Advances in information and communication technology have driven changes in how teachers design, implement, and evaluate learning. Whereas the learning process was previously more teacher-centered, it is now oriented toward students playing an active role in constructing their own knowledge (student-centered learning). This shift is also reflected in the implementation of the Merdeka Curriculum, which positions technology as a tool for creating active, differentiated learning tailored to students' needs (Alshammari, 2024; Nielsen & Budiardjo, 2023).

In this context, Physical Education, Sports, and Health (PJOK) has characteristics that differ from most other subjects. PJOK instruction not only emphasizes conceptual mastery but also requires students to develop motor skills, attitudes, and healthy lifestyle habits in a balanced manner. Therefore, the learning process requires media capable of bridging conceptual understanding with proper movement practice. However, conditions in the field indicate that teachers still largely rely on printed textbooks and live demonstrations as their primary learning resources. These media often fail to fully depict the sequence of sports movements, causing students to struggle with understanding dynamic techniques. Consequently, learning motivation tends to decline, and comprehension of the material does not develop optimally (Barikah et al., 2026; Trisnawati et al., 2024).

This challenge is particularly relevant for seventh-grade students, who are familiar with videos, animations, and interactive digital media. The combination of visual, audio, and interactive elements can provide opportunities for students to observe movement techniques repeatedly, review difficult material, and learn at their own pace. Therefore, digital learning media for PJOK should not only present learning content but also support flexible and engaging learning experiences that facilitate independent learning (Nasution & Tambunan, 2024; Yao, H., liu, W., & Chen, S, 2024; Patricia, 2020).

One potential innovation is an interactive video-based e-book. This medium allows students to study the material while observing repeated demonstrations of movements without being limited by time or space. The integration of text, images, videos, and exercises into a single medium gives students the opportunity to understand concepts before practicing them in the field. Consequently, face-to-face class time can be utilized more effectively for practical activities and teacher feedback (Limbong et al., 2024; Patricia & Zamzam, 2021).

The use of digital media in learning has, in fact, been extensively studied. Various studies show that e-books, e-modules, and interactive multimedia can increase learning motivation, clarify conceptual understanding, and create a more flexible learning experience compared to print media. Other studies also report that the use of instructional videos helps students understand basic sports techniques because movements can be observed from various angles and replayed as needed. These findings indicate that technology holds great potential for improving the quality of Physical Education and Health (PJOK) instruction (Verawati, 2024).

Nevertheless, the results of previous studies still leave room for further development. Most of the e-books developed still function as digital versions of printed books, while instructional videos are presented separately via links or other platforms. This situation requires students to switch between applications during the learning process, making the learning experience less practical. Furthermore, some studies have focused more on testing the media's feasibility through expert validation, while the impact of the media on students' learning motivation and learning outcomes has not been extensively examined in tandem. Research on interactive video-based e-

books specifically designed for the learning characteristics of Physical Education and Health (PJOK) in seventh grade is also still relatively limited (Chen et al., 2023; Yorganci, 2022).

Despite these findings, a specific gap remains in the development of an integrated digital learning medium for Grade VII PJOK. Previous studies have generally examined e-books, instructional videos, or interactive multimedia as separate resources, while limited attention has been given to combining learning content, movement demonstrations, interactive exercises, and assessments within a single e-book. Moreover, the simultaneous evaluation of validity, practicality, learning motivation, and learning outcomes remains limited. Therefore, further development is needed to provide an integrated medium that addresses both the conceptual and practical characteristics of PJOK learning.

The novelty of this study lies in the development of an interactive video-based e-book that integrates instructional content, illustrations, movement demonstration videos, interactive exercises, and assessments within a single digital learning environment. Unlike media in which videos function primarily as supplementary resources accessed through separate platforms, the developed e-book embeds video demonstrations directly into the learning sequence. This integration is designed to connect conceptual understanding, visual observation of movement techniques, independent practice, and learning assessment within one medium.

This study contributes to digital learning research in Physical Education by providing an integrated learning medium that combines multimedia presentation, interactive activities, and opportunities for independent learning. Practically, the developed e-book provides teachers with an alternative resource for presenting movement techniques systematically and enables students to review learning materials and demonstrations according to their learning needs. The study also provides empirical evidence regarding the validity, practicality, and effectiveness of the developed medium in supporting students' learning motivation and learning outcomes.

