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Development of a website based on digital learning multimedia for information technology subject in junior high school students

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Abstract: The integration of technology in learning alters teaching methods, fostering a more interactive and collaborative learning environment. Educational multimedia websites improve user interaction, evaluate student comprehension, and provide diverse media. The purpose of this study is to develop a website based on digital learning multimedia in the information technology subject at SMP Pest. Putri Yatama Mandiri Gowa. This research is classified into the category of research and development (R&D). The development model used in this study refers to the ADDIE model. Validation involved media and design experts as well as material experts. The trial involved 10 students in the small-group phase and 30 students in the large-scale trial. The results of the needs analysis showed that several main factors were the basis for development, including the condition of learning facilities that are still limited and the lack of digital media integrated with teaching materials. The results of the validation of the material experts showed that the product was categorized as very valid with a total average of 4.6. Meanwhile, the results of the validation of media and design experts were found to be 4, indicating a valid product. The results of the small-group trial showed an average score of 91.00 in the practical category. The results of the large-scale trial showed an average score of 90.50, indicating the product's effectiveness. The use of a website based on digital learning multimedia has proven to be practical and effective in significantly improving student learning outcomes in the subject of information technology. Therefore, this website based on digital learning multimedia is worthy of being used as an integral part of modern learning strategies, especially in information technology-based learning.

Keywords: Educational multimedia, technology in learning, websites

Abstrak: Integrasi teknologi dalam pembelajaran mengubah metode pengajaran, mendorong lingkungan belajar yang lebih interaktif dan kolaboratif. Website multimedia pendidikan meningkatkan interaksi pengguna, mengevaluasi pemahaman siswa, dan menyediakan beragam media. Tujuan penelitian ini adalah untuk mengembangkan website berbasis multimedia pembelajaran digital pada mata pelajaran TIK di SMP Pest. Putri Yatama Mandiri Gowa. Penelitian ini termasuk dalam kategori penelitian dan pengembangan (R&D). Model pengembangan yang digunakan dalam penelitian ini mengacu pada model ADDIE. Validasi melibatkan ahli media dan desain serta ahli materi. Percobaan melibatkan 10 siswa pada fase kelompok kecil dan 30 siswa pada percobaan skala besar. Hasil analisis kebutuhan menunjukkan bahwa beberapa faktor utama menjadi dasar pengembangan, termasuk kondisi fasilitas pembelajaran yang masih terbatas dan kurangnya media digital yang terintegrasi dengan bahan ajar. Hasil validasi dari ahli materi menunjukkan bahwa produk dikategorikan sangat valid dengan rata-rata total 4,6. Sementara itu, hasil validasi dari ahli media dan desain ditemukan sebesar 4, menunjukkan produk yang valid. Hasil uji coba kelompok kecil menunjukkan skor rata-rata 91,00 pada kategori praktis. Hasil uji coba skala besar menunjukkan skor rata-rata 90,50, yang mengindikasikan efektivitas produk. Penggunaan situs web berbasis multimedia pembelajaran digital telah terbukti praktis dan efektif dalam meningkatkan hasil belajar siswa secara signifikan pada mata pelajaran teknologi informasi. Oleh karena itu, situs web berbasis multimedia pembelajaran digital ini layak digunakan sebagai bagian integral dari strategi pembelajaran modern, khususnya dalam pembelajaran berbasis teknologi informasi.

Kata kunci: Multimedia pendidikan, teknologi dalam pembelajaran, situs web

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INTRODUCTION

In the 21st century, information and communication technology (ICT) has reshaped traditional learning paradigms and become crucial in education. The Independent Curriculum emphasizes technology-based and student-centered learning, positioning teachers as facilitators (Junarti et al., 2023; Ningsih & Sari, 2024; Runniarsiti et al., 2025). This approach highlights the importance of technology in learning to aid students' understanding of complex concepts and improve the quality of learning (Sa'diyah, 2025; Suryati et al., 2023). The integration of technology in learning alters teaching methods, fostering a more interactive and collaborative learning environment (Haq et al., 2024). Meanwhile, to increase effectiveness in collaborative learning environments, media that support the delivery of information to students is needed.

