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Design and Development of an Interactive E-Learning Website Using Moodle as a Learning Platform

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Abstrak

The development of information technology has driven transformation in the field of education, particularly through the implementation of digital-based learning systems. This research aims to design and develop an interactive e-learning website based on Moodle as a learning medium at SMP Dharma Pancasila Medan. The research methods used include observation, interviews, documentation, and literature review to analyze user needs and design the system according to existing problems. The developed system includes features for managing learning materials, discussion forums, assignments, and online quiz-based evaluations that can be accessed by teachers and students flexibly. The system design employs the Unified Modeling Language (UML) approach, consisting of use case diagrams, activity diagrams, sequence diagrams, and class diagrams. The implementation of this e- learning website is expected to improve the effectiveness of the learning process, facilitate material distribution, and encourage active student participation in learning activities. The research results show that the interactive e-learning website based on Moodle can serve as an alternative solution to support online learning at SMP Dharma Pancasila Medan. With integrated features and a user-friendly interface, this system is expected to enhance the quality of learning while providing a more modern, efficient, and engaging learning experience for both teachers and students.

Keyword: E-learning; Moodle; Interactive Website; SMP Dharma Pancasila Medan.

1. INTRODUCTION

Advances in technology require the education sector to adapt to digital teaching methods. One prominent application of technology in education is e-learning, which offers flexibility in the teaching–learning process by enabling students to study independently anytime and anywhere, without being constrained by physical classrooms or fixed schedules. For this reason, Moodle was chosen as the platform for this project: as one of the leading Learning Management Systems (LMS), Moodle supports interactive learning with a rich set of features such as quizzes, discussion forums, and video lessons. These tools help learners become more autonomous and actively engaged, improving motivation and understanding. Such capabilities align well with 21st-century education goals that emphasize critical thinking, creativity, collaboration, communication, digital literacy, and information literacy.

Moodle (Modular Object-Oriented Dynamic Learning Environment) is an open-source LMS widely used worldwide to support online learning. Its flexibility, scalability, and strong community support make it an excellent foundation for developing an interactive e-learning website (Mariezki et al., 2021).

SMP Dharma Pancasila, a middle school in Medan, faces challenges in enhancing teaching and learning quality. This situation highlights the need to create a more adaptive, engaging, and relevant learning environment for students in the digital age. Based on the author's observations, the school still relies heavily on conventional teaching methods and has limited access to digital learning materials. Student records and assessment results are not always documented systematically, making it difficult to analyze student progress comprehensively. Conventional approaches are often behind when it comes to technology adoption, leaving students unaccustomed to the digital tools that are increasingly expected in the modern workplace. Therefore, implementing an interactive Moodle-based e-learning website tailored to SMP Dharma Pancasila Medan's needs is both timely and necessary.

The use of Moodle in LMS-based digital learning has been widely studied and developed by researchers, and these prior studies form an important basis for the current project. Reviewing earlier research helped shape the development approach, design model, and understanding of Moodle's effectiveness in improving learning quality.

Indah et al. (2022) reported that a Moodle e-learning platform hosted on a Virtual Private Server (VPS) significantly improved student learning outcomes in geography at SMA Negeri 1 Teras Boyolali during the pandemic: average scores rose from a pretest mean of 55.45 to a posttest mean of 88.36. Wismanto et al. (2022) applied the 4D model (Define, Design, Develop, Disseminate) to develop Moodle-based learning media for news writing; expert validation rated the material and media as highly feasible, with scores of 81.54% and 78.4%, respectively. Yuda & Kurniawati (2024) used the ADDIE development

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model to design Moodle learning resources for eighth-grade students at MTs Ma'arif Ponorogo; validation results indicated suitability for use, with media expert ratings of 80% and student trial scores of 81.33%.