Given these conditions, there is a need for learning media capable of integrating content, illustrations, demonstration videos of movements, exercises, and assessments into a single platform that is easy to use for both teachers and students. This integration is expected to help students understand movement techniques more systematically while enhancing their learning motivation through a more engaging learning experience. On the other hand, teachers gain a more effective tool for explaining the material, allowing practical learning to take place more effectively (Nielsen & Budiardjo, 2023; Arifin, M., Sholeh, M., & Agustin, R, 2021).

This study offers a novel approach through the development of an interactive video-based e-book that integrates all learning components into a single digital medium. Unlike previous studies, which generally treated video as a supplementary medium, this study makes video an integral part of the content, illustrations, exercises, and assessments. The development of the medium was conducted using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), resulting in a systematically developed product. In addition to testing the validity of the media, this study also evaluates its practicality of use and its effectiveness in enhancing the motivation and learning outcomes of seventh-grade students.

From an academic perspective, this study is expected to enrich research on the development of digital learning media in the field of Physical Education by integrating the principles of multimedia learning, self-directed learning, and the characteristics of motor learning into a single learning product. Meanwhile, from a practical standpoint, the results of this study are expected to serve as an alternative learning medium for Physical Education teachers in supporting the implementation of more innovative learning, in line with developments in educational technology and the Merdeka Curriculum policy (Mayer, 2024).

The development of interactive video-based e-books is also relevant to the learning demands of the Society 5.0 era, which positions technology as a means to enhance the quality of the learning experience. Through this medium, students can learn movement techniques at any time as needed, while teachers have more time to guide practice, provide feedback, and develop students' motor skills directly on the field (Trisnawati et al., 2024).

Based on the identified research gap, novelty, and contribution, this study aims to develop an interactive video-based e-book for Grade VII Physical Education and Health (PJOK) and to determine its validity, practicality, and effectiveness in supporting students' learning motivation and learning outcomes.



Method (منهج)

This study employed the Research and Development (R&D) method using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) because this model provides a systematic framework for developing learning media, ranging from needs analysis to product evaluation. The research was conducted at MTs Annur Al Huda Ngawonggo, Tajinan Subdistrict, Malang Regency, during the even semester of the 2026/2027 academic year, from February through June 2026. The research stages included needs analysis, product design, development of an interactive video-based e-book, validation by experts, small-group pilot testing, field testing, and evaluation of the quality of the developed product.

The research subjects consisted of expert validators, Physical Education, Sports, and Health (PJOK) teachers, and seventh-grade students. The validators included one PJOK subject matter expert, one instructional media expert, and one language expert with experience in instructional media development. A small-group pilot test was conducted with 10 seventh-grade students selected through purposive sampling to obtain initial feedback on the media's readability, ease of use, and visual presentation. Subsequently, a field test was conducted with 30 seventh-grade students as the primary users of the product. Purposive sampling was used because participants were selected based on characteristics aligned with the objectives of the instructional media development.

The analysis phase was conducted through a literature review, an analysis of the 7th-grade Physical Education curriculum, observations of the learning process, and interviews with teachers and students to identify instructional media needs. The information obtained served as the basis for determining the content, user characteristics, and specifications of the interactive video-based e-book to be developed.

The design phase involved organizing the e-book's content structure, creating storyboards for instructional videos, designing the user interface and media navigation, developing research instruments, and designing a learning evaluation framework. The instructional content was organized based on the learning outcomes for 7th-grade Physical Education, integrating movement demonstration videos, illustrations, images, formative exercises, and assessments to produce an interactive learning medium.

The development phase involved creating the e-book using digital media development software that supports multimedia integration. Instructional videos were recorded and edited according to the developed content, then integrated into the e-book so that students could access the material, observe movement demonstrations, and complete exercises directly within a single learning medium. The resulting product is then validated by subject matter experts, media experts, and language experts to obtain feedback on content, presentation, language, and usability. The validation results serve as the basis for revisions before the learning material is pilot-tested with students.

The implementation phase is carried out through small-group trials and field trials. In this phase, the e-book is used in the Physical Education (PJOK) learning process for seventh-grade students. Students' learning motivation is measured using questionnaires administered before and after the media is used, while learning outcomes are measured through tests given before instruction (pretest) and after instruction (posttest). Teachers are also asked to provide feedback on the practicality of using the media during the learning process.

The evaluation phase was conducted using both formative and summative methods. Formative evaluation was carried out at each stage of development based on the results of expert validation and pilot testing so that the product's weaknesses could be gradually addressed. Summative evaluation was conducted after implementation to determine the level of validity, practicality, and effectiveness, as well as the impact of e-book use on students' motivation and learning outcomes.

