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Front-End Development on A Web-Based Teaching Material Repository System at SMK Diponegoro 1 Jakarta

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ABSTRACT

In the current digital era, information technology has greatly dominated the field of education, and the use of websites stands as a primary example. Websites play a crucial role in storing and conveying information. One such example is the school repository website. Having a storage medium for instructional materials can provide advantages to users, especially schools. Currently, at SMK Diponegoro 1 Jakarta, there is no dedicated storage for instructional materials. A single information system, Google Drive, is used to store all documents and information. The purpose of this research is to present and enhance the front-end appearance and functionality of the web-based Instructional Material Repository System. The development method employed is the Waterfall model, utilizing the Bootstrap framework and Javascript to construct a high-fidelity prototype of the system's front-end. Throughout the development process, black box testing was conducted to ensure the success of the system's functionality and usability. The testing results demonstrated that all tasks were successfully executed with a 100% success rate.

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1. INTRODUCTION

The development of technology has progressed very rapidly and spurred the emergence of various new applications including in the field of information technology that has provided convenience to humans. One form of Internet-based information technology is the web (Szymkowiak et al., 2021). The web is a part of the Internet that consists of pages that can be accessed by web browsers. The web continues to grow until now in the world, one of the impacts of the development of the Internet is the existence of websites that have been widely used by the whole world that are effective to use. Website is a collection of web pages that are accessed by the public and written using HTML (Hyper Text Markup Language). The website displays pages that contain data, both data in the form of text, sound, images, and others that can be accessed via the Internet.

In the field of education, for students the Internet is very helpful in doing schoolwork, making it easier to find references, increasing creativity, and providing useful inspiration (Krishnan *et al*., 2020). Meanwhile, for teachers the Internet is very useful to help their duties as school educators, because on the Internet many things can be used as examples and resources to support the teaching and learning process in schools. The number of teaching materials available on the Internet requires teachers to be more careful and careful in choosing learning materials to be used in the learning process (Bader *et al*., 2022). Not all materials presented on the Internet conform to the curriculum set by the government.

Teaching materials are needed in the learning and teaching process at SMK Diponegoro 1 Jakarta, including teaching modules, Power points (PPT), and vocational videos made by teachers of his department. Therefore, schools need a place to store teaching materials so that they are easily accessible to teachers and students. Mrs. Sirep Purwanti as the principal of SMK Diponegoro 1 Jakarta, said that there is no place to accommodate teaching material data, currently all information documents both absent and school teaching materials are stored on the Google Drive platform. Because not only storing teaching materials on Google Drive, it causes less attention to what teaching materials have been uploaded by the teacher. In the school's Google Drive, for the teaching materials themselves, teachers can store teaching modules, Power Point (PPT), and vocational videos made by their department teachers. Head of Multimedia / DKV Department, Mr. Kevin Ramadhan, also revealed that there are obstacles when using Google Drive links, namely when accessing Google Drive links you have to ask online permission to the admin who is in control first, so you find it difficult when you want to repeat opening links for the purposes of viewing or uploading documents. Based on the results of interviews with two students of SMK Diponegoro 1 Jakarta, students did not know about the school's Google Drive link that is used to store various school information. Teachers provide teaching materials to students via WhatsApp. However, students have a little problem in downloading teaching materials such as the Internet that is less supportive and sometimes the file to be downloaded has expired on WhatsApp so students have to ask again for the file they want to download to the teacher concerned.

With the limited storage of teaching materials, a system is needed that can store teaching materials that are easily accessible to teachers and students, one of which is the school repository system (Aboraya, 2022). A repository is a place to store various kinds of documents and applications that have been created in such a way that they can be accessed via the Internet. The main purpose of a repository is to store a set of files as well as a history of changes to them in a repository that can be accessed anywhere and anytime as long as the user is connected to the Internet.

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This research is an integrated research from 3 (three) students of the Informatics and Computer Engineering Education Study Program who want to create a Web-based Teaching Material Repository System, including UI / UX, front-end, and back-end. The front-end development process on a web-based teaching material repository system at SMK Diponegoro 1 Jakarta uses the waterfall method. In general, the waterfall method has stages that need to be done, namely analysis, design, code / testing, and maintenance. The purpose of the waterfall method is that the process is more structured so as to make the quality of the software good and maintained.