Taken together, these studies indicate that Moodle is effective for learning. Wulandari & Mufidah (2024) describe Moodle as a highly interactive platform that fosters a dynamic digital learning environment; it simplifies the design of engaging, easily accessible learning materials. Khairani et al. (2021) highlight Moodle's strength in delivering personalized and flexible learning experiences. Beyond functionality, Moodle helps build learning communities through user communication features, automated grading, and performance reporting, making the learning process more structured and transparent. In short, Moodle is not merely a platform but a digital learning ecosystem that promotes collaboration, creativity, and active participation in education.

To date, SMP Dharma Pancasila Medan does not have a structured, interactive LMS-based e-learning platform. The school does possess basic infrastructure—such as a computer lab and internet connectivity—and shows administrative support for digital system development. These conditions make the school an appropriate setting for implementing an e-learning solution. By choosing SMP Dharma Pancasila Medan as a case study, this research addresses real-world needs and aims to produce concrete improvements in the quality of teaching and learning at the school.

This study is expected to serve as a reference for other schools looking to adopt e-learning systems, particularly those that want an effective and affordable solution using Moodle. The goal is for SMP Dharma Pancasila Medan to have a structured, interactive, and user-friendly e-learning system that supports a more modern, efficient, and enjoyable learning experience for both students and teachers.

2. RESEARCH METHODE

2.1 E-Learning

E-learning is a learning system that utilizes information and communication technology to support the teaching and learning process. According to Ratnaduhita et al. (2023), the implementation of e-learning can improve learning efficiency through flexible access and digital content delivery. This technology enables learning activities to take place without being limited by time or location, allowing both students and educators greater flexibility in managing the learning process.

E-learning also provides a number of benefits, including flexibility, accessibility, cost efficiency, and personalized learning. Hidayati & Maslikhah (2022) emphasize that students experience higher motivation because learning materials can be accessed anytime according to individual needs. To further enhance the effectiveness of e-learning, it is important to integrate pedagogical principles with technological tools. This integration makes e-learning distinct from conventional learning methods, as it combines technical, pedagogical, and experiential aspects to create a more dynamic learning environment.

2.2 Moodle

Moodle (Modular Object-Oriented Dynamic Learning Environment) is a web-based Learning Management System (LMS) designed to help educators develop more interactive and structured online courses. As an open-source and free platform, Moodle can be widely used and customized to fit the needs of both institutions and individuals.

Hekmatyar & El Gumeri (2024), through a systematic review of 155 articles from 104 journals across 55 countries, found that Moodle is one of the most widely used LMS platforms in higher education, particularly in STEM (Science, Technology, Engineering, and Mathematics). The study revealed that Moodle enhances student performance, engagement, and satisfaction. Its features, such as adaptive quizzes, automated assessment, and artificial intelligence integration, support more flexible learning and enable personalized learning experiences tailored to students' needs.

3. RESULT AND DISCUSSION

3.1 Result

After going through the design and implementation stages, the interactive e-learning website based on Moodle has been successfully developed and adapted to the learning needs of SMP Dharma Pancasila Medan. The following are the main features available in Moodle:

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Figure 1. Homepage

The homepage of the Moodle-based e-learning system is the first interface that users encounter when accessing the website. This page displays the main navigation menu, which provides easy access for users to explore the various features available on the platform.

Figure 2. Login Page

The login page is a core component of the e-learning system, functioning as the entry point for users to access the platform's features and content. In the system that has been designed, users consist of teachers and students, each with specific roles, permissions, and customized interfaces. Therefore, the login page plays a crucial role in maintaining both security and the orderly use of the system. The design of the login page emphasizes simplicity, responsiveness, and user-friendliness. Users are required to enter their registered username and password to gain access. In addition, a supplementary feature such as the "Forgot Password" link is provided to assist users in resetting their login credentials if any difficulties occur during the login process.