The research instruments used include content expert validation forms, media expert validation forms, language expert validation forms, teacher response questionnaires, student response questionnaires, learning motivation questionnaires, lesson observation forms, and multiple-choice learning outcome tests aligned with the competencies being studied. All instruments were developed based on relevant indicators and tested for feasibility before being used in the study.

Research data were collected through observation, interviews, documentation, questionnaire distribution, and learning outcome tests. Observations were conducted to obtain an overview of how Physical Education and Health (PJOK) lessons were implemented at the school. Interviews were conducted with teachers to identify instructional media needs. Documentation was used to obtain supporting data during the development process. Questionnaires were used to gather data on the validity of the media, ease of use, user feedback, and students' learning motivation, while tests were used to measure improvements in learning outcomes following the use of interactive video-based e-books.

Data from expert validation, teacher responses, student responses, and learning motivation were analyzed descriptively and quantitatively using percentages based on media feasibility criteria. The percentage score was calculated by dividing the obtained score by the maximum possible score and multiplying by 100. The resulting percentages were interpreted according to predetermined validity and practicality criteria. Improvements in students' learning outcomes and motivation were analyzed using N-Gain to determine the magnitude of improvement between pretest and posttest scores. N-Gain values were interpreted as high ($g \geq 0.70$), moderate ($0.30 \leq g < 0.70$), and low ($g < 0.30$). Because the primary effectiveness analysis focused on the magnitude of improvement, N-Gain was used as the main indicator of effectiveness. The paired-sample t-test was not included in the reported analysis; therefore, no significance value was reported. All analyses were performed using IBM SPSS Statistics.

Result (نتائج)

The product developed in this study is an interactive video-based e-book designed to support Physical Education, Sports, and Health (PJOK) learning for seventh-grade students. Development was carried out using the ADDIE model, ensuring that each stage resulted in gradual improvements to the product. The e-book serves not only as a digital teaching resource but also as a self-directed learning tool that integrates content, illustrations, demonstration videos of movements, interactive exercises, and assessments into a single learning platform. These features are designed to provide a more engaging, flexible learning experience tailored to the characteristics of students in the digital generation.



Figure 1. Cover of the Interactive Video-Based E-Book

The e-book cover is designed using a combination of blue and orange colors that represent the spirit, dynamism, and characteristics of Physical Education and Health (PJOK) learning. The use of illustrations of sports activities combined with digital devices reflects the concept of technology integration in learning while reinforcing the product's visual identity. This opening display is intended to pique students' interest before they delve into the learning material. Following the introduction, the material is presented systematically, ranging from a discussion of the new paradigm of Physical Education and Health (PJOK) learning, student characteristics, and the urgency of learning digitization, to the core content organized based on the learning outcomes for 7th grade. The material is presented using communicative language and supported by contextual illustrations, making it easier for students to understand the relationship between the concepts being studied and their application in physical activities.



Figure 2. Home Page of the Material

The narrative in the opening section of the e-book is designed to help students understand the role of technology as a tool that supports the learning process, not as a substitute for physical activities in Physical Education and Health (PJOK) learning. Through a step-by-step presentation of the material, students are first introduced to the new paradigm of PJOK learning in the digital age before studying various movement techniques presented interactively. This approach is expected to provide a conceptual foundation so that students understand that the use of technology aims to enhance the learning experience while facilitating the mastery of movement skills.

The presentation of this material is supported by the integration of various multimedia

elements, which is one of the key strengths of e-books. The material is not only presented in text form but is enriched with illustrations, movement demonstration videos, and interactive features that are interconnected within a single learning medium. This combination allows students to gain a more comprehensive understanding of movement concepts and techniques compared to relying solely on static images in printed books. Additionally, instructional videos can be replayed as needed, giving students the opportunity to study each movement independently at a pace that suits their abilities. The concept of multimedia integration applied in the e-book is illustrated in Figure 3.



Figure 3. Pillars of Physical Education Learning Digitization

The diagram in Figure 3 shows that the development of the e-book is based on three main components: multimedia representation, interactivity, and accessibility. These three components complement one another in creating a more effective learning experience, where content is not only presented engagingly through various forms of multimedia but also allows students to interact directly with the media and access it flexibly across various devices. The integration of these three components serves as the foundation for e-book design, ensuring that the resulting media functions not only as a source of information but also supports a more active, student-centered learning process.

The application of these three components is further realized through instructional design that encourages students to manage their own learning process. E-books are equipped with simple navigation features so that students can select the material they wish to study, replay demonstration videos, complete exercises, and conduct self-assessments as needed without always having to rely on the teacher's explanations. This flexibility provides each learner with the opportunity to learn according to their own abilities and learning pace. The concept of self-directed learning integrated into the e-book is based on the principles of Self-Regulated Learning (SRL), which emphasizes students' ability to plan, monitor, and evaluate their own learning process. The application of this concept is illustrated in Figure 4.