Based on the background of the problems that have been explained, this study aims to develop a Front-end on a Web-Based Teaching Material Repository System at SMK Diponegoro 1 Jakarta. This repository system is expected to be a special storage place for school teaching materials that can assist teachers in storing their teaching materials and make it easier for students to be able to see and store teaching materials according to the needs of students so that learning activities at school can be arranged systematically and create an effective and efficient school atmosphere.

2. THEORETICAL BASIS

2.1. Information System

Information systems are organized work procedures, information, people, and information technology. The results of the process will be used as a basis or basis for consideration in organizational decision making (Kochling & Wehner., 2020).

2.2. Repositories

A repository is a place to store digital materials to collect, disseminate, and preserve data in the form of archives produced by an institution or organization that can be accessed using the Internet. The digital materials in question certainly have a relationship with each other (Donaldson, 2020).

2.3. Teaching Materials

Teaching materials are tools used in the learning process which can be in the form of printed or online materials (Murti & Lazuardi, 2019). Teaching materials are developed by educators with the aim of being able to make material according to the conditions of their students.

2.4. Websites

Website is a collection of web pages on a domain on the Internet that are made based on certain purposes and are interconnected (Brauner *et al*., 2022). The website contains information, can be in the form of text, images, animation, sound, video, and others. The website can be accessed anywhere and anytime through the Internet network (Ramadannisa & Hartina, 2021).

2.5. Front-end

The front-end is a part of the system that provides a display to users. The front-end has the task of developing the visual components of a system and is responsible for the appearance of the interface (Rizaldy & Dirgahayu, 2020). During the website creation process, there are generally 3 main compositions, namely web designers or UI / UX, front-end developers, and back-end developers. Front-end obtained from the User Interface designer, where the front-end developer will move the design from the User Interface designer into an interactive form

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and make the design come alive (Riaz *et al.,* 2022). Framework is a collection or pieces of programs that have been compiled (Suprayogi & Rachmanesa, 2019). This study uses Bootstrap Framework and Javascript to build high-fidelity prototypes of front-end systems.

2.6. User Interface (UI)

User Interface (UI) is the visual design display of a system. The system display needs to connect the user with the product. UI can be used to beautify the appearance and provide ease of use.

2.7. Prototype

That a prototype is a model or simulation of all aspects of the real product developed, this model must represent the final product (Rizkidiniah *et al.,* 2016). Prototypes have three levels of fidelity, namely: Low-Fidelity Prototype, Medium-Fidelity Prototype, and High-Fidelity Prototype.

2.8. Waterfall Product Development Method

The waterfall model is a sequential development model. The Waterfall model has a sequential and systematic nature (Thesing et al., 2021). The Waterfall model has 5 stages that must be passed, namely: analysis, design, code, testing and maintenance.

2.9. Black Box Test Methods

The black box testing method is a method of testing on software without paying attention to software details. In black box testing, it takes performance results only through test data and functional checking of the software (Aliero et al., 2020). Testing devices with functional specifications, without testing the design and program code.

3. METHODS

3.1. Place and Time of Research

This research was conducted at SMK Diponegoro 1 Jakarta, Rawamangun, Kec. Pulo Gadung, East Jakarta City, Special Capital Region of Jakarta 13220. This research was conducted from November 2022 to July 2023.

3.2 Research Tools and Materials

In this study using several research tools such as hardware (laptops and smartphones) and software (Windows 10 64-bit, Microsoft Word, Visual Studio Code, Bootstrap, JavaScript, Whatsapp, Web Browser, such as: Google Chrome and others). Research requires materials in the form of observation, questionnaires, interviews and literature studies.

3.3. Research Flow Chart

This research was conducted using the waterfall method which consists of five stages, namely analysis, design, code, testing and maintenance. From these stages, this research only implements four stages, namely only to the testing stage as shown in **Figure 1**.