The results of this observation were conducted in the even semester of the 2024/2025 academic year and were also supported by the results of interviews with teachers who teach at SMP Putri Yatama Mandiri Gowa, who stated that the teaching and learning process has not been fully implemented properly, especially in the information technology subject taught at SMP Pest. Putri Yatama Mandiri Gowa. Because so far, teaching has only used simple media, including PowerPoint slides. The findings were based on observations at SMP Pest. Putri Yatama Mandiri Gowa, teachers still use conventional learning media, namely a method that uses textbooks applied in the teaching and learning process so that it does not attract students' attention; with this method, teachers tend not to involve students actively in learning. Teachers use limited modules as supporting media during learning, which fails to capture students' attention. Productive learning itself is a suitable and sufficient medium to be able to deliver material that contains elements of movement so that the teaching process can be properly considered by information technology. The lack of student motivation, attention, and low learning achievement indicates that obstacles in the learning process disrupt the information that students should receive.

Learning media is a channel or intermediary used to convey messages or teaching materials. Media is essential in learning as a tool for conveying information and messages from teachers to students (Dita et al., 2023; Madzamba & Matorevhu, 2024; Malik et al., 2024; Mustofa et al., 2024). Good and smooth learning requires good learning media that are appropriate to classroom conditions. In information technology subjects, information technology is a productive/practical learning, so it requires media that contain elements of movement (Rahmadani et al., 2025). Therefore, learning videos are one of the appropriate media for detailed and comprehensive learning materials (Burga et al., 2025; Nasrul et al., 2024). Digital learning media are media or teaching aids that contain learning messages. Videos, as audio-visual media, have elements of movement and will be able to attract students' attention and motivate them in carrying out learning activities (Hanif, 2020).

In learning, besides videos, teachers need various digital media to support the success of their teaching. Digital media can take the form of visuals (Yarkova et al., 2017), digital media such as e-modules (Nurzahra et al., 2025; Ramadani & Anwar, 2025), digital comics (Damopolii et al., 2021), digital audio (Xu, 2024), videos (Afify, 2020), even quizzes in the form of digital games (Nuci et al., 2021), and many other forms. The diversity of media provided in learning characterizes the use of multimedia in teaching. Multimedia serves as an educational tool that integrates technology, enhancing teaching and learning by making

the process more engaging, interactive, and effective (Satriani & Prasojo, 2024). Multimedia must be accessible to users anytime and anywhere, or it must be flexible. Multimedia-based websites are one of the means to deliver educational materials (Hwang et al., 2016; Satriani & Prasojo, 2024). Utilization of websites helps increase user interaction (Brijnath et al., 2016), evaluate student understanding of the material (Wang, 2018), provide various media and quizzes (Mustofa et al., 2024), information sources, as assessment tools, and as a platform for producing and sharing products (Dinc, 2017). Thus, the purpose of this study is to develop a website based on digital learning multimedia in the information technology subject at SMP Pest. Putri Yatama Mandiri Gowa.

METHOD

This research is classified into the category of research and development (R&D). Development research aims to produce a product or website that can be applied in an educational context. In this study, the researcher will develop a product or model relevant to the educational needs of SMP Pest. Putri Yatama Mandiri Gowa. The product or website is expected to provide solutions to problems faced by students and teachers in learning. The development model used in this study refers to the ADDIE model.

The researcher will involve 40 eighth-grade students as a product trial sample, and the researcher will involve three teachers and an informatics teacher as the primary users of the model developed by this researcher. These students and teachers were selected based on specific criteria relevant to the research objectives, such as their level of understanding of the material to be developed and their active involvement in the digital learning process of Information Technology. This research focuses on developing a product or website that can address learning problems currently faced by teachers and students, such as low student engagement, a lack of variety in learning media, and the effectiveness of methods used in achieving optimal learning objectives.

In this research and development of digital-based learning multimedia, descriptive analysis techniques were used to analyze data by describing or depicting the data collected from validation and trial results. Validation involved content experts, media and design experts. The trial involved 10 students in the small-group phase, and 30 students in the large-scale trial. The validation results were then categorized based on Table 1.