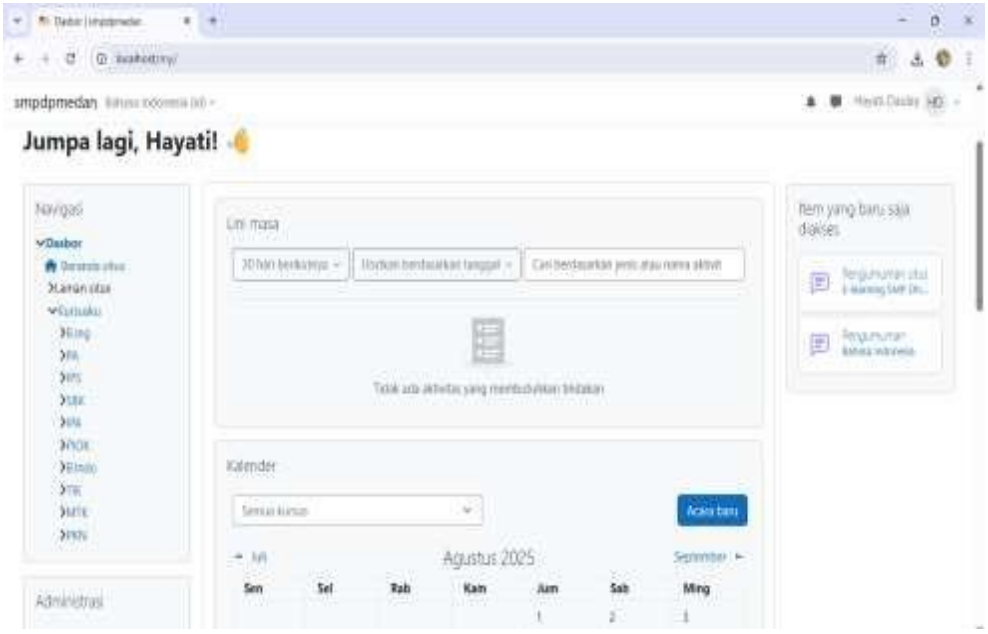

Figure 3. Teacher Dashboard

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This page serves as a control center for teachers in managing learning activities, monitoring student progress, and organizing instructional materials and assessments. Generally, the teacher dashboard in Moodle displays several essential features and information, such as course navigation, activity and resource management, grading menu, student activity reports, academic calendar, notifications and messages, as well as profile and preference settings. The presence of quick navigation to participant lists, reports, and grading pages makes the teacher dashboard an efficient tool for classroom management. Thus, the dashboard not only functions as a summary of information but also as an integrated management tool to support the smooth implementation of digital learning.

