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Web-Based Information System for Tutor Teaching Scheduling

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ABSTRACT

Effective scheduling is a crucial factor in enhancing the operational efficiency of non-formal educational institutions, such as the Ruang Bunda Smart Tutoring Center. Unstructured schedule management frequently leads to confusion among instructors, students, and the management team. To address this issue, a web-based scheduling information system was developed utilizing the CodeIgniter 4 (CI4) framework. CI4 was selected because the framework offers high performance, robust security, and development efficiency for modern web applications. The designed scheduling information system encompasses several core features, including class schedule creation and management, tutor allocation, and real-time schedule monitoring. This system is designed to facilitate administrators in compiling schedules based on student needs and tutor availability, while simultaneously providing more structured information access for all stakeholders involved. Consequently, this system is expected to enhance time management efficiency, mitigate scheduling conflicts, and facilitate rapid and accurate schedule modifications or adjustments. The system development process was conducted through several sequential stages, ranging from requirements analysis, system design, and implementation, to system testing. The testing results demonstrate that the system operates effectively and reliably supports scheduling activities at the Ruang Bunda Smart Tutoring Center. Furthermore, the utilization of CI4 as the underlying framework for system development has proven to deliver both high flexibility and optimal performance.

Keyword: Information System; Scheduling; CodeIgniter 4; Tutoring Center; Ruang Bunda Smart.

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1. INTRODUCTION

Current technological advancements are progressing rapidly, driven by increasing competition across various industrial sectors. Technology providers continuously strive to create innovations that simplify human tasks and improve productivity. One sector that has witnessed significant development is computer technology, which has become a vital necessity in daily life. Computers not only enhance work efficiency but also deliver information rapidly, precisely, and accurately. Furthermore, computers offer a distinct advantage in minimizing the potential for errors in data processing compared to manual methods. However, the effectiveness of computer utilization remains heavily dependent on the quality of the human resources operating them[1]

Ruang Bunda Smart is a non-formal educational institution located at Jl. Gajah Mada, Griya Permata Housing Complex A-4, Jempong Baru, Mataram, West Nusa Tenggara. This institution provides intensive private tutoring services across all educational levels, ranging from preschool, kindergarten, and elementary to high school, alongside preparation classes for the UTBK (university entrance examination) and CPNS (civil servant recruitment). The subjects offered include basic literacy and numeracy (Calistung), English, Physics, Mathematics, among others.

Currently, the tutor scheduling system at Ruang Bunda Smart still relies on Microsoft Excel software. Schedules are manually generated by the administrator based on parents' requests, requiring subsequent adjustments to align with the tutors' availability. However, based on interviews with the management of Ruang Bunda Smart, several

constraints were identified in the current scheduling process, most notably scheduling conflicts (clashes) between tutors and students. This issue directly impacts the overall effectiveness of the teaching and learning activities.

Therefore, there is a critical need for a web-based scheduling information system to facilitate the online schedule management process. The implementation of this system is expected to assist Ruang Bunda Smart in managing tutor schedules more effectively and efficiently, while significantly reducing the potential for scheduling errors. Based on this background, this research is entitled: "Web-Based Tutor Teaching Scheduling Information System at Ruang Bunda Smart Tutoring Center."

2. RESEARCH METHODS

This study was conducted to address the issues of manual teacher data recording and class schedules that were typed and pasted on the school bulletin board, which often resulted in errors and scheduling conflicts. The research utilized Research and Development (R&D) with a software prototype development model. Data collection was carried out through observation, interviews, literature review, and questionnaires. The result of this system development is the creation of a web-based scheduling information system for SMK Negeri 1 Moswaren, built using Visual Studio Code as the design environment, the PHP programming language, and CSS for the interface. Data storage is managed using a MySQL database. The system was successfully designed according to the created prototype and can be used to facilitate the arrangement and management of class schedules at SMK Negeri 1 Moswaren [2].

The creation of PPNPN (non-civil servant government employees) shift schedules was previously done manually using Microsoft Excel. The Waterfall method and UML were used in this study, and Black Box testing was employed for system evaluation. Data were collected through three stages: interviews, observation, and literature study. System analysis is a problem-solving technique that studies system components and their interactions to achieve objectives. Information system design is a step-by-step process focusing on four essential parts: data structure, system architecture, detailed procedures, and user interface characteristics [3] [4].