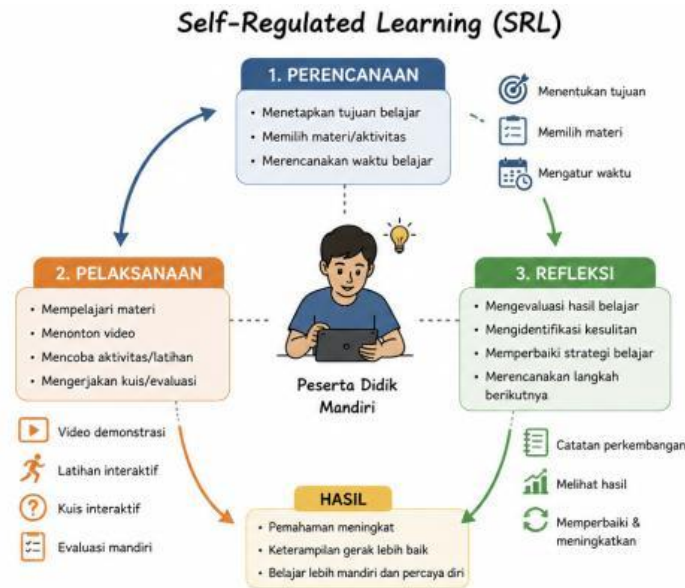


Figure 4. Self-Regulated Learning (SRL) Diagram

Through the stages of planning, implementation, and reflection, the e-book provides students with the opportunity to manage their learning process independently while fostering more active engagement in each stage of learning. Learners can select the material to be studied, access demonstration videos as needed, and assess their understanding through available exercises and quizzes. This learning model not only helps learners develop independent learning skills but also makes it easier for teachers to optimize practical fieldwork time, as mastery of basic concepts has already been achieved before face-to-face activities take place. The implementation of this concept has become one of the key distinguishing features between the developed e-book and conventional e-books. Unlike static e-books, which generally present material only in the form of text and images, this interactive e-book integrates motion demonstration videos, user-friendly navigation, interactive exercises, and immediate feedback. The combination of these features provides a more engaging learning experience, makes it easier for students to understand the material, and increases their engagement during the learning process. The differences in characteristics between interactive e-books and conventional e-books are presented in Figure 5.

Aspek	E-Book Interaktif	E-Book Konvensional (Statis)
 Penyajian Materi	Materi disajikan secara multimodal (teks, gambar, audio, video)	Materi disajikan dalam bentuk teks dan gambar statis
 Visualisasi Gerakan	Tersedia video demonstrasi gerak yang dapat diputar ulang sesuai kebutuhan	Hanya gambar statis sehingga sulit melihat urutan dan detail gerakan
 Keterlibatan Peserta Didik	Melibatkan peserta didik secara aktif melalui navigasi interaktif, latihan, kuis, dan umpan balik langsung	Peserta didik hanya membaca materi tanpa interaksi
 Bentuk Evaluasi	Evaluasi interaktif dengan skor langsung dan umpan balik otomatis	Evaluasi terbatas, biasanya hanya berupa soal di akhir bab tanpa umpan balik langsung
 Aksesibilitas & Fleksibilitas	Dapat diakses kapan saja dan di mana saja melalui berbagai perangkat	Terbatas pada perangkat tertentu dan tidak fleksibel

Figure 5. Comparison of Interactive E-Books with Conventional E-Books These advantages demonstrate that the developed e-book not only

The integration of content, demonstration videos, interactive exercises, and feedback allows students to interact directly with the medium, making the learning experience more meaningful. To ensure all these components are systematically organized and fully integrated, the development process begins with the creation of a storyboard as the initial design of the product. The storyboard includes the layout of each page, the sequence of material presentation, the placement of instructional videos, illustrations, navigation, and the learning activities that students will complete. The storyboard serves as a guideline throughout the development process, ensuring that each page maintains continuity between the content, multimedia elements, and assessment. An example of a storyboard used during the e-book development phase is shown in Figure 6.