Table 1. Validation of assessment aspects (Azwar, 2012)

Interval	Category
4.6<M<5.0	Very Valid
3.6 <M < 4.5	Valid
2.6 <M<3.5	Quite Valid
1.6 <M<2.5	Less Valid
0.0<M<1.5	Not Valid

RESULTS AND DISCUSSION

The results of the analysis stage, which aimed to identify the needs in this study, were obtained from interview data and initial observations at SMP Pest. Putri Yatama Mandiri Gowa is involved in the analysis of identifying multimedia-based website needs. The results of the analysis of the identification of needs on the Multimedia website for Digital Learning

of information technology at SMP Pest. Putri Yatama Mandiri Gowa were carried out through interviews with the Principal of SMP Pest. Putri Yatama Mandiri Gowa. The interview obtained:

1. The teaching and learning process at SMP Pest. Putri Yatama Mandiri Gowa is highly valid, with a score of 4.6 < M < 5.0%.
2. Efforts should be made to immediately design a digitalization program for the multimedia digital learning website for the information technology subject at SMP Pest. Putri Yatama Mandiri Gowa. This is considered valid, with a score of 3.6 < M < 4.5%.
3. The principal of SMP Pest. Putri Yatama Mandiri Gowa supports the development of a multimedia-based digital learning website for the information technology subject at SMP Pest. Putri Yatama Mandiri Gowa. This is highly practical, with a score of 2.6 < M < 3.5%.
4. The support from the ICT subject teacher at SMP Pest. Putri Yatama Mandiri Gowa for the development of a multimedia-based website for digital learning in the information technology subject is very effective because it obtained a score of 1.6 < M < 2.5%.
5. The need for a flexible and accountable platform for improving digital services for the development of multimedia-based websites for digital learning in information technology subjects at SMP Pest. Putri Yatama Mandiri Gowa is highly valid, practical, and effective, achieving a score of 1.5 < M < 5.0%.

Based on the results of research conducted at SMP Pest. Putri Yatama Mandiri Gowa, it was found that there is an urgent need for the development of digital-based learning media, especially for the subject of information technology. This need arises from several main factors, including the condition of learning facilities that are still limited, the lack of digital media integrated with teaching materials, and changes in student learning styles, who are now more familiar with digital devices and the internet. In the modern era like today, students are not only required to understand the material conceptually but also must be able to use technology as part of 21st-century skills. However, in practice, there are still many educational institutions, including SMP Pest. Putri Yatama Mandiri Gowa, which has not optimally implemented digital-based learning. The subject of information technology should be the right vehicle to encourage students' digital literacy. However, without the support of relevant media, the learning process becomes ineffective and not contextual to current developments. A needs analysis aims to identify the user requirements related to the product being developed (Ganefri et al., 2020; Santika et al., 2022).

The design stage of the ADDIE model focuses on creating a digital learning product for information and communication technology; this stage is crucial for developing a multimedia web that effectively manages and accommodates the distribution of information. The flowchart design or flow diagram is used to show the sequence and relationship between processes and their instructions according to the learning concept design. The sequence and relationship between these instruction processes are depicted with certain symbols and are connected to each other using connecting lines. The flowchart is designed using the Diagram application.

