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E-Learning Application Based on Learning Management System for Online Teaching Adaptation at State Vocational School

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Abstract

The learning process at SMK Negeri 1 Bone (State Vocational High School 1 Bone) remains predominantly conventional, requiring physical interactions between teachers and students in the classroom. This limitation highlights the need for technological integration to enhance accessibility and flexibility in education. This study aims to design and implement an e-learning application based on a Learning Management System (LMS) to facilitate online learning adaptation at SMKN 1 Bone. The development follows the UML model, while system testing employs the black-box method. Data were collected through field research and literature reviews from various academic sources. The results of this study led to the development of an LMS-based e-learning application that significantly supports online learning implementation. A user effectiveness test involving 30 respondents yielded a 71.57% feasibility score, categorizing the system as viable. Furthermore, black-box testing confirmed the system's functional reliability. This research contributes to the global discourse on digital education by demonstrating the practical application of LMS technology in vocational education, offering insights into scalable solutions for enhancing learning accessibility and effectiveness worldwide.

Keywords: E-Learning; Learning Management System (LMS); Vocational Education; Online Learning Adaptation; Digital Education Transformation.

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Introduction

The rapid development of information and communication technology in the modern era has led to the emergence of an urgent need for information technology-based learning concepts and mechanisms (Abdillah et al., 2020; Purba et al., 2020; Rachmawati, 2018). According to (Sawitri et al., 2019). This is inseparable from the ability of technology to present flexible and adaptive learning solutions to the challenges of the times. This concept allows its users to overcome various barriers of space and time, especially by utilizing the internet network that can be accessed widely. Thus, technology-based learning, or better known as e-learning, is an innovative solution that can support learning anywhere and anytime (Sukarno, 2020; Hadisi & Muna, 2015; Widianto, 2021).

The acceptance of the e-learning concept in various educational institutions shows that this learning model is increasingly relevant and in demand (Mustafa & Alshaykha, 2022) (Hariyadi et al., 2023; Husain & Basri, 2021; Sugandini et al., 2022; Sukmawati et al., 2022; Sumiharsono & Hasanah, 2017). Its increasingly widespread implementation proves that e-learning not only offers ease of access, but is also able to improve the overall quality of education (Hariyadi et al., 2023; Jalinus et al., 2020; Sobari & others, 2024; Sulianta, 2020; Waliulu et al., 2023). As expressed by (Anshori, 2018) The use of e-learning has become a widespread trend in educational institutions. This reflects the adaptation of education to technological advances, which not only function as a complement but also become an integral part of the learning system in the digital era (A'la et al., 2023; Husamah & In'am, 2024; Khushk et al., 2023; Marella, 2024; Siahaan et al., 2023).

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Online learning, or what is known as E-learning, is learning that utilizes technology (Education articles, 2023; Kuanta, 2024; Pardede, 2011; Rezaalf, 2021; Salma, 2024). Online learning, or the term (online), is a form of conventional learning delivery that is then poured into a digital format via the internet (Admin, 2022; Hafidh, 2020; Web, 2023). So that online learning is the only learning medium that can deliver material between teachers and students during the emergency period of the COVID-19 pandemic (Azhar, 2020; Hayumuti, 2021; Imania et al., 2021). Various applications designed for e-learning have been proposed by several previous studies, including research conducted by Fridayanthie entitled Design and construction (Web-Based E-learning information system at SMK Daarut Taufiq Tangerang). Furthermore, the research conducted (Zainuddin et al., 2020) entitled Design of E-learning Information System to Support Web-Based Learning Process at SMA Santa Maria 3 Cimahi Using Extreme Programming Method of Student Module.