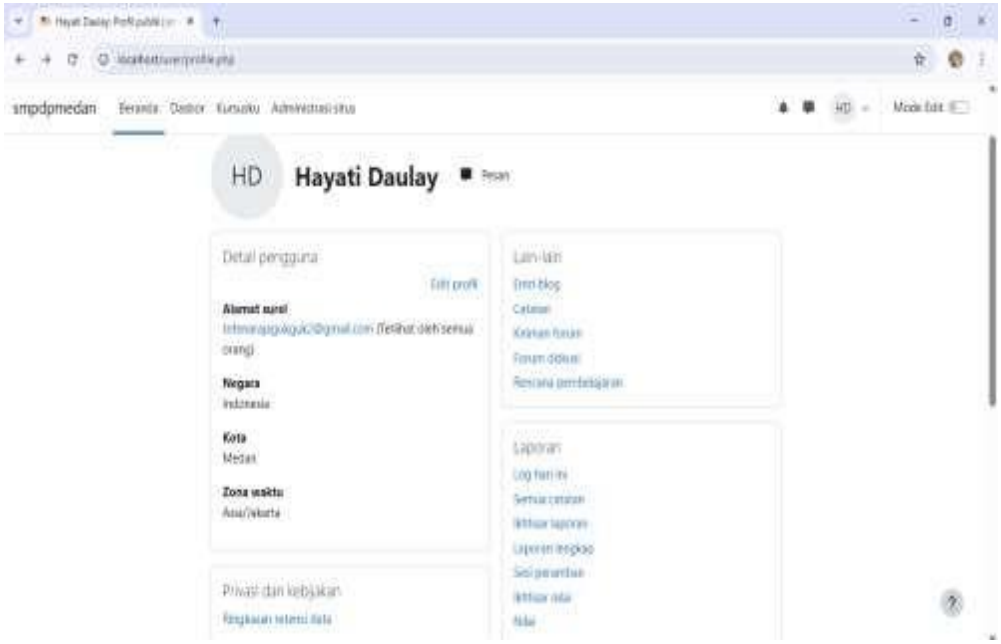

Figure 4. Teacher Profile Page

he teacher profile page in the Moodle-based e-learning system serves to display the identity and personal information of teachers registered in the system. This page generally contains personal data such as full name, profile photo, email address, and additional details that can be customized according to school or institutional needs. In addition to personal information, the teacher profile page also presents details related to the subjects or courses taught. Teachers can display the list of courses they are currently instructing, discussion forums they have participated in, and learning materials they have uploaded. This feature allows students and fellow teachers to better recognize the teacher's role and contributions in supporting the teaching and learning process. Moreover, it helps create transparency and fosters better interaction among users within the Moodle e-learning environment.

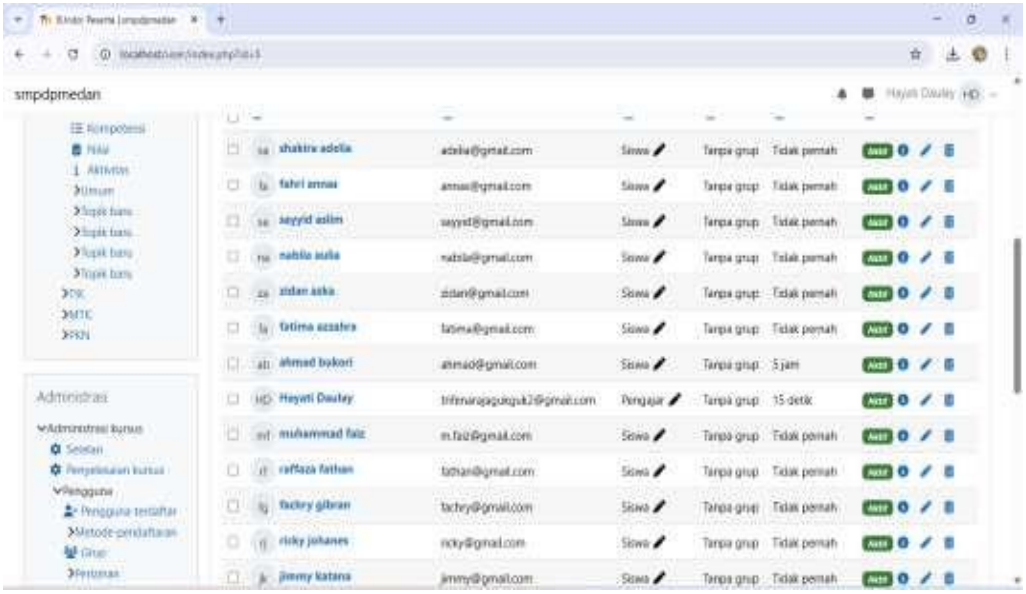

Figure 5. Class Participants List

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The participants list page in Moodle displays all users registered in a class or subject. For teachers, this menu is crucial as it functions as a tool for monitoring, managing, and directly interacting with students. The main components and functions of the participants list include student identity information, access status and last activity, filtering and search features, access to individual reports, and interaction tools with students. Additionally, this page often includes extra features such as participant search, filtering by group or role, and options for sending direct messages or emails to specific students. These features facilitate communication between teachers and students, while also supporting more efficient classroom management.