Teacher scheduling becomes a complex problem if handled solely using Microsoft Excel. In system design, the appropriate qualitative method significantly influences system development to meet the required needs. Therefore, selecting a suitable method is crucial to ensure the system design meets the school's expectations. The designed system can assist in generating reports and retrieving data more quickly and accurately when needed. This application was built using PHP and a database designed with phpMyAdmin, enabling the teaching scheduling system at SMP Negeri 9 Muaro Jambi to be fully implemented according to requirements [5].

2.1 Research Methodology

The system development method used in this research is the Waterfall model. The stages in the Waterfall method can be seen in the figure below [6] [7]:

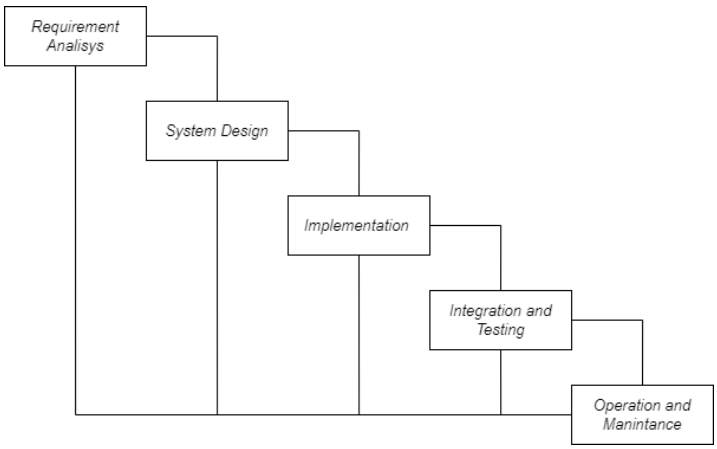


Figure 1. Waterfall Method

The use of the Waterfall method in developing the scheduling application is supported by several strong rationales, particularly when the project requirements are clear and stable. This method offers structured and sequential stages, starting from requirements analysis, design, implementation, testing, to maintenance, where each phase must be completed before proceeding to the next. This ensures that all aspects of the application, such as features, interface design, and backend systems, are thoroughly prepared. If the application requirements are fully understood and do not change significantly during development, Waterfall is the optimal choice due to its focus on detailed initial planning. Furthermore, this method emphasizes comprehensive documentation at every stage of development, which is highly critical for scheduling applications to allow for future modifications, as well as to facilitate maintenance and training for new users. Waterfall also ensures that testing is conducted systematically after the development phase is complete, allowing the application to run accurately without bugs. With this approach, development is more predictable because the timeline and budget are planned from the outset. Therefore, Waterfall is highly suitable for

scheduling applications that require clear specifications and features from the beginning and do not undergo frequent changes throughout the development process.

2.2 System Design

A Use Case Diagram is used to model object behavior and connect them through collaborations [8], [9].

a. Actors, which are roles that interact with the system.

b. Use Cases, which are descriptions that help system users understand the purpose of the system being built.

c. Associations, which represent relationships between specific elements.