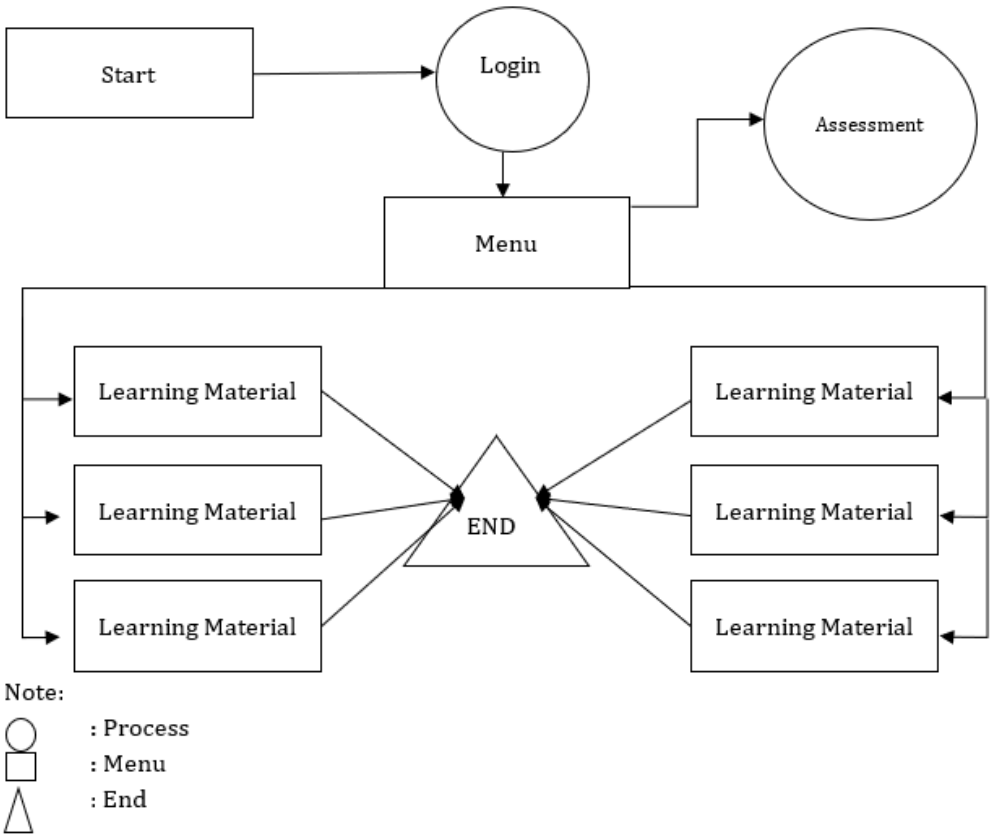

Fig. 1. Web flowchart

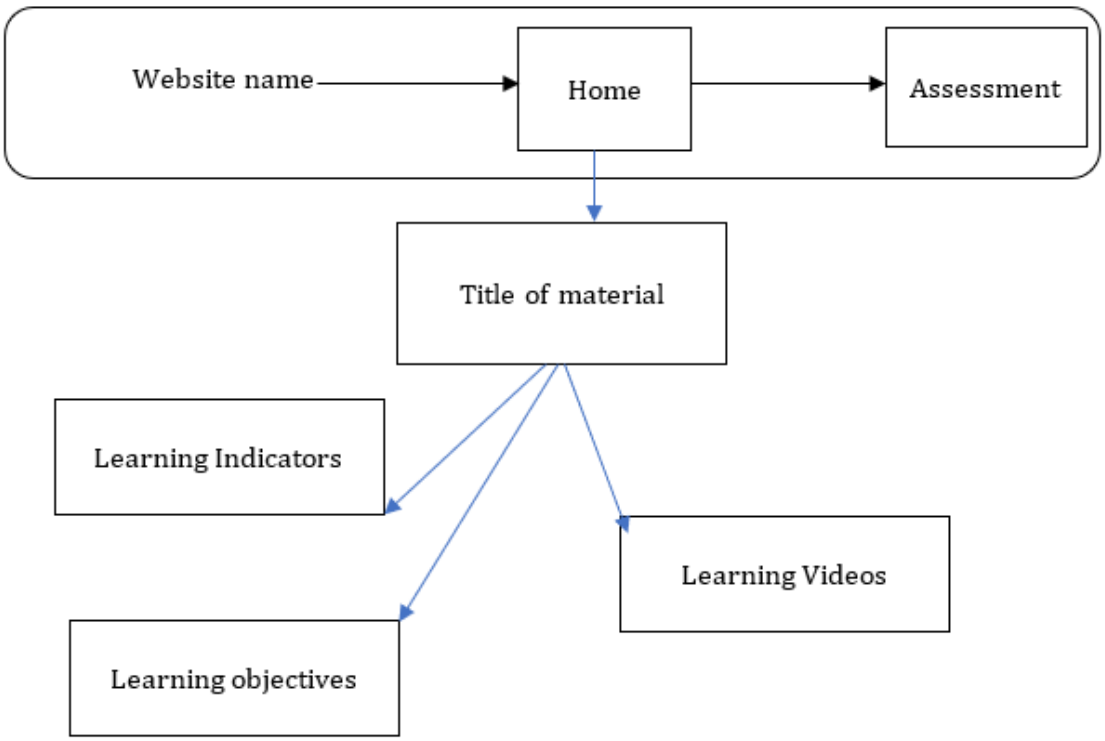

Fig. 2. Website name storyboard

The digital learning multimedia website was developed based on the previous steps. Figure 3 – 5 shows the components of the product development result.