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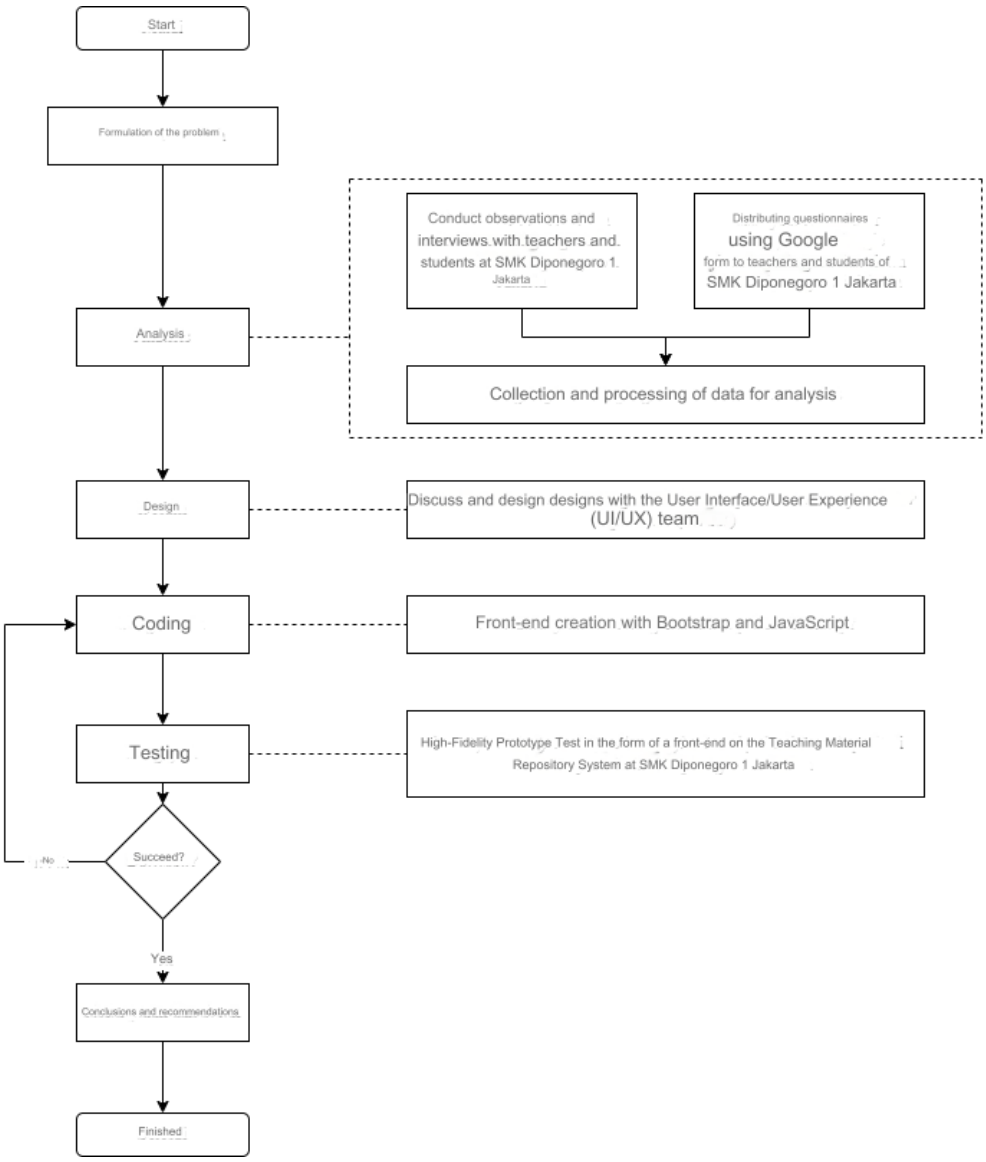

Figure 1. Research Flow Chart

3.4. Data Collection Techniques and Procedures

In this study, the data collection techniques used were observation, questionnaires, and interviews. Observation is carried out by observing the learning process at school. Questionnaire to evaluate the results of the design design that has been made by the User Interface. The interview relates to user habits in using smartphone and laptop devices, user experience in viewing the display of the teaching material repository system, as well as opinions and expectations of this website. Questionnaires and interviews were conducted by researchers to the Principal, Vice Curriculum, Head of TKJ Department, Multimedia/DKV, OTKP/MP and several students.

3.5. Technical Data Analysis

The technique of analyzing the data used is black box testing to test whether there is an error in the function of the teaching material repository system. Users perform tests based on task scenarios created by researchers. If there is an error, it will be fixed at the implementation stage until the web operates as expected.