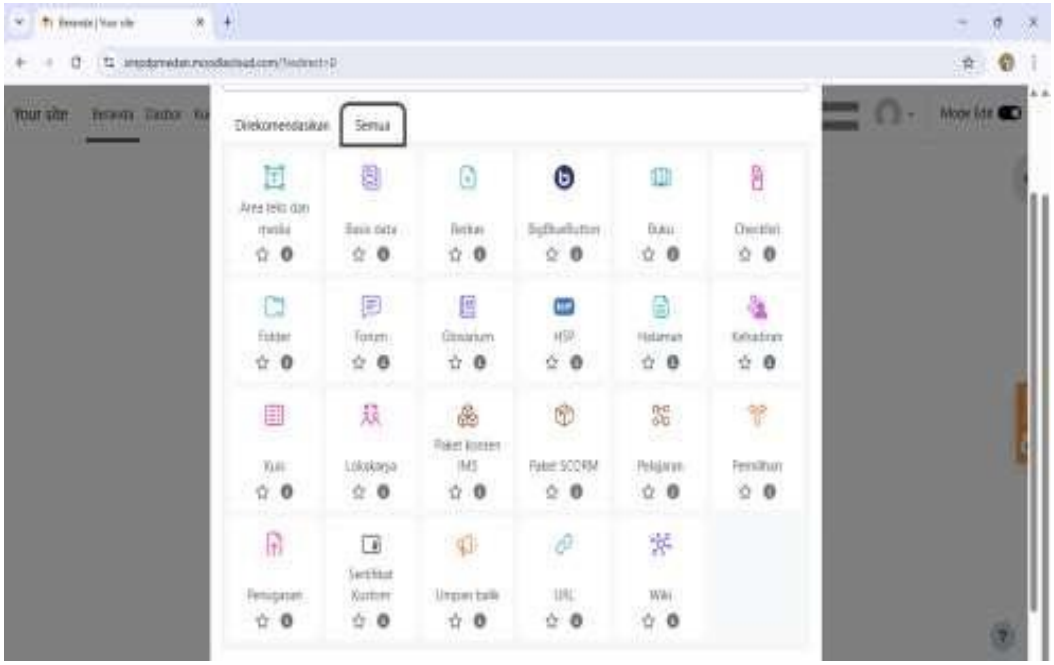

Figure 6. Learning Features in Moodle

Learning features in Moodle are core components of the e-learning system designed to support online teaching and learning processes. Moodle provides comprehensive and flexible tools, allowing teachers to organize learning materials systematically and interactively while offering students easy access to participate in learning activities. Typically, Moodle's learning features include elements such as instructional content, learning activities, structured course navigation, progress tracking, interactivity, and independent learning. Teachers can manage these features by adding or editing content as needed. Each activity can be equipped with deadlines, grading weights, and feedback to support the evaluation process.