Fig. 3. Digital multimedia website homepage

Fig. 4. Digital multimedia website home page

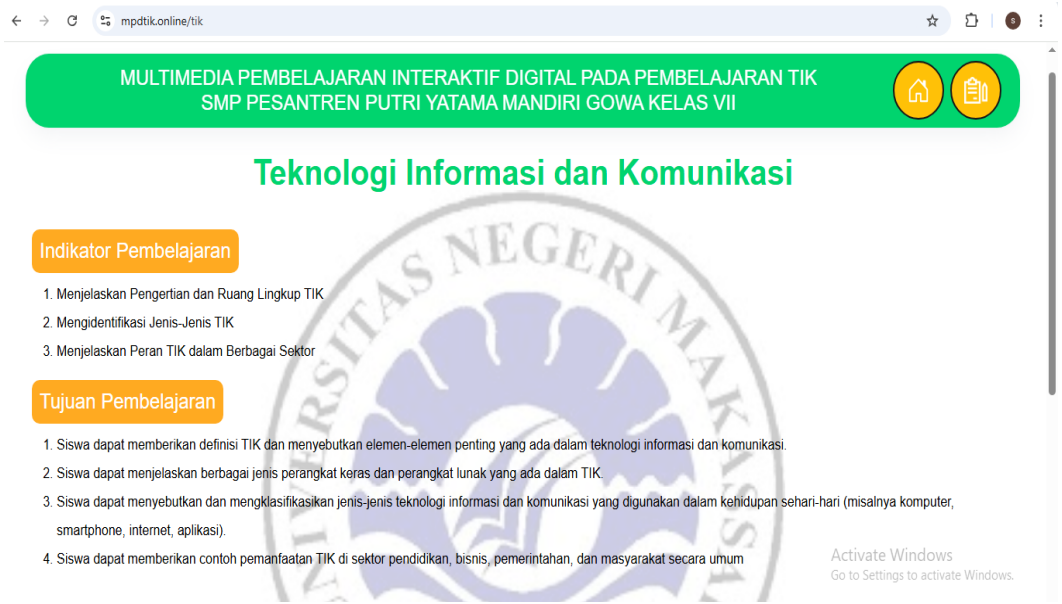

Fig. 5. Content page

The design stage is one of the most crucial stages in the process of developing digital-based learning media. In the ADDIE development model, this stage serves as a bridge between needs analysis and actual product implementation. Design is not just about creating a visual appearance but also includes comprehensive planning of material content, learning flow, interactivity, and user experience. In the context of this research, the information technology learning multimedia website was designed systematically and strategically to meet the needs of students and teachers at SMP Pest. Putri Yatama Mandiri Gowa. The design process began with the formulation of the website's content structure and navigation. The researcher developed a design framework based on the results of the user needs analysis.

The flowchart illustrates the navigation flow from one page to another, including login, the main dashboard, material access, assessments, and the school profile and developer biography sections. This design aims to create a simple yet informative experience, making it easy for students to navigate the content without feeling confused. Next, the researchers used a storyboard to visualize the interface of each page in more detail. This storyboard served as the primary guide for the user interface and user experience development process. Emphasis was placed on display consistency, text readability, eye-pleasing color combinations, and the use of icons or illustrations that support understanding of the material. This is important considering that the target users are junior high school students who require an attractive yet uncluttered display.

Validation is a crucial step in the development of digital-based learning media. This stage aims to ensure that the developed product truly meets quality standards, both in terms of content (material) and in terms of appearance and technique (design and media). Before implementing the media for end users, namely teachers and students, quality control also includes validation. In the context of this research, validation was carried out by two parties with competence and authority in their respective fields: a material expert and a design/media expert.

Table 2. Results of material validation by material and content experts

NO	Rated aspect	Score
	Content	
1	Conformity between material and learning video	4
2	Suitability of learning indicators	4
3	Suitability of learning objectives	5
4	Conformity of material to scientific truth	4
5	Suitability of material to student characteristics	4
	Average (I)	4.2
	Material	
6	Sentences used in accordance with correct Indonesian language rules	5
7	Language suitability to students' cognitive level	5
8	The language used is easy for students to understand	5
9	Discussion of material encourages student knowledge	5
10	Discussion of material encourages students' curiosity	5
	Average (II)	5
	Total	4.6

Based on the results of the material and content expert validation presented in Table 2, the average score for the content aspect is 4.2 and for the material aspect is 5, resulting in a final average score of 4.6. This score, when converted using the validity criteria table, falls into the very valid category. These findings indicate that the content and material used in the digital multimedia learning website are highly appropriate in terms of alignment with learning objectives, language suitability, cognitive level, and the accuracy of scientific content. Furthermore, the validator provided positive feedback, encouraging the immediate use of the website in the learning process.

