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Web-Based Student Grade Management Information System for SMP IP YAKIN West Jakarta

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ABSTRACT

The world of technology is currently developing very rapidly in line with the great need for information. Currenly the computers has taken a very important role in any work related to data processing, assessment is very important in a learning, assessment is carried out by the teachers to determine the ability of students to master the learning objevtives that have been set. At the SMP IP YAKIN West Jakarta where every work on storing grades is stiil done manually. Judging from this working system, the author sees a lot of inefficiencies and effectiveness or inaccuracy. From this research, the author wants to design an information system application processing student grades at SMP IP YAKIN West Jakarta which aims to produce software. The waterfall research method is used in this study. In data collection, there are two types that need to be collected, namely primary data and secondary data, primary data is the result of observations and interviews from relevant sources, while secondary research data uses the technique of collecting learning data or reading experts. This research resulted in a student grade processing application system, which is designed to help check grades quickly and precisely. Help in the search for student grades because of the grades stored in the database.

Keywords: Information Systems, Grades, Web-Based, School, Students.

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INTRODUCTION

In tandem with rapid technological progress, the field of computing continues to undergo significant advancements. Today, computers have transcended their role as mere auxiliary tools in modern education, evolving into a sophisticated scientific discipline that contributes substantially to both technological innovation and human development [1]. Within this context, the management of timely and accurate information is vital for the growth of any institution. In the educational sector, information technology is indispensable, as it streamlines student access to academic activities and progress reports while enabling parents to monitor their children's learning development. One of the most effective and responsive applications of this technology is the implementation of web-based information systems supported by robust hardware and internet connectivity [2].

Despite these potential benefits, SMP IP YAKIN West Jakarta has yet to strategically utilize information technology, as nearly all academic procedures remain manual. Currently, the management of student grades is suboptimal, relying on physical entry into paper-based grade sheets without the support of an integrated web-based database. This manual approach is prone to data entry errors, physical document damage (such as tearing or water damage), and data loss, while also being significantly time-consuming. The core issue at SMP IP YAKIN West Jakarta is the absence of a systematically interconnected data storage medium; the current conventional archiving methods are inefficient and ineffective. Consequently, there is an urgent need for a web-based information system

to assist educators in managing student data. In light of these challenges, this study aims to design a structured web-based system to facilitate rapid data access, accurate information delivery, and overall operational efficiency.

The primary problems identified in this study include the reliance on physical logbooks for student data, which leads to time-consuming retrieval and risks of document loss or accumulation. Furthermore, the lack of a specialized system results in excessive time spent on manual grade entry per class, leading to delays in generating administrative reports. To address these issues, this research formulates several key questions: How can a web-based application be developed to accelerate the grade management process? How can system testing ensure effective data presentation for students? And finally, how can the implementation of this system provide a fast, accurate, and easily accessible information platform for the school?

The primary objective of this research is to build a web-based grade information system that streamlines data management, retrieval, and record-keeping, making the input process faster and more flexible for teachers. The benefits of this system include transforming manual, unstructured workflows into a computerized and organized framework, thereby improving the administrative performance of the staff at SMP IP YAKIN. Furthermore, it ensures that academic information is communicated to both teachers and students with greater speed and precision.

The scope of this research focuses on the functionality of the web-based grade management system at SMP IP Yakin West Jakarta in handling data related to students, classes, subjects, and academic grades. System access is restricted to three specific roles: Administrators, Teachers, and Students. Administrators and Teachers possess the authority to manage (add or edit) student records, class data, and subject information, as well as generate grades. Conversely, students are granted access to view subject and class details, as well as view and print their individual academic results.

LITERATURE REVIEW

Information Systems and Management

A system is defined not only by its constituent components, such as the environment, boundaries, connectors, inputs, processes, outputs, and objectives, but also as a networked framework of interconnected procedures collaborating to achieve specific goals [3]. In formulating a system, approaches typically focus on either these procedural workflows or the underlying structural components [4]. Information, the core product of such systems, results from data that has undergone classification, analysis, and interpretation to serve as a foundation for decision-making. Information systems, therefore, transform raw data into meaningful intelligence, utilizing computer-driven stages to enhance utility for relevant stakeholders [5]. These systems represent a synergy of human design, computer technology, and systematic methods intended to collect, store, and manage data effectively through the integration of people, software, and networks.