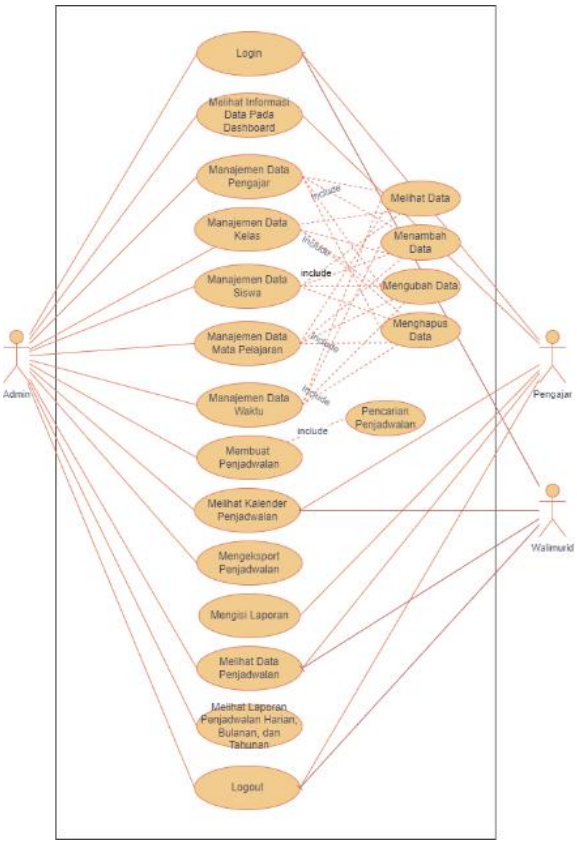


Figure 2. Use Case Diagram

The diagram above is a Use Case Diagram of the scheduling application system that illustrates the interaction between three main actors: Admin, Instructor, and Guardian. The Admin has full access to all features, including login, master data management (instructors, classes, students, subjects, and time), schedule creation, viewing the calendar, exporting schedules, filling out reports, and viewing daily, monthly, and yearly scheduling data and reports. Instructors can use the schedule search feature, view scheduling data, and fill out activity reports. Meanwhile, Guardians only have read-only access to view scheduling data and reports. Several main features, such as adding, editing, and deleting data, are related to CRUD (Create, Read, Update, Delete) operations, and are shown in the diagram with an "include" relationship indicating that these operations depend on one another

A Class Diagram is a collection of classes and their relationships. A class is equivalent to an entity and is represented in a rectangular shape, with the class name written at the top, the attributes contained within the class in the middle, and the methods at the bottom[10] [11]. A Class Diagram serves as a specification for creating objects during instantiation and is the core of Object-Oriented Design (OOD) and development[8]

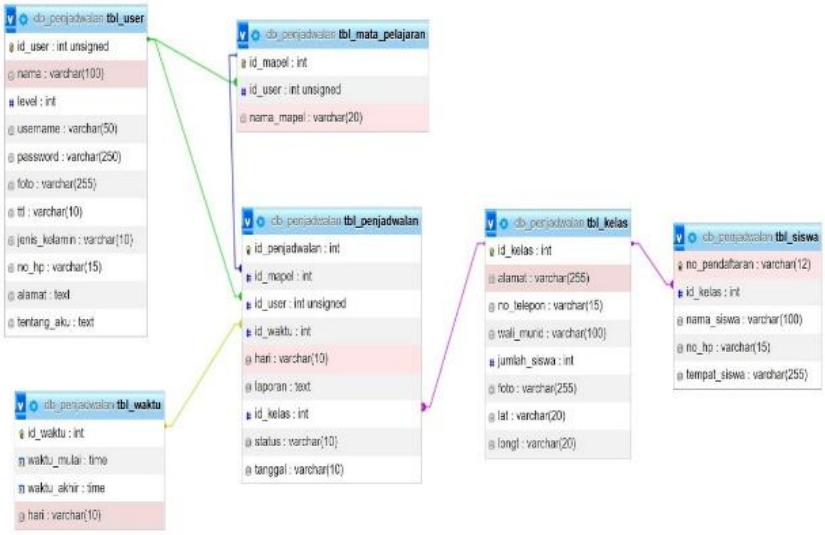


Figure 3. Class Diagram

3. RESULTS AND DISCUSSION

his section presents the implementation results of the user interface for the designed Web-Based Tutor Teaching Scheduling Information System, along with an evaluation of the system's functionality through Black Box testing. The system implementation aims to address the issues associated with manual scheduling, which is prone to errors and scheduling conflicts.

3.1. System Interface Implementation

System access begins at the authentication page. Figure 4 illustrates the login page interface, which serves as the system's security gateway. It includes a 'Username' input field (filled with 'admin' in the example), a 'Level' dropdown menu to determine user access rights (e.g., admin, tutor, or guardian), and a 'Password' field masked with asterisks. An eye icon feature within the password field provides users with the flexibility to verify their password entry. The 'Login' button at the bottom validates the credentials and redirects users to the dashboard according to their specific access level (role-based access).

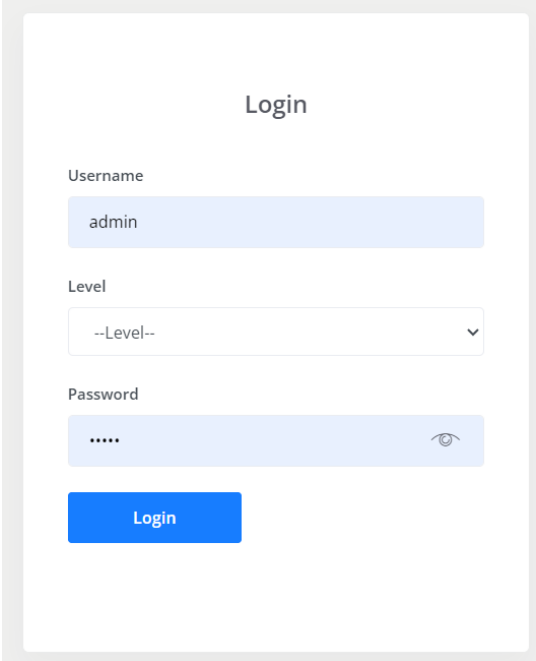


Figure 4. Login Page

Upon successful authentication, users are redirected to the main page. Figure 5 displays the Dashboard, designed as a central monitoring hub. This interface presents real-time statistical information panels detailing the total number of tutors, classes, subjects, and scheduling data. Furthermore, it features schedule aggregation categorized by