So far, the learning process at SMK Negeri 1 Bone (State Vocational High School 1 Bone) can be said to be still conventional; in other words, the learning process between students and teachers can only be carried out on the condition that there is a meeting between students and teachers in the classroom. If the meeting between students and teachers does not occur, then automatically the learning process cannot be carried out, and also, the limited time to study in class, or sudden matters, so that teachers cannot attend class, sometimes hinders the delivery of all learning materials. This causes the learning process to be inefficient, due to the limited time and place. In addition, the process of transferring knowledge is almost entirely carried out in the classroom, which causes the transfer of knowledge to be late if the meeting does not occur. This situation can clearly hinder the learning process at SMKN 1 Bone, which can result in reduced student understanding of a subject matter, so that learning objectives are not achieved. The preparation of E-learning is specific because it must be based on the nature and characteristics of the learning process. Therefore, to overcome the problems that have been explained previously, it is considered necessary to conduct research on the use of information technology in the form of E-learning to help improve the education process at SMK NEGERI 1 BONE.

Method

This research will be conducted at State Vocational High School 1 Bone (SMKN 1 Bone), located on Jalan Lapawawoi Karaeng Sigeri Kr. Sigeri, Biru, Tanete Riattang District, Bone Regency, South Sulawesi, 92716. The research is scheduled to take place from July to October 2022. Figure 1 presents the location map of SMKN 1 Bone. The development of the application system in this study adopts the Extreme Programming (XP) methodology, which includes four main phases: Planning, Design, Coding, and Testing. Prior to the development of the E-Learning system, a comprehensive system design is required. One of the key design elements is the Use Case Diagram, which illustrates the interactions between system actors and the system's functionalities (Bittner & Spence, 2003; Kurniawan, 2018; Lesmono, 2024; Maulana, 2022; Setiyani, 2021). The Use Case Diagram for this system is shown in Figure 1.

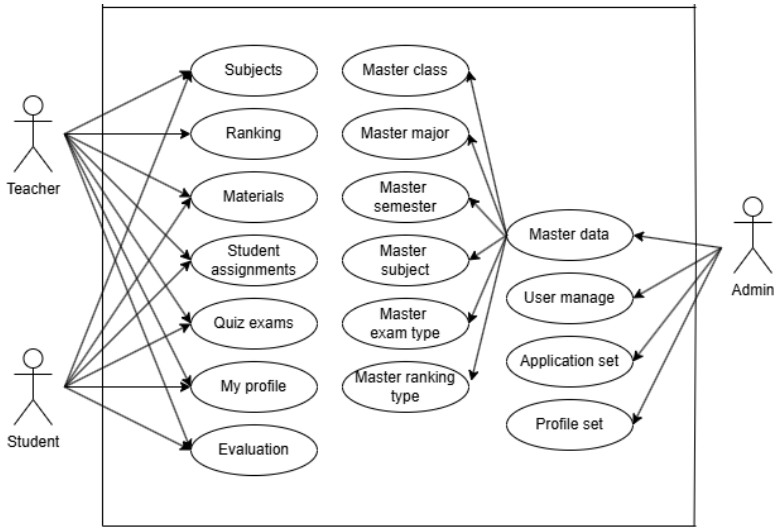

Figure 1. Use case diagram

In the Figure 1 use case diagram, there are 3 actors involved, namely Admin, Teacher, and Student. Admin is responsible for managing master data in the system. Master data includes management: Class Master: Management of class data. Department Master: Management of department data. Semester Master: Management of semester data. Subject Master: Management of subject data. Exam Type Master: Management of exam type data. Device Type Master: Management of device data used. Admin also manages users in the system, such as creating, deleting, and updating user information (teachers and students). Admin can make general application settings to suit the system's needs. Admin can also set application profiles that include system information and configuration. Teachers have access to manage the subjects they teach. Teachers can access and manage student ranking data based on evaluation results and assignments.

Teachers can upload and manage learning materials that can be accessed by students. Teachers can give assignments to students and manage and evaluate the assignments collected. Teachers can organize and manage quizzes that will be taken by students. Students have access to manage their personal profiles in the system. Students can access the evaluation results of the assignments and exams they have taken. Interaction Between Actors: Admin has a very important role in managing master data, user management, and application and profile settings. Teachers are responsible for managing learning content such as subjects, materials, assignments, and exams, as well as providing evaluations to students. Students can access learning materials, submit assignments, take quizzes, and monitor their evaluation results. This diagram provides an overview of how each actor interacts with the E-learning system to carry out their respective functions. The relationship between actors and use cases shows the responsibilities and access that each actor has in the system.