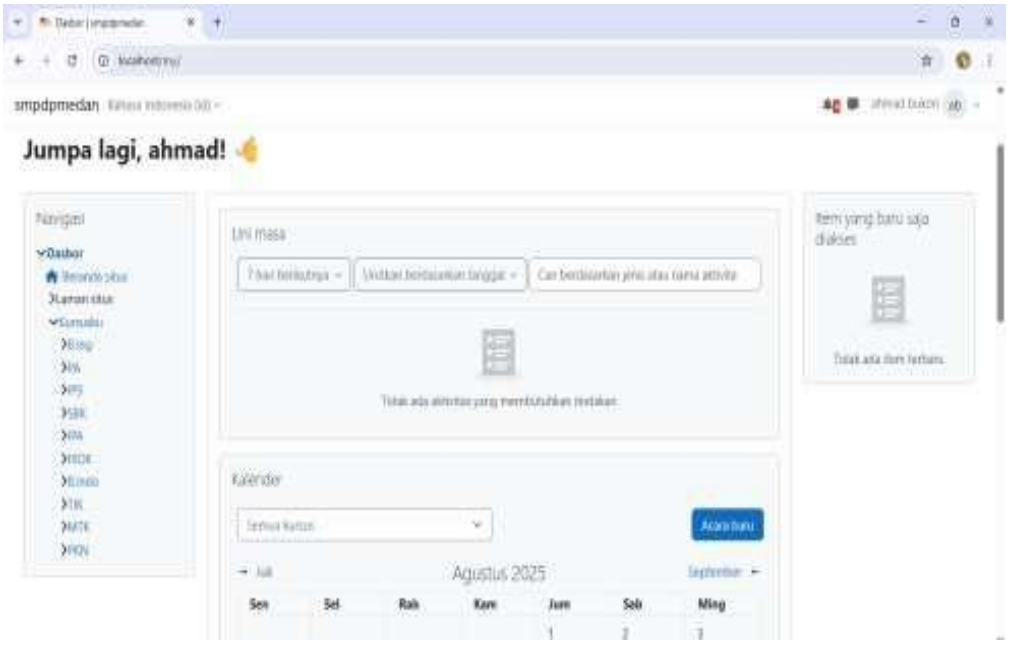

Figure 7. Student Dashboard

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The student dashboard is the main page that appears after a student successfully logs into the system. This interface is designed to be simple, engaging, and user-friendly, allowing students to directly access features related to their learning activities. The student dashboard typically displays important menus such as enrolled courses, available learning materials, active quizzes or exams, grades and progress reports, discussion forums, and student profile settings. Additionally, students can access supporting features such as an academic calendar and notifications about recent class activities. With a structured and interactive interface, the Moodle student dashboard facilitates comprehensive monitoring of learning progress while serving as the central hub for accessing various digital learning features.

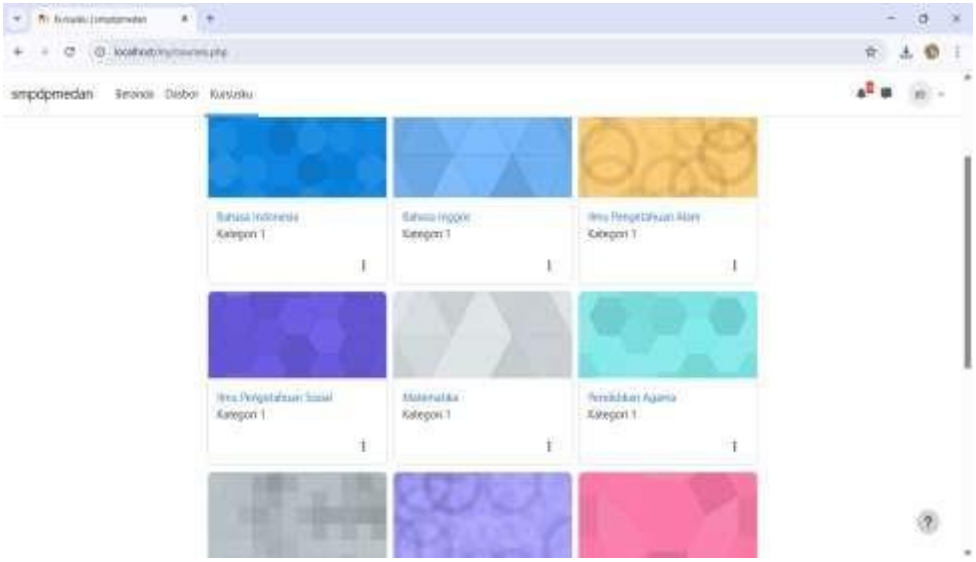

Figure 8. Course Page

The course page in Moodle is designed to accommodate all learning components, ranging from instructional content and activities to assessments. In this sense, a course functions as an organized virtual classroom. The page typically displays interactive learning activities available in Moodle, such as assignments, quizzes, discussion forums, chats, lessons, and workshops. Within each course, users can find various components arranged systematically, such as materials, discussion forums, quizzes, assignments, and other supporting resources. Teachers can structure content by topics or weeks, ensuring a more organized learning process. For students, this page serves as the primary access point for participating in online learning, downloading materials, completing assignments, and interacting with teachers and peers.