Judul E-Book : Teknik Dasar Bola Voli untuk Pemula		Tujuan Pembelajaran : Peserta didik mampu memahami konsep, teknik, dan praktik passing bawah bola voli dengan benar.			
Materi : Passing Bawah					
Sasaran : Peserta didik SMP					
No.	Halaman / Scene	Visual / Tata Letak (Sketsa)	Narasi / Teks	Media	Interaksi / Aktivitas
1.	Halaman Judul (Cover)		Selamat datang! Pada materi ini, kamu akan belajar teknik dasar passing bawah dalam permainan bola voli. Ayo, mulai belajar!	• Gambar ilustrasi pemain passing bawah • Audio pembuka	• Tombol "Mulai" untuk masuk ke materi
2.	Halaman Tujuan Pembelajaran		Setelah mempelajari materi ini, kamu diharapkan mampu memahami pengertian, teknik, dan praktik passing bawah dengan benar.	• Teks • Icon target	• Tombol "Selanjutnya" untuk menuju materi
3.	Halaman Konsep (Pengertian)		Passing bawah digunakan untuk menerima bola rendah atau sebagai awal serangan. Perhatikan sikap tubuh dan posisi lengan saat melakukan passing bawah.	• Teks • Ilustrasi gerakan	• Tombol navigasi (kembali/selanjutnya)
4.	Halaman Demonstrasi (Video)		Perhatikan video berikut untuk melihat gerakan passing bawah yang benar. Gunakan fitur ulang atau slow motion agar kamu dapat mengamati lebih detail.	• Video demonstrasi • Kontrol video (play, ulang, slow motion)	• Tombol kontrol video • Peserta didik dapat mengulang atau memperlambat video
5.	Halaman Langkah Teknik		Beril langkah-langkah teknik passing bawah seperti pada gambar. Latihan secara berulang agar gerakan menjadi lebih baik.	• Teks • Ilustrasi langkah teknik	• Peserta didik membaca langkah teknik • Tombol navigasi
6.	Halaman Aktivitas / Latihan		Kerjakan latihan berikut untuk meningkatkan penguasaanmu. Latihan 1	• Teks • Icon latihan/kuis	• Tombol "Mulai Latihan" untuk masuk ke soal • Skor dan umpan balik setelah selesai
7.	Halaman Penutup / Rangkuman		Bagus! Terus berlatih dan terapkan teknik passing bawah saat bermain bola voli.	• Teks rangkuman • Ilustrasi penghargaan	• Tombol "Ulangi Materi" atau "Kembali ke Menu Utama"

Figure 6. Storyboard for the Volleyball Underhand Pass

The storyboard serves as a guide in the e-book production process, ensuring that each topic is presented in a logical sequence from concept explanation and movement demonstrations to the exercises students must perform. This planning ensures that every video shown is directly relevant to the material being studied and supports the achievement of learning objectives. The storyboard is implemented through instructional videos integrated into each section of the material. Videos are one of the key components that distinguish this e-book from conventional digital media because they present movement demonstrations clearly and systematically. In addition to featuring replay and slow-motion functions, the videos also give students the opportunity to observe body positioning, movement coordination, and the sequence of techniques in greater detail before practicing them on the court. Thus, students can build conceptual understanding while gaining a visual understanding of the correct techniques, making the learning process more effective. The implementation of motion demonstration videos in the e-book is shown in Figure 7.

