

Optimizing Education Through Website-Based Learning Media: Implementation in Junior High Schools

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Abstract

This study aims to design and implement a website-based learning and information management system for MTs KSM Kalupapi. The system serves as a comprehensive platform for facilitating school information dissemination and supporting online learning processes. Employing the UML approach, the system was developed with intuitive interfaces and structured data management to ensure accessibility and functionality for diverse user groups. It accommodates school principals for administrative oversight, teachers as content managers, students for accessing educational materials and assignments, and parents for monitoring their children's academic progress. The system underwent rigorous testing using the black box method to validate its functionality, ensuring accurate outputs aligned with specified requirements. Survey feedback from users indicated exceptional satisfaction, with an average score of 99% and overwhelmingly "strongly agreed" responses across all evaluation metrics. These results highlight the system's effectiveness in enhancing learning efficiency and streamlining information management within the school environment. This study underscores the transformative potential of website-based learning systems in modern education. It also offers a foundation for future enhancements, such as integrating advanced features, adapting for broader educational contexts, and scaling for use in other institutions, thereby promoting innovation and accessibility in education.

Keywords: Website-based learning; Learning; Online education; Information management system; User interface design.

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Introduction

Updates are the result of ever-evolving cultural dynamics, where technology becomes the main tool to facilitate various human activities (Nawisan, 2024; Ngafifi, 2014; Rev., 2016). The existence of technology not only affects daily life, but also penetrates various important aspects such as economics, society, and education (Jamun, 2018; Maritsa et al., 2021; TD Putri, 2019; Suryadi, 2019). In the world of education, technology has become a major catalyst that drives the creation of innovation in learning methods and interactions between teachers and students (Firdos et al., 2023; Nurharirah, 2024; RA Putri et al., 2023). This transformation is a challenge for every party in the world of education to continue to adapt and utilize technology to support a more effective teaching and learning process (Saputra, 2020; Subroto et al., 2023).

The development of technology in the field of education has created new demands for students and teachers to compete to keep up with existing changes (Ikawati & Yulia, 2022; Padmini & Atika, 2016; Sadriani et al., 2023). Teachers, as educators and facilitators, play a strategic role in preparing students to become talented and competitive individuals (Lubis et al., 2022; Rahmawati & Suryadi, 2019; A. Ramadhan, 2024; Sulistiani et al., 2023). For this reason, a systematic and innovative approach is needed to support technology-based learning, so that students are not only able to understand the teaching material, but can also develop critical, creative, and adaptive thinking skills in the digital era (Dwijayanthi, 2022; Fajri et al., 2024; Wahyuaji & Suparman, 2019; Hartini, 2017).

The shift in the education system from traditional to utilizing existing media requires teachers to innovate in the learning process (Arifin et al., 2021; Hafizhah, 2021; Hartini, 2017). The right strategy is needed to develop students' understanding. This understanding affects the quality of education. As a step towards this, the quality of teachers can

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be improved in terms of selecting the right learning media. As agents of change, teachers must follow the dynamics of the times, including the development of learning media (Bahar et al., 2023).

Currently, information technology is developing very rapidly, allowing the use of increasingly developing information technology in the learning process between teaching staff (teachers) and students. Teachers are now required to be able to integrate technology in learning using learning media (Panggabean & Hidayat, 2022; Tafonao, 2018; Tarihoran, 2019). Equipment such as televisions, LCD projectors, computers, and VCDs can support the learning process. However, the function and use of these facilities are not maximized by school teachers (Fatwa & Rofiq, 2019; Dewi & Hilman, 2019; Lestari & Wirasty, 2019; Nurhayati, 2021).

The learning system using intelligent methods through interactive learning media is expected to enable students to obtain and prove their awareness of knowledge and information, and effectively and efficiently achieve their learning goals and understand the material in the interactive media system and educational staff to obtain the use of appropriate tools and techniques to support students' understanding of learning (Harsiwi & Arini, 2020).