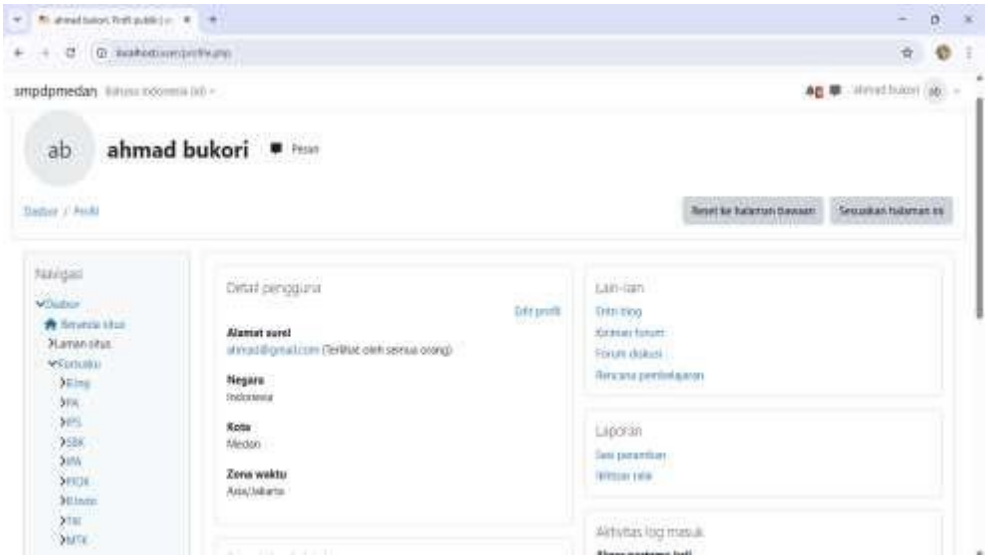

Figure 9. Student Profile Page

The student profile page in Moodle displays a student's identity and activity within the e-learning system. This profile serves as a digital identity that can be accessed by teachers and classmates to foster familiarity, facilitate interaction, and support classroom management.

3.2 Discussion

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The interactive e-learning system implemented based on Moodle has generally fulfilled the design objectives established in the early stages of the study. The main goal of this system design is to provide an interactive and easily accessible digital learning medium that supports teaching and learning activities at SMP Dharma Pancasila Medan for both teachers and students. In terms of accessibility and usability, the system provides a simple and user-friendly interface, making it suitable for users from various backgrounds, including students at the junior high school level. The use of Moodle as the development platform allows for the integration of various structured learning features such as discussion forums, quizzes, digital learning materials, and grade reports.

From the perspective of interactivity and learning effectiveness, the system includes discussion forums that serve as interactive spaces between teachers and students, as well as online quizzes/exams that enable immediate assessment of learning. These features align with the objective of creating an active learning environment that encourages collaboration. Regarding learning management, the system facilitates teachers in managing teaching materials, classes, and assessments digitally, which supports efficiency in material delivery and student evaluation.

Several interactive features have been implemented to support dynamic and engaging learning. One such feature is the discussion forum, which enables two-way communication between teachers and students. Through this feature, students can ask questions, respond to materials, and engage in peer discussions, while teachers can provide additional explanations without waiting for face-to-face sessions. This ensures that learning can continue seamlessly beyond the classroom. Another key feature is online quizzes and exams, designed to evaluate students' understanding of the materials. This feature not only allows automatic and instant grading but also provides immediate feedback to students. Such feedback motivates students to actively improve their comprehension by recognizing and addressing their weaknesses. Additionally, the system enables digital management of learning resources, where teachers can upload materials in the form of text, images, videos, or other relevant documents. The availability of these materials anytime and anywhere allows students to learn at their own pace, fostering personalized and independent learning.