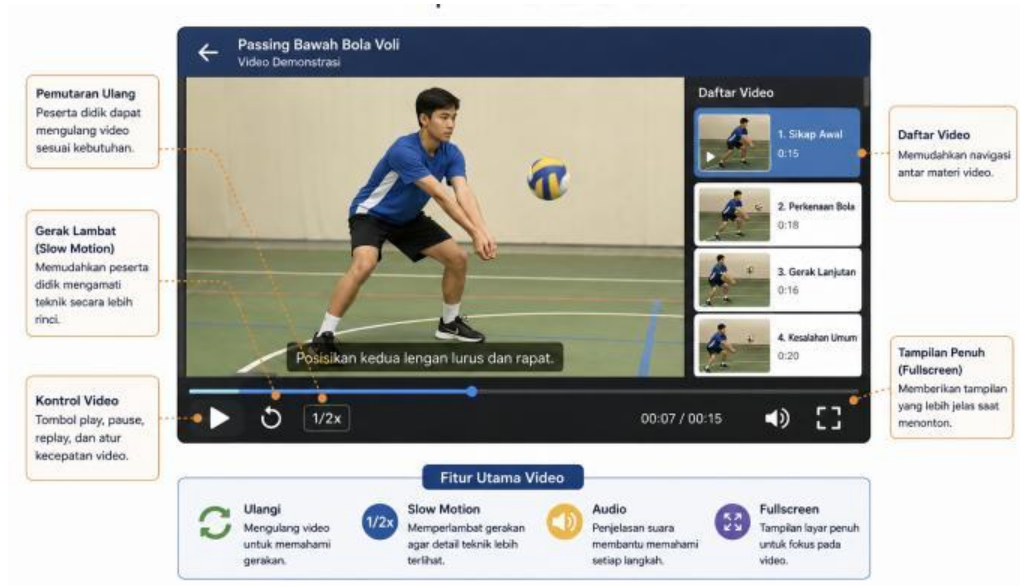


Figure 7. Motion Demonstration Video Display

In addition to the content and videos, the e-book is equipped with interactive assessments that students can complete independently. Students receive immediate feedback on each answer they provide, allowing them to identify which parts of the material still need further review. This feature supports the learning reflection process and enhances student engagement while using the medium, as shown in Figure 8.

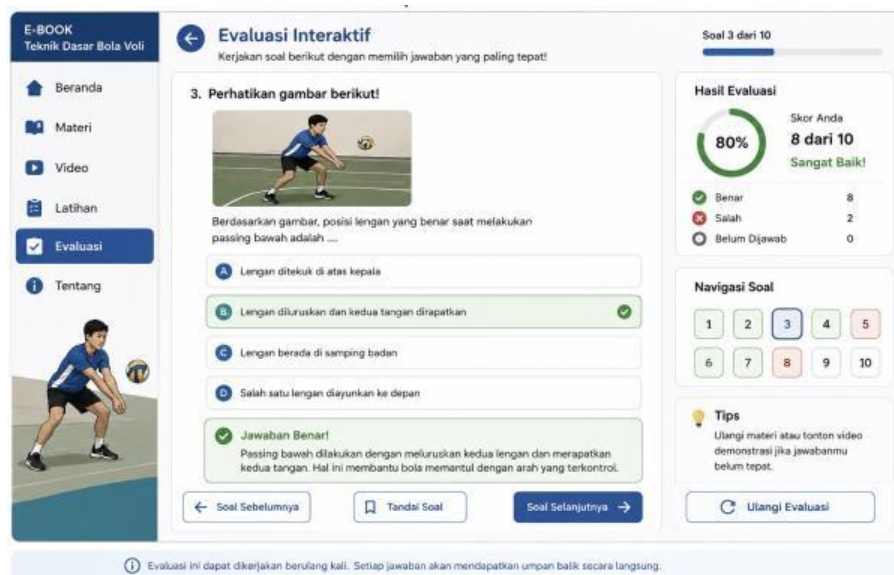


Figure 8. Interactive Assessment Page

After all components of the e-book were developed, the product was not immediately implemented for students but first underwent a validation process to ensure the appropriateness of the content, media design, and language use. Validation was conducted by subject matter experts, media experts, and language experts to obtain feedback on the product's quality before it was used in the pilot phase. The assessment results from the validators were then used as the basis for refinements so that the resulting e-book meets the eligibility criteria for implementation in Physical Education and Health (PJOK) instruction. A summary of the product validation results is presented in Table 1.

Table 1. Product Validation Results

Evaluation	Percentage (%)	Category
Subject Matter Expert	94,21	Highly Valid
Media Expert	92,35	Highly Valid
Language Expert	95,12	Highly Valid
Average	93,89	Highly Valid

The validation results show that the e-book was rated as “highly valid” across all evaluation aspects. The validators provided several suggestions regarding improvements to navigation, icon consistency, and adjustments to technical terminology. All of this feedback was incorporated before the resource was implemented for students.

After being deemed suitable by the validators, the interactive video-based e-book was then pilot-tested to determine its practicality in learning activities. The practicality assessment was conducted through a questionnaire administered to physical education teachers and students after the media was used during the learning process. The aspects evaluated included ease of use, clarity of navigation, media presentation, ease of accessing videos, and the media’s effectiveness in facilitating the delivery of content. A summary of the practicality test results is presented in Table 2.

Table 2. Practicality Test Results

Respondent	Percentage (%)	Category
PJOK Teachers	95,63	Very Practical
Students	93,78	Very Practical

Based on the results of the practicality test, both teachers and students rated the material as “very practical.” Teachers found that the e-book was easy to use and helped explain the material more systematically, especially when demonstrating movement techniques through video demonstrations. The inclusion of videos integrated with the material also reduced the time needed for repeated explanations, allowing for more effective learning. From the students’ perspective, the medium was rated as easy to understand, visually engaging, and providing the flexibility to review the material or videos as needed. This ease of use encouraged students to participate more actively in the learning process and feel more confident when practicing the movements they have learned.