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4. RESULTS AND DISCUSSION

4.1. Display of Web-Based Teaching Material Repository System at SMK Diponegoro 1 Jakarta

This research aims to develop a front-end on a web-based Teaching Material Repository System at SMK Diponegoro 1 Jakarta. Producing a high-fidelity prototype, namely a front-end prototype, this front-end implementation provides various features and functionality to support the process of managing teaching materials. This repository system is designed and developed with the aim of storing teaching materials at SMK Diponegoro 1 Jakarta that can be used by teachers and students and can be managed by the admin. The results of the display of the Web-Based Teaching Material Repository System at SMK Diponegoro 1 Jakarta in **Table 1.**

Table 1. Web-Based Teaching Material Repository System Display

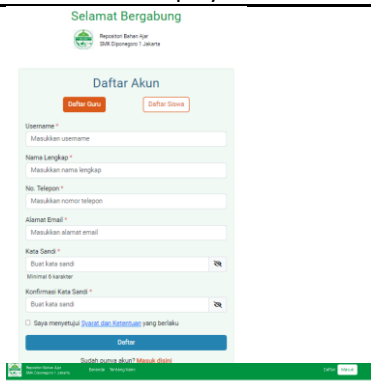
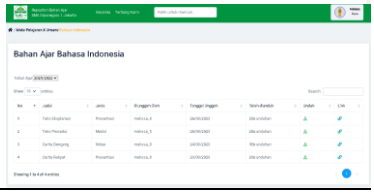
No.	Info	Display
1.	Account List View	
2.	Login View	
3.	Forgot Password Display	
4.	Home View	
5.	Subject View	
6.	Display of Teaching Materials	

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Table 1 (continue). Web-Based Teaching Material Repository System Display

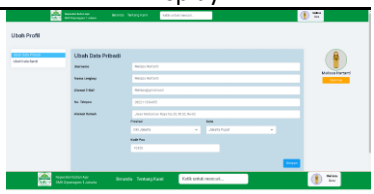
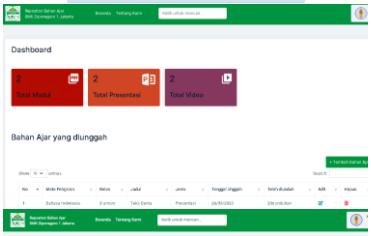
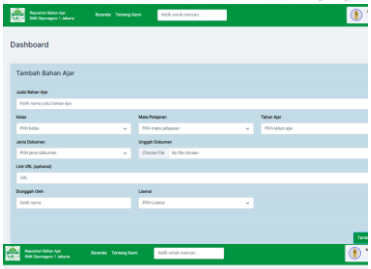
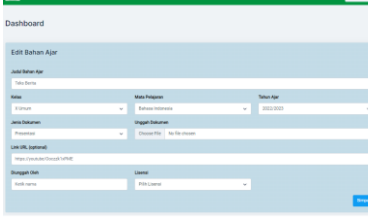
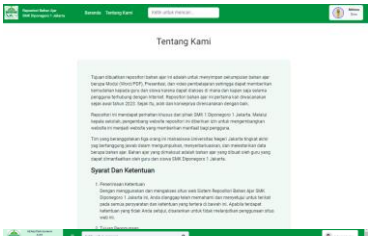
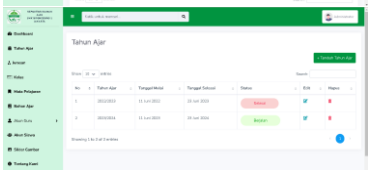
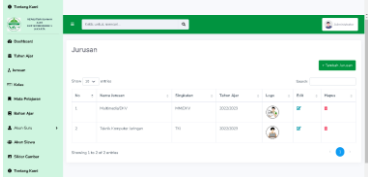
No.	Info	Display
7.	Change Profile view	
8.	Change Password view	
9.	Teacher Dashboard View	
10.	Display Add Teaching Materials	
11.	Edit Teaching Material View	
12.	About Us View	
13.	Admin Home View	
14.	Manage Admin Teaching Year view	
15.	View Manage Admin Majors	