The school website is expected to not only make it easier for teachers to provide teaching materials and information but also relatively students can more easily understand the material and see the information presented. This research is in line with the research Sherley et al. (2021), with the title "Design and Construction of a Website-Based Learning Media Information System (Case Study: De Potlood Tutoring)" further research Utama & Fajriani (2021), with the title "WEB-Based E-Learning Media at Vocational High School Level" and Pradiatiningtyas (2018), with the title "E-Learning as a Web-Based Learning Media at SMK N 4 Purworejo". This MTs KSM Kalpapi school website application can provide interaction so that it can improve the quality of teaching and learning because it is easy to use and is not bound by distance or time. Then it can be used anytime and anywhere. The media includes learning content such as titles, teaching materials, assignments, questions, videos, and learning assessments to increase students' interest in learning.

Method

The research activities were carried out by directly observing the research subjects and by closely observing the ongoing teaching and learning activities. The observation activities were aimed at obtaining data related to the material presentation system, quizzes, and student responses to the material presented. The activities were implemented at the MTS KSM KALUPAPI school located in Banggai Laut Regency. Based on the results of the needs analysis, it is necessary to identify problems related to the learning process at the MTs KSM KALUPAPI school. To identify these problems, interviews, and class observations were conducted. After the existing problems are known, the needs can be found in developing web applications for schools. This needs analysis will then be used as a reference for the school website. The things that will be analyzed are the needs of teachers and students, and the types of materials to be developed.

In this study, using the development model (RAD). This model is one of the systematic learning designs. The selection of this method is based on systematic considerations and is based on learning theory (Adiya et al., 2024; FAI Ramadhan & Sulthon, 2023; Zen & Iswavigra, 2023). This model is a program arrangement of a series of systematic activities to address learning problems related to learning resources that are responsive to the needs and characteristics of students in the field, in this case, MTs KSM KALUPAPI students.

The method used for system testing is the black box method. The black box system testing method is a software testing technique that focuses on evaluating system functions based on input and output, without examining the internal structure or program code (Dashti & Basin, 2020; Patria, 2023; Peled et al., 1999; Setiawan, 2021; Team, 2023; Wicaksono, 2022). This testing aims to ensure that the software functions according to the predetermined functional requirements or specifications, as well as identifying various errors, such as functional, interface, and data validation errors.

Figure 1 is a Use case diagram of the system being built. Use Case Diagram is a diagram in Unified Modeling Language (UML) that shows how actors (users or external systems) interact with the system (Bittner & Spence, 2003; Kurniawan, 2018; Lesmono, 2024; Maulana, 2022). This diagram makes it easier to understand the functions of the system and who uses it. In the use case diagram, there are 4 users, it is explained that teachers can manage the data in the system.

Teachers can manage school profiles, manage materials, manage groups, view subject participants, manage assignments, manage subject schedules, manage grades, manage announcements, login, and logout. Students can send messages to teachers, view announcements, do assignments, view materials, view subject schedules, view attendance, and view grades. The principal can manage school profiles, send messages to teachers, view teacher activities, and print reports. While guardians can view announcements, send messages to teachers, view student assignments, view subject schedules, view student attendance, and view grades.