In addition to measuring practicality, this study also evaluated the effectiveness of using interactive video-based e-books on students’ learning outcomes and motivation. The assessment was conducted by comparing pre-instruction (pretest) and post-instruction (posttest) scores, which were then analyzed using the N-Gain score to determine the extent of improvement. The results of the effectiveness analysis are presented in Table 3.

Table 3. Effectiveness Test Results

Variable	Pretest	Posttest	N-Gain	Kategori
Learning Outcomes	63,40	86,70	0,64	Moderate
Learning Motivation	68,15	88,92	0,66	Moderate

The data in Table 3 show an increase in both measured variables after students used interactive video-based e-books. Average learning outcomes increased from 63.40 on the pretest to 86.70 on the posttest, while learning motivation increased from 68.15 to 88.92. The N-Gain values of 0.64 for learning outcomes and 0.66 for learning motivation fall into the moderate category, indicating that the use of this medium produced a significant improvement in the

learning process.

These improvements indicate that e-books not only help students understand the material conceptually but also provide opportunities to learn movement techniques through video demonstrations that can be replayed as needed. The integration of content, illustrations, videos, exercises, and assessments makes the learning process more focused, ensuring that students have sufficient time to build their understanding before engaging in practical fieldwork. Thus, interactive video-based e-books can serve as an alternative learning medium capable of supporting the implementation of Physical Education, Health, and Sports (PJOK) more effectively than the use of printed books as the sole learning resource.



Discussion (مناقشة)

The research results show that the interactive video-based e-book developed meets the criteria of validity, practicality, and effectiveness for use in Physical Education and Health (PJOK) instruction for seventh-grade students. The high level of validity indicates that the content, media presentation, language use, and video integration are aligned with the students' characteristics and the intended learning outcomes. The practicality results also indicate that the media can be used easily by both teachers and students. Rather than merely confirming the feasibility of the product, these findings indicate that the integration of content, multimedia elements, and interactive features was acceptable to the intended users. These findings are consistent with previous research reporting the potential of digital learning media to support instructional quality and user acceptance (K. Zamzam et al., 2026; Niu, 2026; Nasution & Tambunan, 2024).

The media's suitability, as determined in this study, aligns with the principles of the Cognitive Theory of Multimedia Learning (CTML), which explains that the learning process becomes more effective when information is presented through a combination of text, images, and complementary visual media (Mayer, 2024). In the developed e-book, conceptual explanations are accompanied by illustrations and integrated motion demonstration videos. From the perspective of the present study, this combination provides students with both textual and visual representations of movement techniques, which is particularly relevant to PJOK because the learning content involves dynamic physical movements. The integration of various forms of multimedia may also help reduce unnecessary cognitive processing when students learn complex movement sequences (Tantri et al., 2023). Thus, the contribution of multimedia in this study is not simply the addition of video to an e-book, but the alignment of visual demonstrations with the concepts and activities that students are expected to learn.

The effectiveness of the e-book is reflected in the improvement in students' learning outcomes and motivation after the medium was used. The increase in posttest scores compared to pretest scores, accompanied by an N-Gain score in the moderate category, indicates that the medium is capable of providing a more meaningful learning experience. One factor believed to contribute to this improvement is the availability of demonstration videos that can be played repeatedly as needed by students. The opportunity to observe movement techniques repeatedly helps students understand the sequence of movements before practicing them directly on the field. This finding aligns with Yorganci's study, which reported that the use of interactive e-books combined with video feedback can improve both learning performance and students' intrinsic motivation compared to the use of conventional digital books (Yorganci, 2022).

The present findings should also be distinguished from the broader claims made in previous studies. While Yorganci (2022) provides evidence from another multimedia learning context, the current study demonstrates that an integrated video-based e-book can produce moderate improvement in both learning outcomes and motivation in a Grade VII PJOK context. Thus, the previous study provides theoretical and empirical support for interpreting the role of

video feedback, whereas the N-Gain results reported here constitute evidence specific to the participants and implementation conditions of the present study.

The increase in learning motivation found in this study also holds significant implications for Physical Education (PJOK) instruction. Motivation is one of the factors influencing students' engagement during physical activities. When learning materials are presented in an engaging manner, students tend to be more enthusiastic about the lessons, are more willing to try each activity, and demonstrate a higher level of curiosity toward the material being studied. This was evident during the pilot study, where students were more active in exploring the material, replaying demonstration videos, and discussing proper movement techniques. These results support the findings of Verawati, who concluded that the use of interactive learning media can increase students' interest and engagement in physical education (Verawati, 2024).