Table 1 (continue). Web-Based Teaching Material Repository System Display

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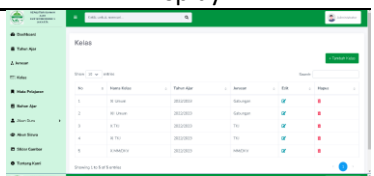
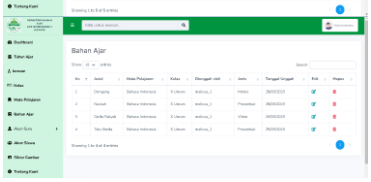
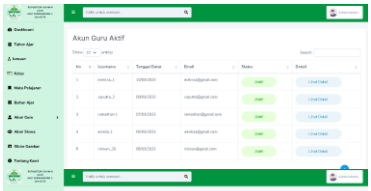
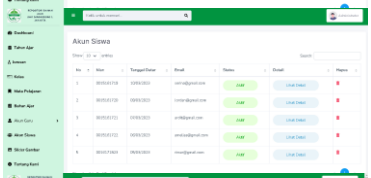
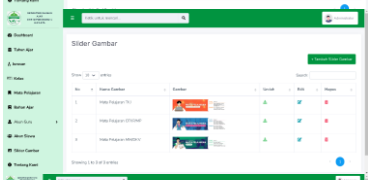
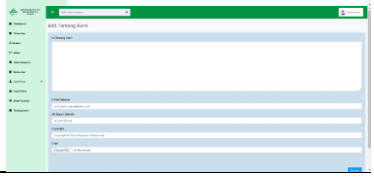
No.	Info	Display
16.	Manage Admin Classes view	
17.	Manage Admin Teaching Materials view	
18.	Manage Teacher Account view	
19.	Manage Student Accounts view	
20.	Manage Admin Image Slider view	
21.	Edit view About Us Admin	

4.2. Test Results

Black box testing was carried out on a total of five target users, consisting of Mrs. Sirep Purwanti and Mr. Fajar Adrian as teachers, Ratu Messiah Nur Habibah and Azzahra Ribka Davianti as students, and Mr. Kevin Ramadhan as admin as in **Table 2, 3 and 4**.

Table 2. Black box testing results by teachers

Code Task	Testing Activities	Expected results	Teachers Mrs. Sirep Purwanti	Mr. Fajar Adrian
T1	Sign up for an account	Can register an account	Yes	Yes
T2	Fill in the registered username/email and password	Can go to the Home page of the Teaching Material Repository System of SMK Diponegoro 1 Jakarta	Yes	Yes
T3	Click the More button in one of the classes on the home page	You can click the More button in any of the classes on the Home page to see the subjects in that class	Yes	Yes

Table 2 (continue). Black box testing results by teachers

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Code Task	Testing Activities	Expected results	Teachers Mrs. Sirep Purwanti	Mr. Fajar Adrian
T4	Choose subjects	Can enter the course page to go to the teaching materials page	Yes	Yes
T5	Click the Home menu	Can display the Home page to return to the Home page	Yes	Yes
T6	Click the Profile menu to view your profile	Can Change Personal Data and Change Photo	Yes	Yes
T7	Click the Profile menu to view your profile	Can Change Password	Yes	Yes
T8	Click the Dashboard menu to view the dashboard	Can display the Dashboard menu to see information in the dashboard, such as the total teaching materials that have been uploaded by type (Modules, Presentations, and Videos)	Yes	Yes
T9	Add teaching materials	Can display Add Teaching Materials on the dashboard page to fill in the teaching material data you want to upload, click Class, Subject, Teaching Year, and Document Type	Yes	Yes
T10	Click the Edit button on uploaded teaching materials	Can display Edit on the dashboard page to edit teaching materials	Yes	Yes
T11	Click the About Us menu	Can display the about us page to see information about the repository system	Yes	Yes
T12	Click the Sign Out button	Can log out of account	Yes	Yes

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Table 3. Results of black box testing by students

Code Task	Testing Activities	Expected results	Students Ratu	Azzahra
T1	Sign up for an account	Can register an account	Yes	Yes
T2	Click the More button in one of the classes on the home page	Can go to the Home page of the Teaching Material Repository System of SMK Diponegoro 1 Jakarta	Yes	Yes
T3	Choose subjects	You can click the More button in any of the classes on the Home page to see the subjects in that class	Yes	Yes
T4	Click the Home menu	Can enter the course page to go to the teaching materials page	Yes	Yes
T5	Click the Profile menu to view your profile	Can display the Home page to return to the Home page	Yes	Yes
T6	Click the Profile menu to view your profile	Can Change Personal Data and Change Photo	Yes	Yes
T7	Click the Dashboard menu to view the dashboard	Can Change Password	Yes	Yes
T8	Click the About Us menu	Can display the about us page to see information about the repository system	Yes	Yes
T9	Click the Sign Out button	Can log out of account	Yes	Yes