When comparing the Moodle-based e-learning system with the conventional learning methods previously applied at SMP Dharma Pancasila Medan, several fundamental differences can be identified in terms of methods, media, and learning effectiveness. In conventional learning, the process occurs entirely face-to-face in classrooms, where teachers deliver material verbally or through printed media, and students take a more passive role. Interactions are limited by time and space, with little flexibility for revisiting or deepening material outside school hours. On the other hand, the Moodle-based e-learning system provides greater flexibility, interactivity, and digital documentation. Students can access materials anytime, participate in discussions, complete online quizzes, and directly review their results. This approach supports independent learning tailored to individual pace. For teachers, the system simplifies classroom management, material distribution, test creation, and assessment through automated processes. Unlike manual grading, the system stores and processes data systematically, providing structured grade tracking. However, conventional methods still maintain advantages in terms of direct social interaction, which cannot be entirely replaced by online learning. Therefore, a blended learning approach—combining online and offline learning—could be an ideal solution to integrate the strengths of both methods.

Based on the author's observations, the implementation of Moodle demonstrates that technology can effectively complement and enhance learning quality. The system provides an adaptive alternative suited to modern demands, particularly in emergency contexts such as the pandemic or limited physical facilities. An evaluation of the Moodle-based interactive e-learning system was conducted to determine its usefulness and acceptance among key users—teachers and students. Data were gathered through observation, interviews, and feedback during the system's trial phase at SMP Dharma Pancasila Medan. Teachers responded positively, noting that Moodle facilitated the organization and distribution of learning materials, test and quiz creation, and automated assessment. They also appreciated the discussion forum feature, which enabled them to address student questions beyond classroom hours. Furthermore, the gradebook feature allowed teachers to monitor student progress in a structured manner.

Students likewise showed enthusiasm for using the system. Most reported that Moodle's interface was easy to understand and its features supported their learning. The ability to access learning resources online gave them the flexibility to study at their preferred time. Quizzes and online assignments were seen as engaging and challenging due to the immediate feedback provided. Nonetheless, the evaluation also revealed several technical challenges, including limited internet access and lack of devices such as laptops or smartphones at home. These issues, particularly for students from economically constrained backgrounds, can hinder system usage. Thus, adequate infrastructure support and training for both teachers and students are critical for successful implementation.

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In general, the evaluation results indicate that the Moodle e-learning system was well-received by both teachers and students. With gradual improvements and consistent support from the school, this system holds significant potential to be widely adopted in enhancing learning quality at SMP Dharma Pancasila Medan.

4. CONCLUTION

As the closing part of this study, this chapter presents the conclusion as a summary of the research findings that have been carried out. The conclusions are formulated based on data analysis, discussion, and the achievement of the research objectives established at the beginning. Through this conclusion, it is expected to provide a comprehensive overview of the results obtained. The current learning system implemented at SMP Dharma Pancasila Medan still relies on conventional methods, namely face-to-face classroom meetings. In this process, teachers deliver materials through blackboards or printed media, while students listen, take notes, and submit assignments, exams, or exercises manually by handing them directly to the teachers. This system is highly dependent on the physical presence of both teachers and students. The conventional learning system also applies a one-way communication pattern, where materials are delivered only during the learning session in class and cannot be flexibly accessed afterward as they are not digitally stored. Furthermore, student assessments are still conducted manually, requiring more time for compilation and feedback distribution. Based on the analysis, the current learning system is less effective in addressing the needs of modern education. This is due to the limited access to learning materials, lack of interactivity, and inflexibility in terms of time and place for learning. Therefore, it is necessary to develop an interactive e-learning website based on Moodle, which can provide easier access, enhance interactivity, and support both distance learning and face-to-face learning in an integrated manner.

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