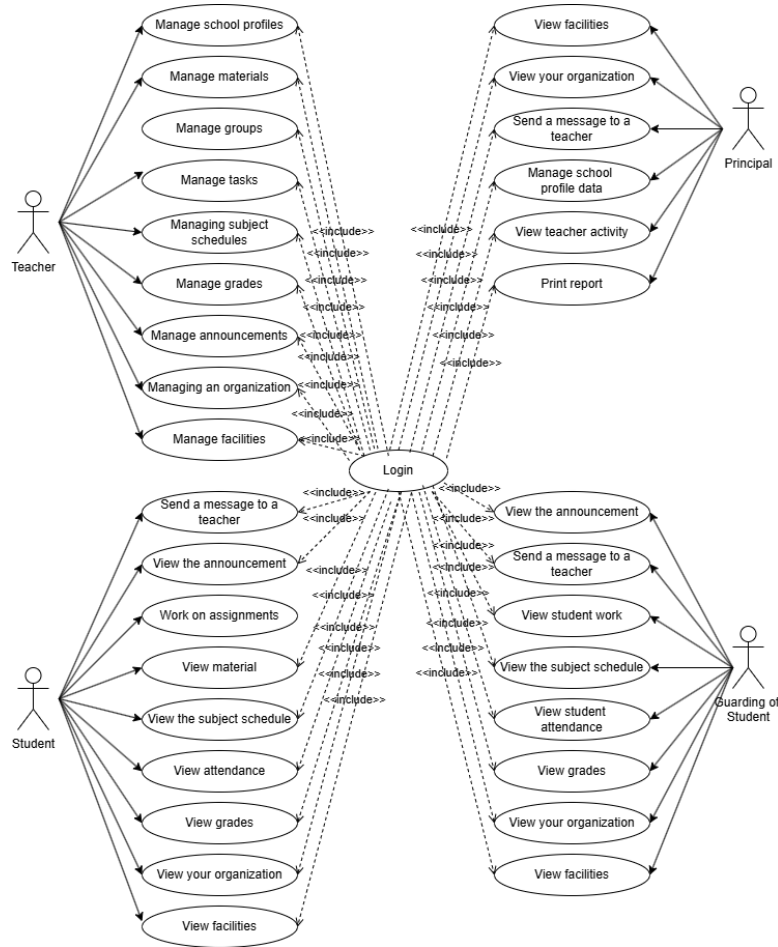


Figure 1. Use case diagram

Results and Discussion

Results

The results of this study highlight the successful design and implementation of a web-based learning system, which accommodates four key user groups: the principal, teachers, students, and guardians. Each of these user groups plays a distinct role within the system, ensuring that the platform supports a range of educational activities. The principal oversees the overall functionality and management of the system, while teachers manage content and assignments. Students benefit from the system by accessing learning materials and completing assignments, and guardians can monitor their children's academic progress, including grades and assignments. These findings reflect the system's comprehensive design, catering to the needs of various stakeholders within the educational environment. The system's interface, designed to be intuitive and user-friendly, can be seen in Figure 2.



Figure 2. Main page

Figure 2 shows the main form, which appears after the user successfully enters the correct username and password. This view contains a series of menus that allow users to access other forms within the program.

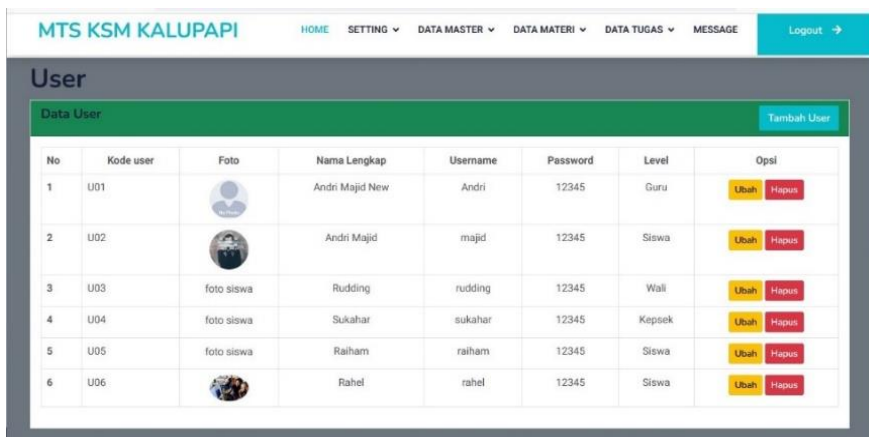


Figure 3. User settings from page

Figure 3 shows the user settings form page, which is designed to input, modify, or delete user data. This form allows administrators to manage user information, including usernames, passwords, and user levels.