Academic Assessment and Student Development

In an educational context, grading serves as a critical metric for measuring student achievement and subject mastery. Assessment is a process of drawing conclusions based on collected data, supported by professional judgment to establish appropriate policies [6]. The implementation of computerized academic records provides a data-driven basis for student guidance and the diagnosis of learning progress [7]. At the secondary education level (Junior and Senior High School), students are regarded as individuals undergoing a formal educational process aimed at maximizing their potential through curricula tailored to their respective academic stages.

Web Technologies and Connectivity

The Internet functions as a global network of interconnected computers utilizing the Transmission Control Protocol (TCP) as a standardized exchange system to serve billions of users worldwide [8]. It is characterized as an open global network that transmits data in packets according to standard internet protocols [9]. A primary interface of this network is the Website, a collection of pages containing

various files that display text, data, animations, and multimedia content. The homepage serves as the critical entry point and initial interface for users accessing a site.

Database Management Systems

A database is a systematic structure designed to store, retrieve, and process data via computer systems [10]. Within a database, information is organized into logically connected tables to support decision-making processes.

1) HTML (HyperText Markup Language): The standard markup language used to structure web pages for browser accessibility. Written in ASCII format, it enables the integrated presentation of information across the internet.
2) PHP: A server-side scripting language where instructions are executed on the server, with the final output delivered to the user's browser.
3) MySQL: A widely adopted open-source relational database server. It utilizes Structured Query Language (SQL) as a standardized method for managing and accessing data, making it a preferred choice for web-based applications due to its ease of implementation.

System Modeling and Testing Methodologies

Standardized modeling is essential for software analysis and design. The Unified Modeling Language (UML) is the industry-standard visual language used to map system architecture within an object-oriented programming approach [6]. To visualize data relationships, the Entity Relationship Diagram (ERD) is employed as a conceptual model consisting of entities, relationships, and attributes. This is further refined into a Logical Record Structure (LRS), which represents the logical structure of records resulting from entity relationships in a clear, tabular format.

Finally, to ensure system integrity, Black Box Testing is utilized. This methodology focuses exclusively on functional requirements according to specifications, disregarding the internal code structure. By executing specific modules and observing outputs against predefined business logic, this testing ensures that all software functions operate as intended and meet user requirements.

METHODOLOGY

Data Collection Techniques

To ensure the accuracy and reliability of the information used in this study, three primary data collection techniques were employed:

1) Observation: Direct observations were conducted at SMP IP YAKIN West Jakarta to gain a comprehensive understanding of the existing manual academic processes. This stage involved recording operational data in real-time to ensure the findings accurately reflected the school's current systemic challenges.
2) Interviews: In-depth interviews were conducted with key stakeholders to gather comprehensive insights. These participants included Mr. Muhamad Abduh, S.T. (Principal of SMP IP YAKIN West Jakarta), Mr. Edy Supandi (Head of Administration), and various administrative staff members.
3) Literature Review: A systematic review of existing literature was performed by analyzing journals, academic papers, books, and other relevant references. This process provided a theoretical foundation and supported the analysis of materials pertinent to the research topic.

Software Development Life Cycle (SDLC)

This research follows the Waterfall model for system development, consisting of the following stages:

1) System Requirements Analysis: This phase identified the essential elements required for the management information system to function optimally. The analysis focused on the data necessary to generate automated reports, including scheduling, academic grading, classroom distribution, and teacher and student profiles.
2) System Design: The software design was executed systematically, focusing on system architecture, user interface (UI) design, and coding procedures. The system utilizes MySQL as the primary database, while Unified Modeling Language (UML), specifically Use Case Diagrams was employed to map the system's structural requirements and user interactions.