The characteristics of the e-book which integrates content, videos, exercises, and assessments into a single platform also provide a learning experience distinct from that of conventional digital media. Students do not merely read the material but can observe movement demonstrations, review specific sections they have not yet understood, and receive immediate feedback through interactive assessments. These activities demonstrate that learning is no longer teacher-centered but instead provides students with greater freedom to construct their own understanding through interaction with the media. This approach aligns with the constructivist perspective, which positions students as active participants in the learning process (Leikin & Elgrably, 2022), and is supported by the findings of Trisnawati, which show that the use of interactive videos in Physical Education (PJOK) learning can enhance learning motivation while developing students' critical thinking skills (Trisnawati et al., 2024).

Another interesting finding is the ability of e-books to facilitate self-regulated learning. Simple navigation features, replayable videos, and assessments accompanied by feedback allow students to manage their own learning process according to their needs. They can determine the material they wish to study, review sections they have not yet understood, and then independently evaluate their learning outcomes. These characteristics are highly relevant to the needs of seventh-grade students, who are beginning to be guided toward developing independent learning skills. A learning environment that provides students with the opportunity to manage their own learning process is known to enhance intrinsic motivation, self-confidence, and engagement in learning activities (K. F. Zamzam et al., 2026).

Compared to previous studies, this research offers a more integrated approach. Most previous studies developed instructional videos e-modules, or interactive multimedia as standalone media, whereas this study combines all learning components from content, illustrations, demonstration videos, exercises, to assessments into a single interactive e-book. This integration allows students to access all their learning needs without having to switch to other platforms. Thus, the e-book functions not only as digital instructional material but also as a learning environment that supports the learning process as a whole. This finding reinforces the results of a systematic review on the implementation of interactive multimedia in Physical Education and Health (PJOK) instruction, which states that the integration of various forms of digital media can enhance students' motivation, engagement, and learning outcomes (Kamaruddin et al., 2025).

In practical terms, the developed media benefits both teachers and students. Teachers gain an alternative medium that helps explain material more efficiently, allowing field instruction time to be focused on practical activities, providing feedback, and developing motor skills. Meanwhile, students have the opportunity to study the material independently before attending in-class sessions, so that face-to-face time can be used to deepen their mastery of movement skills. These findings indicate that interactive video-based e-books have the potential to support the

implementation of the Merdeka Curriculum, which emphasizes active, flexible, and learner-centered learning (Barikah et al., 2026).

This study has several limitations that are important when interpreting its effectiveness. The product trial was conducted at a single school with a relatively limited number of participants, consisting of 10 students in the small-group trial and 30 students in the field test. Consequently, the findings primarily reflect the characteristics of the participating school and students and cannot yet be assumed to represent Grade VII PJOK students in other schools or regions. Differences in school facilities, students' digital familiarity, teacher characteristics, and learning environments may influence the usability and effectiveness of the e-book.

The short-term nature of the intervention also limits interpretation of the moderate N-Gain values. The study captures changes occurring during the implementation period but does not establish whether these improvements would be maintained over a longer period. In addition, learning outcomes were assessed immediately after the intervention, so the study does not provide evidence regarding long-term retention or sustained motivation. The effectiveness of the medium was also evaluated through learning motivation and short-term learning outcomes rather than through longer-term motor-skill development, physical activity, or learning retention.

These limitations suggest that the moderate N-Gain results should be viewed as preliminary evidence of improvement under the specific conditions of the present study rather than as evidence of broad or long-term effectiveness. Future research could involve larger and more diverse samples across several schools, employ a quasi-experimental or experimental design with a comparison group, and include follow-up measurements to examine retention. Future studies could also examine whether repeated and longer-term use of the e-book produces greater improvement in learning outcomes, motivation, and motor-skill performance.



Conclusion (خاتمة)

This study produced an interactive video-based e-book as a Physical Education learning medium for seventh-grade students that is suitable for use in the learning process. The integration of content, illustrations, movement demonstration videos, exercises, and assessments into a single medium provides a more focused learning experience and makes it easier for students to understand movement concepts and techniques. Furthermore, this medium also helps teachers present material more systematically, making learning more interactive, efficient, and student-centered.

The research findings indicate that interactive video-based e-books have the potential to serve as an alternative learning medium that supports the implementation of Physical Education and Health (PJOK) instruction in the digital age. Therefore, the development of similar media can be applied to different subject matter and educational levels so that its benefits can be tested in a broader context. Further research is also recommended to develop more adaptive features, such as integration with a Learning Management System (LMS) or artificial intelligence-based technology, so that the resulting learning media becomes increasingly relevant to learning needs.

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