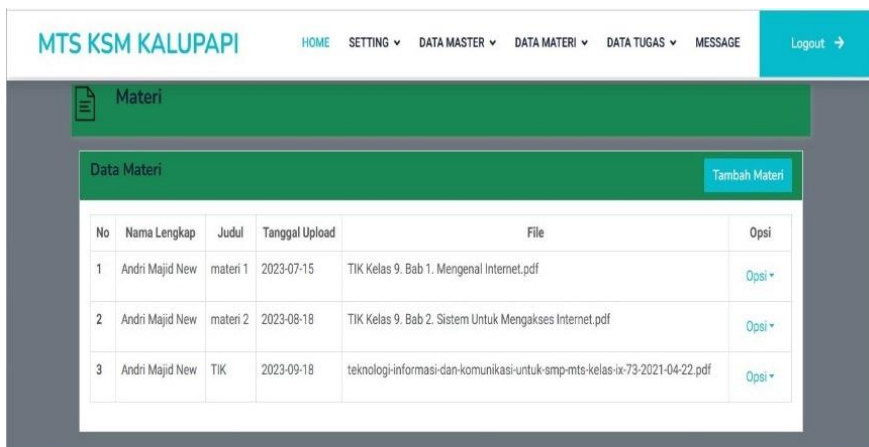


Figure 4. Material form page

In Figure 4, the material form page is a display of material data, adds material, and manages material. Here, teachers can add, change, or delete, the desired material data.

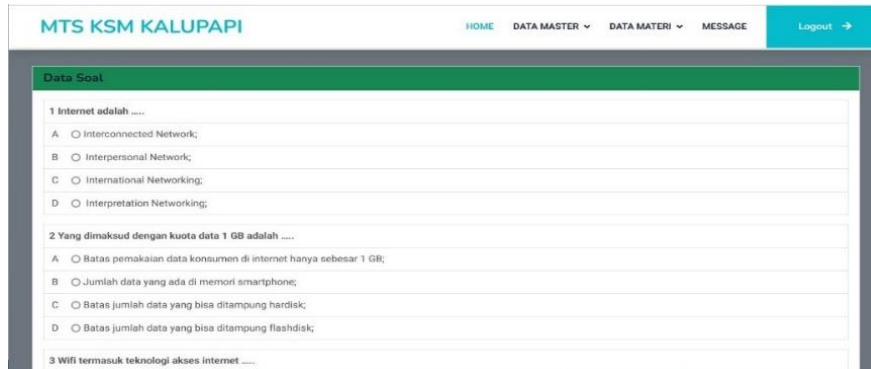


Figure 5. Assignment and quiz pages

In Figure 5, the assignment and quiz pages are used to work on various questions given by the teacher. This assignment menu contains questions about information and communication technology, and the exercises can be done independently by students so that students can immediately find out how far their abilities are.

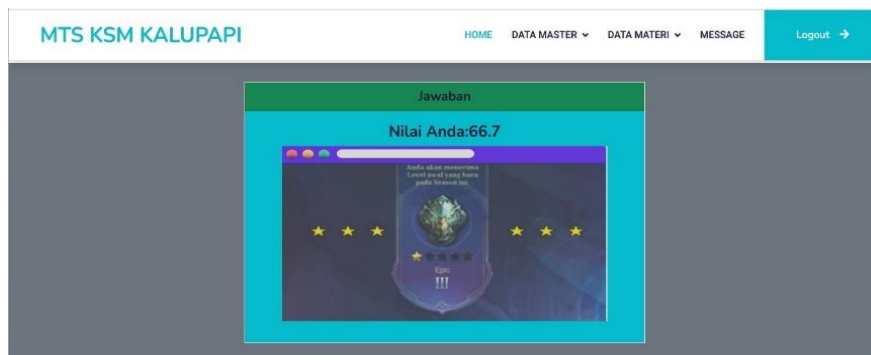


Figure 6. Assignment value form display

In Figure 6, the assignment grade form page is the page that will appear to see the grades of students who have completed assignments and quizzes.