timeframes: today's schedule, this month's schedule, and this year's schedule. Details of active and completed schedules are also displayed, enabling admins and tutors to quickly and comprehensively evaluate the progress of teaching and learning activities.

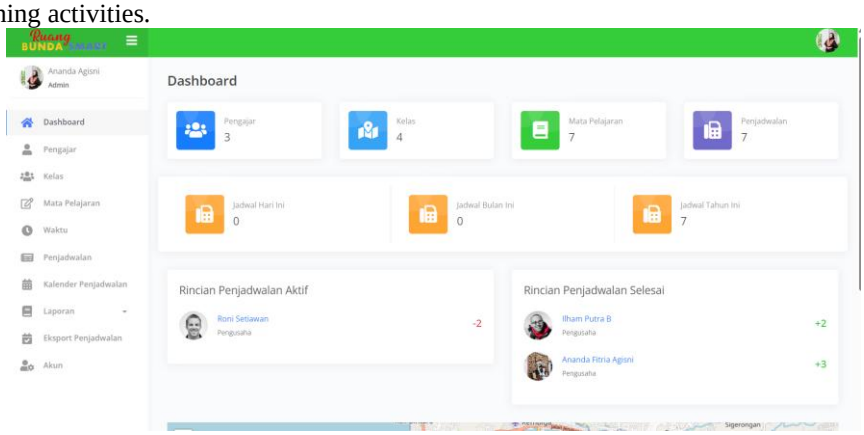


Figure 5. Dashboard Page

The core functionality of the system resides within the scheduling data management module. Figure 6 illustrates the scheduling data page, equipped with Create, Read, Update, and Delete (CRUD) operations. The 'Add' button is utilized to input new schedules, while 'Edit' and 'Delete' icons are provided for each data row to facilitate data maintenance. To ensure smooth navigation across large data volumes, a search form is provided, allowing users to query scheduling data using specific keywords (such as tutor name, class, or subject).

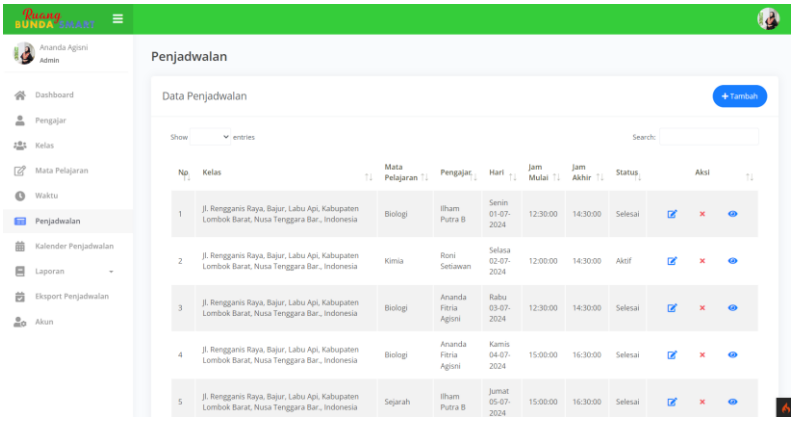


Figure 6. Scheduling Page

To meet reporting and archiving requirements, the system provides a data export feature. Figure 7 displays the scheduling export page, where users can filter and view schedules based on a selected date range. This feature is crucial for educational institutions to generate periodic reports (daily, monthly, or yearly) for distribution to stakeholders.