Table 3. Results of design validation by design and media experts

NO	Rated aspect	Score
	Content	
1	Easy to use website	4
2	The proportional layout of the front cover is correct	4
3	Synchronization between materials and videos	3
4	The video used is clear	4
5	Video sound can be heard clearly	4
	Average (I)	3.8
	Material	
6	Accuracy of layout of each menu section	4
7	Attractiveness of website design	4
8	Use of color on website	4
9	The type of font used is easy to read	4
10	The composition of color and writing is correct	5
	Average (II)	4.2
	Total	4

The validation process conducted by the media and design expert, a lecturer in the Master's Program of Educational Technology at UNM, indicates that the digital multimedia learning website meets good design principles and user needs. Based on Table 3, the average score for media aspects is 3.8, and for material/design aspects is 4.2, resulting in a final average score of 4.0.

Product validation by experts is a crucial quality assurance measure before media is used in actual learning. Without validation, media risks containing conceptual errors, miscommunication of learning messages, or even technical failures that disrupt student learning (Damopolii et al., 2022; Dita et al., 2023). Therefore, the validation process is not merely a development formality, but a crucial step in ensuring that the developed media is truly high-quality, functional, and aligns with learning objectives. The developed multimedia website-based learning media is of excellent quality, both in terms of content and design. Validation from these two perspectives provides confidence that the product is worthy of further implementation and broader field testing. The level of practicality in this study was carried out at the trial stage, namely testing the digital learning multimedia website using a small group test questionnaire from student user responses.

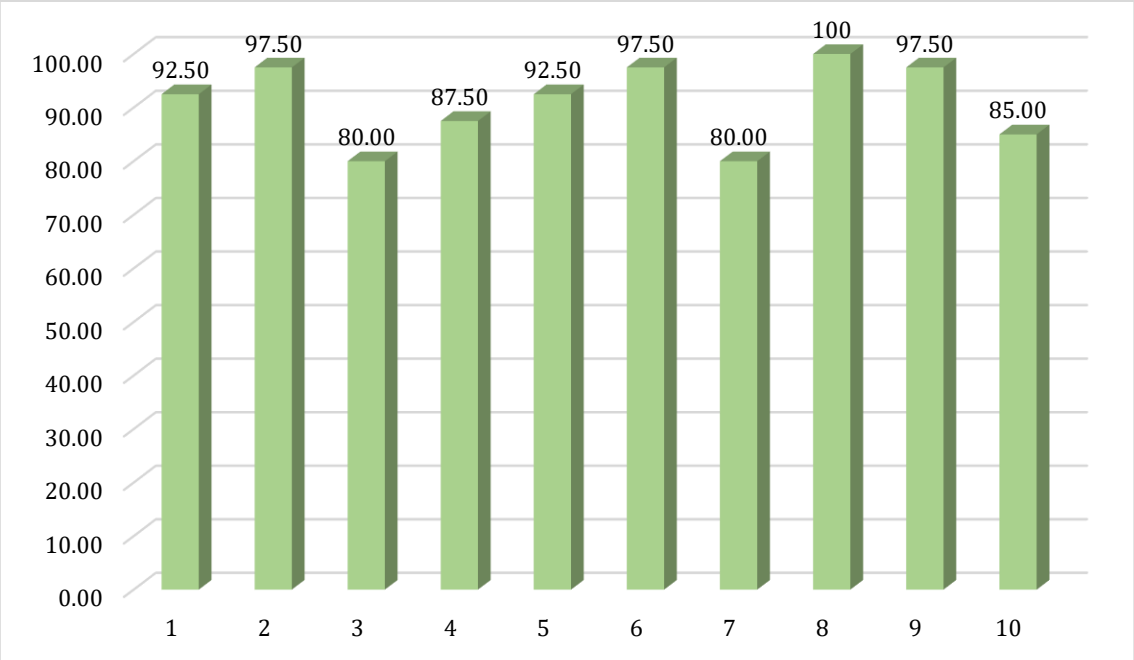

Fig. 6. Results of small group trials

The results obtained were 91.00 (Table 6), or in the very practical category. Additional input and suggestions from students included adding connecting material before entering the learning video stage. The target users considered the developed digital learning multimedia website very practical, as demonstrated by this small group trial. This practicality included aspects of technical ease, visual comfort, and suitability to student learning patterns. These results provide a strong basis for continuing testing on a larger scale, namely effectiveness testing on a wider group (Ahliana et al., 2025; Amir et al., 2025; Runniarsiti et al., 2025). This practicality test also yielded several important notes for

improvement. Several students reported that the page display on mobile devices (smartphones) was sometimes disproportionate, especially when playing videos or opening practice questions. This provides valuable feedback for developers to ensure that the website supports cross-device responsiveness so that it can be accessed properly on both laptops and mobile phones.