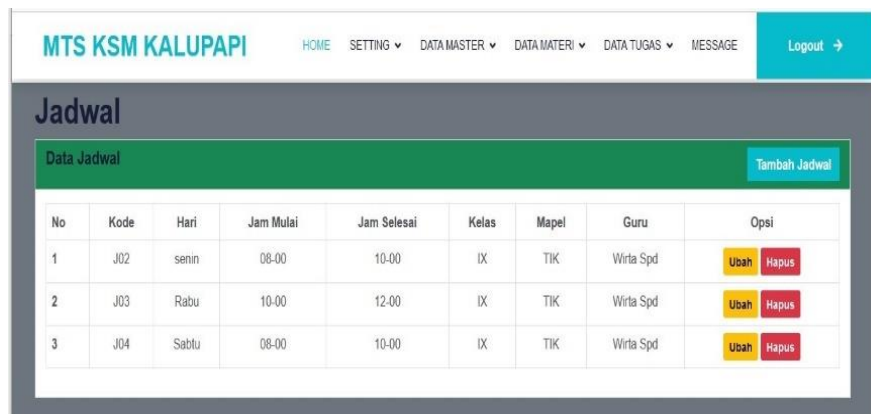


Figure 7. Lesson schedule form page

In Figure 7, the schedule page is a page for managing lesson schedules. Here teachers can add, change, and delete the desired lesson schedules.

No	Kode Hadir	Tanggal	Nama	Hadir	Alpa	Izin	Sakit	Bolos	Opsi
1	K01	2023-09-23	rahei	10	0	1	2	0	Ubah Hapus
2	K02	2023-09-23	majid	10	0	1	0	0	Ubah Hapus

Figure 8. Student attendance form page

In Figure 8, the student attendance data page is a page for inputting student attendance where teachers can add, change, and delete student attendance data as desired.

No	Kode	Nama Lengkap	MID	UAS	Nilai Rata Rata	Keterangan	Opsi
1	U01	majid	50	70	73	LULUS	Ubah Hapus
2	U02	rahei	40	40	53	GAGAL	Ubah Hapus

Figure 9. Student grade input page

In Figure 9, the student data entry page is a page used to enter student grades where teachers can add, change, and delete student grade data according to needs.

No	Sekolah	Foto	Ubah	Hapus
1	MTS KSM KALUPAPI		Ubah	Hapus

Figure 10. School structure input page

In Figure 10, the school structure input page is a page for managing the school structure, teachers can add, change, or delete structure data according to their needs.

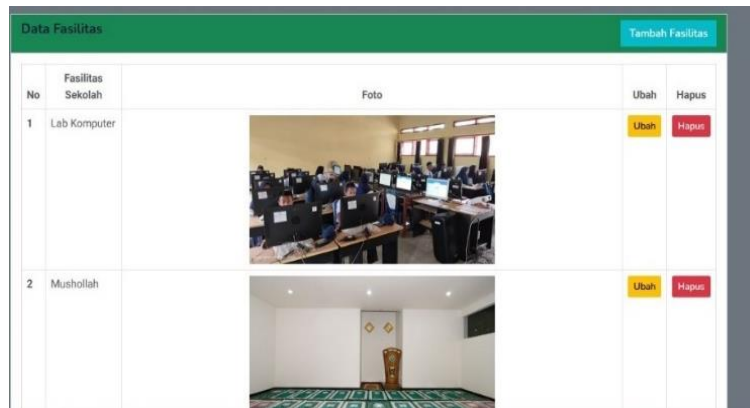


Figure 11. School facilities input page

In Figure 11, the school facilities input page is used to enter school facilities data and allows teachers to add, change, or delete facility data as needed.

The results of testing using the black box method, this testing is done in a documented way to ensure that the application works as expected. This testing is often done at the end of the development cycle which includes testing system functions, user commands, data manipulation, business processes, user screens, and integration.

Table 1. Results of teacher black box testing

Scenario	Test Case	Results obtained	Information
Fill in all the fields on the teacher login page using the correct username and password.	Enter username and password Click Login	Login successfully and display the teacher's main page.	Succeed
The teacher does not test every field on the login page.	Username: - Password: - Click Login	The system denies login access and displays the message "Login failed, check your username and password".	Succeed
Enter one of the columns on the Teacher Login page.	Username: - Password:12345 Click Login	The system denies login access and displays the message "Login failed, check your username and password".	Succeed
filled in all the columns on the Teacher Login page, but the username and password are incorrect	Username:user123 Password:1234 Click Login	The system will reject login access and display the message "Your login failed, please check your username and password."	Succeed
The teacher adds category data	Click the add data button, enter data, and save it in the database	Successfully saved category data	Succeed
The teacher edits category data	Click the change button on one of the categories	The system receives access to edit the category and displays the edit page.	Succeed
Teacher deletes category	Click the delete button on one of the categories	The system will receive delete access and display a page with the categories that have been deleted.	Succeed
Teacher logout	Clicking the logout button	Successfully exited and returned to the login page	Succeed