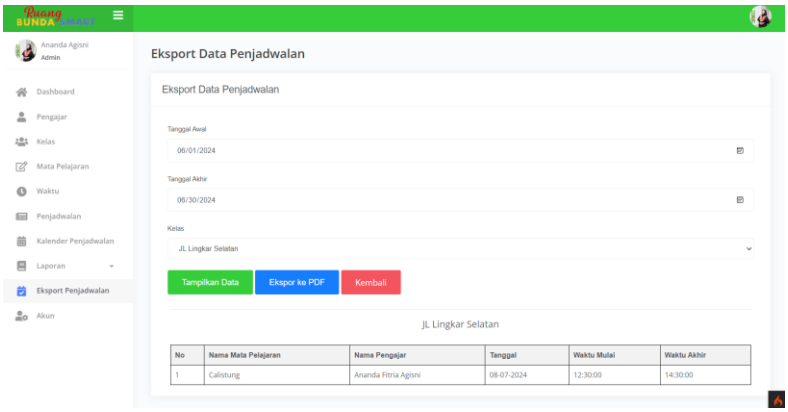


Figure 7. Scheduling Export Page

3.2. Discussion and System Evaluation

Overall, the implemented interface has successfully translated user requirements into operational features. The integration of an informative dashboard and a structured CRUD module within the scheduling page directly addresses the issues of data redundancy and scheduling conflicts that previously occurred with manual methods. Additionally, the date-based export feature effectively fulfills the requirements for transparency and administrative reporting.

Table 1. Black Box Testing Results

No.	Feature Tested	Test Scenario	Input	Expected Output	Test Result	Status
1	Login	Log in using the correct username and password	Valid username, level, and password	The system accepts the login and displays the dashboard according to the user's access level	Dashboard is displayed according to the user's level	Successful
2	Login	Log in using an incorrect password	Correct username and incorrect password	The system rejects the login and displays an error message	Error message is displayed	Successful
3	Dashboard	Access the dashboard after logging in	Valid user data	The system displays statistical information and scheduling summaries	Statistics and schedule summaries are displayed	Successful
4	Tutor Data	Add a new tutor	Complete and valid tutor data	Tutor data is saved and displayed in the tutor list	Data is successfully saved	Successful
5	Tutor Data	Edit tutor data	Existing tutor data	Tutor data is updated according to the changes	Data is successfully updated	Successful
6	Tutor Data	Delete tutor data	Selected tutor data	Tutor data is deleted from the list	Data is successfully deleted	Successful
7	Class Data	Add a new class	Valid class name/details	Class data is saved and displayed	Data is successfully saved	Successful
8	Subject Data	Add a new subject	Valid subject name	Subject data is saved	Data is successfully saved	Successful
9	Scheduling	Add a new schedule	Tutor, class, subject, date, and time	The schedule is saved and displayed in the scheduling list	Schedule is successfully saved	Successful
10	Scheduling	Add a schedule with incomplete data	Some fields are left empty	The system rejects the submission and displays validation messages	Validation message is displayed	Successful
11	Scheduling	Add a schedule with a time conflict	Same tutor/class and overlapping time	The system detects the conflict and rejects the schedule	Schedule conflict is detected	Successful
12	Scheduling	Edit schedule data	Existing schedule data	Schedule data is updated according to the changes	Schedule is successfully updated	Successful
13	Scheduling	Delete schedule data	Selected schedule data	Schedule data is deleted from the list	Schedule is successfully deleted	Successful

14	Search	Search for a schedule by tutor name	Tutor name keyword	The system displays schedules matching the keyword	Matching data is displayed	Successful
15	Search	Search for a schedule by class/subject	Class/subject keyword	The system displays the corresponding data	Data is successfully found	Successful
16	Schedule Export	Export schedules based on a date range	Start date and end date	The system generates scheduling data according to the selected date range	Data is successfully exported	Successful
17	Schedule Export	Export schedules for a date range with no data	Date range without schedules	The system displays information indicating that no data is available	Information is displayed	Successful
18	Logout	Log out from the system	Click the Logout button	The system terminates the session and returns to the login page	Login page is displayed	Successful

Based on the results presented in Table 1, all main functions of the Web-Based Tutor Teaching Scheduling Information System operated according to the predetermined test scenarios. The testing covered authentication, data management, scheduling, schedule conflict validation, data searching, data export, and logout functions. These results indicate that the main system functions have met the specified functional requirements.

4. CONCLUSION

The Ruang Bunda Smart tutoring center previously encountered challenges in scheduling tutors' teaching sessions, which led to errors and scheduling conflicts. These issues arose due to the inefficient use of Microsoft Excel for managing complex scheduling requirements. To address this problem, a web-based scheduling information system has been developed. The implementation of this system is expected to facilitate the management of tutors' teaching schedules, minimize scheduling errors, and enhance overall operational efficiency at Ruang Bunda Smart

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