Table 4. Black box testing results by admin

Code Task	Testing Activities	Expected results	Conclusion
T1	Clicking the Sign In button	Can go to Admin Home page	Yes
T2	Clicking the Profile menu to view the profile	Can change personal data and change photos	Yes
T3	Clicking the Profile menu to view the profile	Can change password	Yes
T4	Clicking the Admin Dashboard menu	Can display the Admin Dashboard	Yes

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Table 4 (continue). Black box testing results by admin

Code Task	Testing Activities	Expected results	Conclusion
T5	Clicking on the Academic Year menu	Can display the Academic Year page to view the academic year	Yes
T6	Clicking the Add Academic Year button	Can display the Add Academic Year page to add an academic year	Yes
T7	Clicking the Edit button on the academic year	Can display the Edit page to edit the academic year	Yes
T8	Clicking on the Department menu	Can display the Departments page to see the departments at SMK Diponegoro 1 Jakarta	Yes
T9	Clicking the Add Major button	Can display the Add Major page to add a major	Yes
T10	Clicking the Edit button on the department	Can display the Edit page to edit majors	Yes
T11	Click on the Class menu	Can display the Class page to see the classes at SMK Diponegoro 1 Jakarta, both classes with general subjects, as well as classes for each department	Yes
T12	Clicking the button add class	Can display the Add Class page to add a class	Yes
T13	Click the Edit button in a class	Can view the Edit page to edit a class	Yes
T14	Click the Subjects menu	Can view the Subjects page to view the entire subject	Yes
T15	Click the Subjects menu	Can display the Add Subjects page to add Subjects	Yes
T16	Clicking the Edit button on a Subject	Can view the Edit page to edit Subjects	Yes
T17	Click the Teaching Materials menu	Can display the Teaching Materials page to see all Teaching Materials	Yes
T18	Clicking the Edit button on Teaching Materials	Can display the Edit page to edit Teaching Materials	Yes
T19	Click the Image Slider menu	Can display the Image Slider page to see the entire Image Slider	Yes

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Table 4 (continue). Black box testing results by admin

Code Task	Testing Activities	Expected results	Conclusion
T20	Click the Add Image Slider button	Can display Add Image Slider page to add Image Slider	Yes
T21	Clicking the Edit button on the Image Slider	Can display the Edit page to edit the Image Slider	Yes
T22	Click the About Us menu	Can view the About Us page to see the entire About Us	Yes
T23	Change About Us	Can display About Us page	Yes
T24	Click the Teacher Account menu	Can view the Teacher Accounts page, then select Active Accounts to see which teacher accounts are active or can access the *website*	Yes
T25	Click the Details button on your teacher account	Dapat menampilkan halaman pada salah satu akun guru	Yes
T26	Click the Student Account menu	Dapat menampilkan halaman Akun Siswa untuk melihat seluruh akun siswa	Yes
T27	Find and click the Sign Out button	Dapat Keluar Akun	Yes

Testing using black box testing is done based on task scenarios. Every function runs well, the user will give a statement "Yes" while if the function does not work well, the user will give a statement "No". Data obtained that all tasks that succeeded as many as 69 tasks out of a total of 69 tasks got a 100% success percentage rate of the overall task.

5. CONCLUSION

Based on the research that has been done, it can be concluded that the front-end development of the Teaching Material Repository System at SMK Diponegoro 1 Jakarta has been successfully carried out. The use of waterfall method in the development process provides a structured and systematic approach, starting from the analysis, design, coding and testing stages. The purpose of front-end development is to be useful in designing a repository system that uses a bootstrap framework and javascript programming language in the form of a high-fidelity prototype so that it can be used as a reference for the Web-Based Teaching Material Repository System at SMK Diponegoro 1 Jakarta to the next developer. The results of testing using black box testing obtained data that all tasks that succeeded as many as 69 tasks out of a total of 69 tasks got a 100% success percentage rate of the overall task.