Table 2. Results of students' black box testing

Scenario	Test Case	Results obtained	Information
Fill in all fields on the student login page, using the correct username and password.	Enter username and password Click Login	Successfully logged in and displayed the student home page	Succeed
Students enter the home page	Clicking on the application menu	Successfully logged in to the homepage	Succeed
Students select learning material data	Clicking the view button on one of the categories	Successfully entered the lesson material page	Succeed
Students select learning video data	Clicking the view button on one of the categories	Successfully entered the video lesson page	Succeed
Students select learning task data	Clicking the task button	Successfully logged into the task page	Succeed
Students select lesson schedule data	Clicking the schedule button	Successfully entered the class schedule page	Succeed
Students select attendance data	Clicking the attendance button	Successfully logged in to the attendance page	Succeed

Scenario	Test Case	Results obtained	Information
Student logout	Clicking the logout button	Successfully exited and returned to the login page	Succeed

Table 3. Results of black box testing of student guardians

Scenario	Test Case	Results obtained	Information
Fill in all the fields on the principal's login page, using the correct username and password.	Enter username and password Click Login	Successfully logged in and displayed the principal's main page	Succeed
The principal enters the home page	Clicking on the application menu	Successfully logged in to the homepage	Succeed
The principal sees the teacher's activities	Clicking the view button on one of the categories	Successfully entered the material page	Succeed
The principal sends a message to the teacher	Clicking the message button	Successfully entered the message page	Succeed
The principal prints the report	Clicking the print report button	Successfully logged in to print the report	Succeed
Principal logout	Clicking the logout button	Successfully exited and returned to the login page	Succeed

The results of the respondent questionnaire, respondents involved in data collection were students who provided answers in the form of developing learning media using the gamification method to increase students' interest in learning at MTs KSM Karpapi based on the web which was used to determine student responses.

Table 4. Assessment scale

Answer Form	Symbol	Score Weight
Very Interested	SB	5
Interested	B	4
Less Interested	KB	3
Not interested	TB	2
Very Uninterested	STB	1

Table 4 shows the assessment scale to measure the level of interest with five answer categories, namely "Very Interested" (SB) with the highest score weighting of 5, followed by "Interested" (B) with a score of 4, "Less Interested" (KB) with a score of 3, "Not Interested" (TB) with a score of 2, and "Very Not Interested" (STB) with the lowest score weighting of 1. This scale is used to provide a quantitative assessment of the respondent's level of interest, thus facilitating systematic data analysis.

Table 5. Range of value weighting criteria

Scenario	Test Case	Results obtained	Information
Student Guardians enter the home page	Clicking on the application menu	Successfully logged in to the homepage	Succeed
Student guardians view learning material data	Clicking the view button on one of the categories	Successfully entered the lesson material page	Succeed
Student guardians select learning video data	Clicking the view button on one of the categories	Successfully entered the video lesson page	Succeed
Student guardians view learning assignment data	Clicking the task button	Successfully logged into the task page	Succeed
Student guardians view class schedule data	Clicking the schedule button	Successfully entered the class schedule page	Succeed
Student guardians view attendance data	Clicking the attendance button	Successfully logged in to the attendance page	Succeed
Parents see student grades	Clicking the value button	Successfully logged in to the attendance page	Succeed
Student guardians print student grades	Clicking the print value button	Successfully scored a score	Succeed
Student guardian logout	Clicking the logout button	Successfully exited and returned to the login page	Succeed

Table 5 provides a comprehensive evaluation of the system's functionality and performance through two interconnected components: test case results and value weighting criteria. The test case results detail various scenarios in which student

guardians (parents) interact with the platform, including logging into the homepage, viewing learning materials, accessing video lessons, checking assignments, schedules, attendance, and grades, as well as printing grades and logging out. Each action was tested by interacting with the relevant buttons, and all scenarios were executed successfully. This consistent performance demonstrates the system's reliability and user-friendliness in facilitating these essential tasks.