After the website-based learning media was declared valid and practical through validation and small-group trials, the next step in this research was to conduct an effectiveness test. This evaluation aimed to determine the extent to which the developed media could support the achievement of learning objectives in a real-world classroom context (Setyantoko et al., 2023; Yomaki et al., 2023), particularly in information technology subjects.

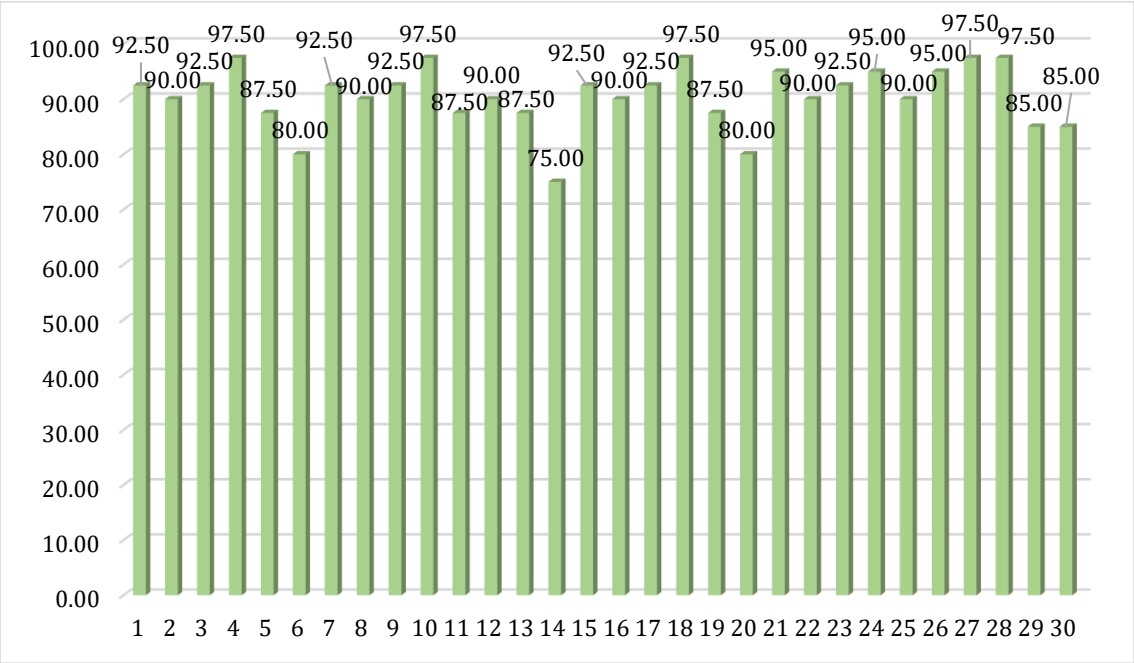

Fig. 7. Results of large group trials

The research results obtained were 90.50 (Figure 7), or in the very effective category. Additional input and suggestions from students were to immediately implement this website to facilitate a deeper understanding of ICT, because it is very necessary in today's era. The product developed is in the form of an educational video stored in website format. The development process involved the use of Vercel and contains material on video editing, which is part of the information technology subject. The design is in line with the characteristics of multimedia learning that emphasizes sound, visuals, and movement as important elements in learning media (Abdulrahaman et al., 2020; Amali et al., 2020; Çeken & Taşkın, 2022).

This effectiveness is supported by several important factors. First, learning media presents content in various formats (text, video, images, and quizzes), thus meeting the learning needs of various types of students. For students who tend to be visual and auditory learners, the use of videos and illustrations significantly aids comprehension. Second, this media allows students to learn independently and flexibly, as it can be accessed outside of

school hours. Third, the availability of practice questions that can be worked on directly also provides opportunities for students to test and strengthen their understanding of the material they have learned (Aka, 2025; Babayev, 2025; Badiah & Kurniawan, 2025; Damopolii & Kurniadi, 2019).