The testing method for the designed system is to use the black box method. Black box testing is a way of testing software by seeing whether the system works according to its function, without needing to check the contents of the code or how the software was made (Dashti & Basin, 2020; Ismail & Efendi, 2021; Jacob & Prasanna, 2016; Team, 2023). The tester only focuses on what comes in (input) and what comes out (output) according to the rules that have been determined. The purpose of this test is to ensure that all the main features are running well, check whether the results are correct according to the input given, and find errors or problems in the application's functions (Patria, 2023; Peled et al., 1999; Wicaksono, 2022).

Results and Discussion

Results

In this research, there are several major parts of the development of e-learning applications based on learning management systems for adapting online teaching at SMK NEGERI 1 BONE. The following are the results of this development, shown in Figure 2.

Figure 2. Login page

Figure 2 shows the initial display of the e-learning application, where the admin must log in first. After logging in by entering the correct username and password and selecting access rights as admin, the system will direct you to the dashboard page.

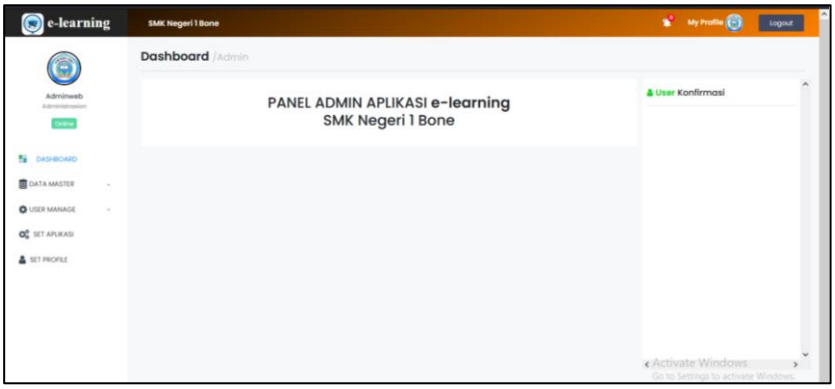

Figure 3. Admin dashboard page

In Figure 3 is the Dashboard Page for the admin web application, which includes many menus on the left channel and can be seen by admins who have registered in the admin web system. After logging in first and the admin will handle/manage all incoming data.

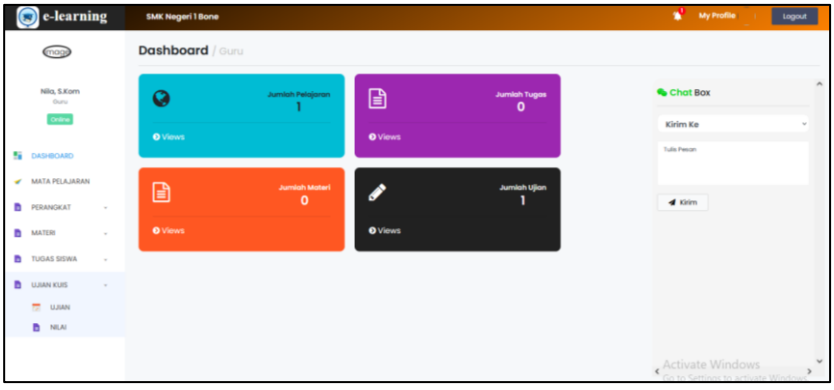

Figure 4. Teacher dashboard page

Figure 4 shows the dashboard page for the teacher web application, which includes many menus on the left, including; subject menu, device menu, material menu, student assignment menu, quiz test menu and on the right there is a chatbox feature that functions as a communication tool between teachers and students, where students registered in the subjects or majors handled by the teacher can communicate via the chatbox feature.