Complementing these results, the value weighting criteria offer a qualitative framework for assessing system performance and user satisfaction. The criteria range from "Very Bad" (0%-20%) to "Very Good" (81%-100%), allowing evaluators to systematically categorize feedback. With all test cases yielding successful outcomes, the system's performance falls within the "Very Good" category, reflecting its effectiveness in meeting the intended objectives and ensuring high levels of user satisfaction.

Further validating these findings, data from a questionnaire involving 30 respondents reveal that the usability standard of the system is rated "Excellent," with a remarkable satisfaction score of 99%. This result indicates that the majority of users—comprising school principals, teachers, students, and parents—found the system highly effective and user-friendly in terms of both functionality and ease of use. Such feedback underscores the success of web-based learning media in addressing diverse user needs while supporting learning processes and school information management.

Moreover, the system's efficiency and reliability are further substantiated by data in Table 7, which highlights overwhelmingly positive responses across all tested indicators. These results reinforce the system's ability to create a structured, efficient, and user-friendly educational environment, making it an ideal solution for improving academic activities and school information management at MTs KSM Kalupapi.

The results of the learning media questionnaire testing reveal a high level of user satisfaction across various evaluated aspects. The questionnaire, completed by 30 respondents, assessed dimensions such as display quality, system functionality, usability, and overall effectiveness in facilitating learning. The display aspect and system functionality were rated as "Very Interested" by all respondents, achieving perfect scores and satisfaction rates of 100%. Similarly, the ease of use and interest in using the application received unanimous "Very Interested" ratings, reflecting a flawless user experience. The usability and functionality aspects were slightly less unanimous, with 29 respondents rating them as "Very Interested" and one as "Interested," resulting in scores of 149 and satisfaction rates of 99%. The same ratings were observed for the ease of learning, further emphasizing the media's effectiveness. Overall, the learning media achieved an average satisfaction rate of 99%, underscoring its high quality and ability to meet user expectations. These results highlight the platform's success in delivering an engaging, functional, and user-friendly solution that effectively supports learning processes.

Discussion

This study successfully demonstrated the effectiveness of implementing website-based learning media at MTs KSM Kalupapi. This system accommodates four main user groups, namely principals, teachers, students, and guardians, with functionality designed according to the needs of each group. The main finding of this study is the success rate of the system based on Usability Standards testing which reached an average of 99%, indicating that this application is very feasible to use. These results support previous literature, such as research Sherley et al. (2021) And Utama & Fajriani (2021), which emphasizes that website-based learning media can improve the quality of learning and facilitate access to information.

This finding is important because it provides an effective solution in supporting the teaching and learning process in the digital era. The web-based system allows flexibility of time and place for users, and increases efficiency in managing materials, assignments, and communication between teachers, students, and guardians. With consistent test results and in accordance with usability standards, this system is expected to be able to encourage improvements in the quality of education at MTs KSM Kalupapi.

However, this study has some limitations, such as the system performance has not been tested on a larger user scale or with different infrastructure conditions. In addition, the development of additional features, such as the integration of learning analytics or cloud-based storage, can be the focus of further research to improve the system's capabilities. This study provides a strong foundation for the adoption of technology in relevant and sustainable education.

Conclusions and Suggestions

Conclusions

The conclusion of this study demonstrates that the developed system successfully accommodates the needs of four primary user groups: the principal, who oversees the overall management; teachers, who serve as regular administrators; students, who access learning materials and complete assignments; and guardians, who monitor student performance and assignments. Based on the results of the Usability Standards test, the website-based learning media implemented at MTs KSM Kalupapi achieved an impressive success rate of 99%. These findings confirm that the system is highly effective, user-friendly, and feasible for implementation, making it a valuable tool for enhancing the efficiency of learning processes and school information management.

Suggestions

Based on the findings of this study, the following suggestions have been made for further development of the school website, namely:

1. The implementation of website-based learning media at MTs KSM Kalupapi can then be developed to be even better;
2. The school website requires further development efforts, such as adding functionality and improving the quality of storage that can be integrated into the school website.

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