This study indicates that the use of multimedia website-based learning media significantly increases student learning engagement, enhances material comprehension, and provides a more engaging and interactive learning experience. These findings align with previous research conducted by various researchers in the field of educational technology. Research by Adhana and Andriani (2024) demonstrated that interactive multimedia-based learning media positively impacts student learning outcomes, particularly in subjects requiring practical conceptual understanding, such as ICT (Yani et al., 2024). In their study, they developed video tutorials and simulation-based media, and the results showed increased learning motivation and student understanding of the material. This evidence supports the findings of this study, where the presence of learning videos on the website was highly appreciated by students because it facilitated conceptual understanding. Another study by Dita et al., 2024, confirmed that the use of information technology in learning contributes to the development of independent learning characteristics in students. This is also in line with the results of this study, which indicated that website-based learning media helps students access material independently, anytime and anywhere, without absolute dependence on teachers in the classroom.

Furthermore, another strength of this research lies in the technical development aspect, which utilizes modern frameworks such as React.js and Next.js, which are not yet widely used in the development of learning media in junior high schools. This demonstrates that technological innovation combined with a mature educational approach can produce learning media that is not only effective but also relevant to current technological developments. One of the main advantages of this medium is its flexible access. This website is designed to be accessible anytime and anywhere, as long as an internet-connected device is available. Today's students, whose learning habits transcend specific spaces and times, find this flexibility crucial. In the context of SMP Pest., flexible access is a relevant solution to support independent learning. At SMP Pest. Putri Yatama Mandiri Gowa, busy schedules and religious routines often limit learning activities, making flexible access a relevant solution to support independent learning. Multimedia integration is a driving force in creating a more flexible, accessible learning environment that supports independent learning (Mustofa et al., 2024; Staneviciene & Žekienė, 2025).

The second advantage lies in the integration of various media forms, such as narrative text, illustrative images, and instructional videos. This combination makes the material richer and easier to understand for students with different learning styles. Text explains concepts verbally, images help visualize the material, and videos provide explanations through sound and movement. By presenting material in various formats, this medium supports a multimodal approach, which has proven more effective in improving student understanding and retention. Multimodality explores how communication modes complement or conflict with each other and emphasizes diverse student learning using audio, video, e-books, and online gaming applications (Gusdini et al., 2025). Furthermore, this website excels in ease of navigation. The simple and consistent interface design allows students to explore the content without feeling overwhelmed. The navigation menu is

clearly displayed, with intuitive icons and buttons, so students can easily move from one page to another. This is especially helpful for junior high school students who may be unfamiliar with complex online learning platforms. Another advantage is the inclusion of quizzes and practice questions directly within the material. This allows students to self-evaluate and immediately assess their level of understanding. This activity can also motivate students to learn more actively and take responsibility for their own progress (Ota et al., 2023; Wismiati et al., 2025).

During the effectiveness test, several technical challenges were encountered, such as differences in internet speed and device issues for some students. However, these obstacles did not significantly reduce the media's effectiveness in supporting the achievement of learning objectives. Teacher assessments also supported the results of this effectiveness test. Teachers stated that during the learning process using the website, students appeared more active, enthusiastic, and independent in exploring the material. Teachers also found it helpful in managing classes and providing assessments through this medium. This indicates that the media is not only effective for students but also has a positive impact on teachers in carrying out their role as facilitators. From the results of this evaluation, it can be concluded that the website-based learning media developed can make a significant contribution to improving student learning outcomes. The high effectiveness indicates that this website is not only suitable for use but is also highly recommended for integration into formal learning, particularly in ICT subjects.

CONCLUSION

Based on the research results and discussions that have been conducted, it can be concluded that the development of a multimedia-based digital learning website for the information technology subject at school is a solution to the low effectiveness of learning that still uses conventional methods. Putri Yatama Mandiri Gowa is a solution to the low effectiveness of learning that still uses conventional methods. The results of validation by experts indicate that the developed multimedia digital learning website is included in the category of very valid and feasible to use. In terms of practicality, the developed multimedia website received a positive response from teachers and students. Teachers felt helped in delivering material and managing the class, while students felt more motivated and easily understood the material being taught. The use of a website based on digital learning multimedia has proven to be very effective in significantly improving student learning outcomes in the information technology subject. Therefore, researchers made a breakthrough with this website based on digital learning multimedia product, not only presenting information in an interesting and comprehensive manner but also encouraging active student involvement in the teaching and learning process. Therefore, this website based on digital learning multimedia is worthy of being used as an integral part of modern learning strategies, especially in information technology-based learning.

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