The design of a Web-Based Teaching Material Repository System can help the school in the teaching and learning process by providing this storage area, the main feature in this teaching material repository system for teachers can upload and download the desired teaching

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materials. For students, they can only see what teaching materials are available and download the desired teaching materials. For admins, can manage everything in the teaching material repository system.

Suggestions from the author through this study so that it can be further developed in the next research, namely:

1. Conduct a needs analysis for UI with more speakers and a larger scale to produce more diverse data.
2. It is hoped that future research can develop a Web-Based Teaching Material Repository System that looks back to adjust to new design needs such as the curriculum used by schools.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

7. REFERENCES

Aboraya, W. (2022). Exploring the Need for Using Digital Repositories to Enhance Teaching and Learning in Omani Schools: Teachers' Perceptions. *International Journal of Learning, Teaching and Educational Research, 21*(5), 1-21.

Aliero, M. S., Ghani, I., Qureshi, K. N., and Rohani, M. F. A. (2020). An algorithm for detecting SQL injection vulnerability using black-box testing. *Journal of Ambient Intelligence and Humanized Computing, 11*, 249-266.

Bader, S., Oleksiienko, A., and Mereniuk, K. (2022). Digitalization of future education: analysis of risks on the way and selection of mechanisms to overcome barriers (Ukrainian experience). *Futurity Education, 2*(2), 23-35.

Brauner, P., Dalibor, M., Jarke, M., Kunze, I., Koren, I., Lakemeyer, G., & Ziefle, M. (2022). A computer science perspective on digital transformation in production. *ACM Transactions on Internet of Things, 3*(2), 1-32.

Donaldson, D. R. (2020). Certification information on trustworthy digital repository websites: A content analysis. *Plos One, 15*(12), 242-525.

Köchling, A., & Wehner, M. C. (2020). Discriminated by an algorithm: a systematic review of discrimination and fairness by algorithmic decision-making in the context of HR recruitment and HR development. *Business Research, 13*(3), 795-848.

Krishnan, I. A., Ching, H. S., Ramalingam, S., Maruthai, E., Kandasamy, P., De Mello, G., and Ling, W. W. (2020). Challenges of learning English in 21st century: Online vs. traditional during Covid-19. *Malaysian Journal of Social Sciences and Humanities (MJSSH), 5*(9), 1-15.

Murti, S., & Lazuardi, D. R. (2019). Pengembangan Bahan Ajar Mata Kuliah Konsep Dasar Bahasa dan Sastra Indonesia Berbasis Kontekstual STKIP PGRI Lubuklinggau. *Jurnal KIBASP (Kajian Bahasa, Sastra dan Pengajaran), 3*(1), 1-16

DOI: https://doi.org/10.17509/jcs.v5i2.70798
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Ramadannisa, R. F., and Hartina, M. M. (2021). The design of web-based learning using Google Sites for teaching heat and temperature topic. *Jurnal Penelitian & Pengembangan Pendidikan Fisika, 7*(2), 107-114.

Riaz, S., Arshad, A., Band, S. S., and Mosavi, A. (2022). Transforming Hand Drawn Wireframes into Front-End Code with Deep Learning. *Computers, Materials & Continua, 72*(3), 4303-4321.

Rizaldy, R., and Dirgahayu, R. T. (2020). Pengembangan Front-End Sistem Informasi Pendataan Pendar Foundation Yogyakarta. *Automata, 1*(2), 1-6.

Rizkidiniah, F., Yamin, M., and Muchlis, N. F. (2016). Design and Implementation of GPS (Global Positioning System) and SMS Gateway System Prototype on Arduino Uno-Based Motor Vehicle Search. *semanTIK, 2*(2), 87-92.

Suprayogi, B., and; Rahmanesa, A. (2019). Application of Bootstrap Framework in Education Information System of SMA Negeri 1 Pacet Cianjur, West Java. *Thematic: Journal of Information Communication Technology (e-Journal), 6*(2), 119-127.

Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society, 65*, 101-565.

Thesing, T., Feldmann, C., and Burchardt, M. (2021). Agile versus waterfall project management: decision model for selecting the appropriate approach to a project. *Procedia Computer Science, 181*, 746-756.

DOI: https://doi.org/10.17509/jcs.v5i2.70798
e- ISSN 2723-4088