Figure 5. Student dashboard page

Figure 5 shows the dashboard page for the student web application, which includes many menus on the left, including: my profile menu, materials, assignments, evaluations, and exam announcements. When the teacher gives an assignment/exam, it will appear in the middle of the dashboard, and on the right, there is a chatbox feature that functions as a communication tool between teachers and students, where students registered in the subjects or majors handled by the teacher can communicate via the chatbox feature.

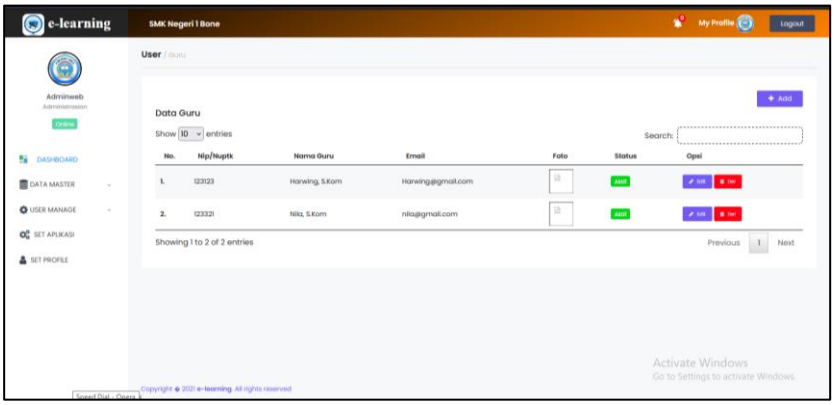

Figure 6. Teacher data page

Figure 6 shows a display of the teacher data menu managed by the admin. This menu functions to add, edit, and delete teacher data.

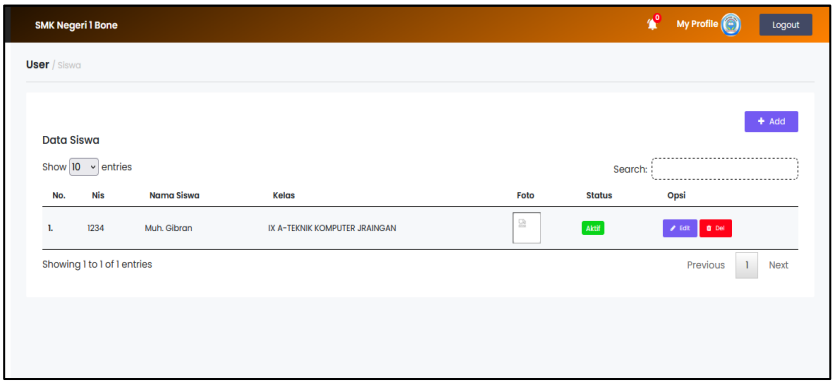

Figure 7. Student data page

Figure 7 shows a display of the student data menu managed by the admin. This menu functions to add, edit, and delete student data. Next is the application testing result. After the system development process has been completed, the author presents the results of the application development in the form of testing using the black box method. This testing is done by running the system that has been designed using the black box method. This testing aims to see a menu or input that is run according to the output with the initial plan. The results of this black box testing can be seen in Table 1.

Table 1. Blackbox test results

No.	Testing	Information	
		Succeed	No
1	Admin dashboard page	✔	
2	Master class menu	✔	
3	Master menu of majors	✔	
4	Semester Menu	✔	
5	Subject menu	✔	
6	Test type menu	✔	
7	Teacher management menu	✔	
8	Student management menu	✔	

No.	Testing	Information	
		Succeed	No
9	Profile menu	✔	
10	Teacher dashboard page	✔	
11	Subject menu	✔	
12	Device menu	✔	
13	Material menu	✔	
14	Student Assignment Menu	✔	
15	Student exam menu	✔	
16	Chatbox feature	✔	
17	Student dashboard page	✔	
18	Profile menu	✔	
19	Material menu	✔	
20	Task menu	✔	
21	Value form	✔	
22	Exam info form	✔	
23	Question list form	✔	
24	Chatbox feature	✔	

From the test results using the blackbox method, it can be seen that the system created is able to work well, so from the results of several tests and explanations that the author has presented about the design of an e-learning application based on a learning management system for online teaching adaptation at SMK Negeri 1 Bone, where the application has run well as it should according to the initial design and some improvements for the perfection of the application itself. So it can be concluded that the test was successful as expected. The results of the questionnaire test on users, data for 30 respondents on the performance of E-Learning for testing this system, there are five score indicators, namely: 5 (Strongly agree), 4 (Agree), 3 (Neutral), 2 (Disagree), 1 (Strongly Disagree). The results of this test can be seen in Table 2.

Table 2. Results of questionnaire testing on users

No.	Question	Answer					Score Total	Results
		SS	S	N	TS	STS		
1	This app helps me to be more active	20	10	0	0	0	140	93.3
2	This app helps me to be more productive	26	2	2	0	0	145	96.0
3	This e-learning is beneficial for teachers and students	25	5	0	0	0	149	99.3
4	E-Learning helps in terms of getting materials and uploading assignments, quizzes, and exams.	25	4	1	0	0	144	96.0
5	The application makes it very easy for me to evaluate	21	3	2	0	0	123	82.0
6	This E-Learning has many features	18	8	4	0	0	134	89.3
7	This e-learning is easy to access	17	10	3	0	0	134	89.3
8	This app works as I expected.	25	5	0	0	0	145	96.7

Discussion

This study produces an E-learning application based on the Learning Management System (LMS) to help adapt online teaching at SMKN 1 Bone. This application has been tested using the black box method and is stated to run according to the initial design. The user effectiveness test showed a feasibility level of 71.57%, which is included in the feasible category based on responses from 30 users. This application provides a solution to the limitations of conventional learning that requires physical meetings between teachers and students. With this application, the learning process can take place without space and time constraints, especially in the context of a pandemic. This finding is important because it supports digital transformation in the education sector, especially vocational education.

The results of this study are in line with expectations to improve the efficiency and effectiveness of online learning, as explained in previous literature by (Atsani, 2020), which emphasizes the role of e-learning in emergency situations. In addition, these results are in line with the research of (Adimarangga et al., 2020; Fridayanthie et al., 2018), which showed the success of implementing a web-based e-learning system in educational institutions. This study is consistent with similar findings showing the effectiveness of e-learning in increasing learning accessibility. However, this study

adds a specific contribution by focusing on the context of vocational schools in Indonesia, especially at SMKN 1 Bone, which has unique characteristics in vocational education.

Although the results show feasibility, it is still possible that these positive results are influenced by other factors, such as the level of technological literacy of respondents or the questionnaire design that is not completely free of bias. Further research needs to consider these variables to ensure the validity of the findings. In the context of education, these findings are relevant to improving the quality of online learning at the vocational school level. The implementation of this application can be a model for other schools facing similar challenges, especially in terms of limited physical infrastructure. This study has several limitations, including a test sample limited to one school, respondents who may not be representative of the population as a whole, and an evaluation that only uses the black box method. In addition, the application has not been tested for long-term or large-scale use.

Conclusions and Suggestions

Conclusions

From the results of this study, the author concludes that the study produced an E-learning application based on the Learning Management System (LMS) that can help adapt online teaching at SMKN 1 BONE. The application has functioned well according to the initial design, accompanied by several improvements to improve its performance. Based on the user effectiveness test, the results were 71.57%, which is included in the feasible category. These results were obtained through a questionnaire involving 30 respondents, while system testing using the black box method also showed that the application is feasible to use.

Suggestions

The suggestions that can be given for further research are as follows:

1. The E-Learning application that has been created can be implemented and can be further developed in the future.
2. It is hoped that schools, both teachers and students, will be interested in using this application because there are many benefits that can be achieved when this application is implemented.
3. This application can still be developed further with features that present information in multimedia form, so that educational material can be produced.

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