3) Coding: During the implementation phase, the system was developed using a suite of web technologies, including HTML, CSS, PHP, and MySQL. The source code was structured to ensure maintainability and alignment with the predefined system requirements.
4) Testing: To ensure the integrity of the application, the web-based system underwent rigorous Black Box Testing. This method focused on verifying the functionality of each system component to ensure the program is free from syntax errors and logical inconsistencies.
5) Maintenance: The final stage involves ongoing system maintenance to adapt to evolving institutional needs. This includes data updates, validation procedures, program optimization, and security measures to protect the system against viruses or other technical disruptions.

RESULTS

Problem Analysis

The current academic evaluation process at SMP IP Yakin West Jakarta faces several critical challenges that hinder administrative efficiency:

1) Student grades are currently processed manually, utilizing paper-based ledgers or basic, non-integrated spreadsheets (e.g., Microsoft Excel).
2) The absence of a searchable database makes retrieving specific student records time-consuming, as administrators must manually scan individual entries.
3) Physical archives are highly susceptible to loss, unauthorized access, or environmental damage, such as humidity or physical wear.
4) The lack of automated validation leads to a higher margin of error in grade calculations and reporting, rendering the current system inefficient for long-term organizational growth.

Requirements Analysis

1) Functional Requirements (User Requirements) The system is designed with specific access privileges categorized by user roles:
   Administrator Requirements:
   a) Authentication through a secure login interface and the ability to update administrative profiles.
   b) Comprehensive CRUD (Create, Read, Update, Delete) capabilities for managing teacher records, classrooms, and academic subjects.
   c) Full administrative control over scheduling and student enrollment data.
   Teacher Requirements:
   a) Secure system authentication and profile management.
   b) Authority to manage student and classroom assignments.
   c) Direct oversight of the grading process, including the ability to input, modify, and delete student academic scores.
   Student Requirements:
   a) Access to the student portal via authenticated login.
   b) Self-service capabilities for updating personal profiles.
   c) Functionality to view and print individual academic transcripts and grade reports.

2) Non-Functional System Requirements To ensure a robust user experience and operational reliability, the system must meet the following technical criteria:
   a) The system shall display clear error notifications for failed authentication attempts.
   b) Upon successful login, the system must redirect users to a centralized dashboard and display relevant data dynamically based on the selected navigation menu.
   c) The system must facilitate the generation and printing of standardized academic reports.

DISCUSSION

Design

Entity-Relationship Diagram (ERD)

The Entity-Relationship Diagram (ERD) provides a conceptual overview of the relationships between the key entities within the system.

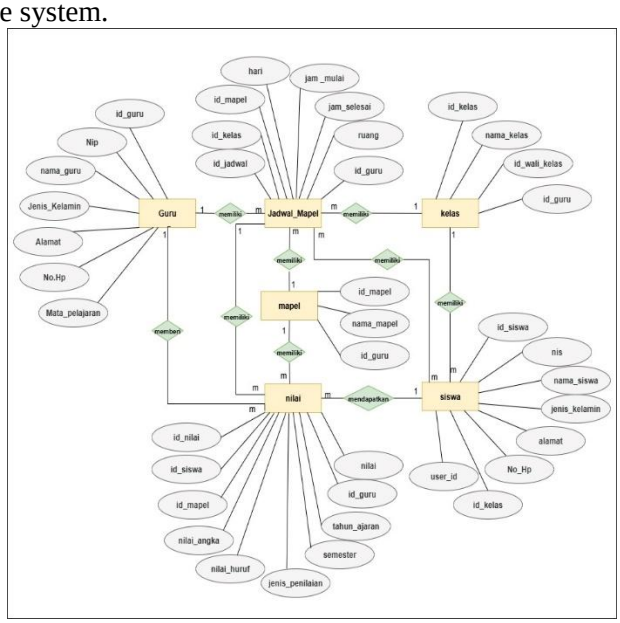

Figure 1. Entity-Relationship Diagram (ERD)

Logical Record Structure (LRS)

To ensure the correct construction of the database or data storage system for student grades, a Logical Record Structure (LRS) was developed. This structure refines the initial database design established in the preceding Entity-Relationship Diagram (ERD).

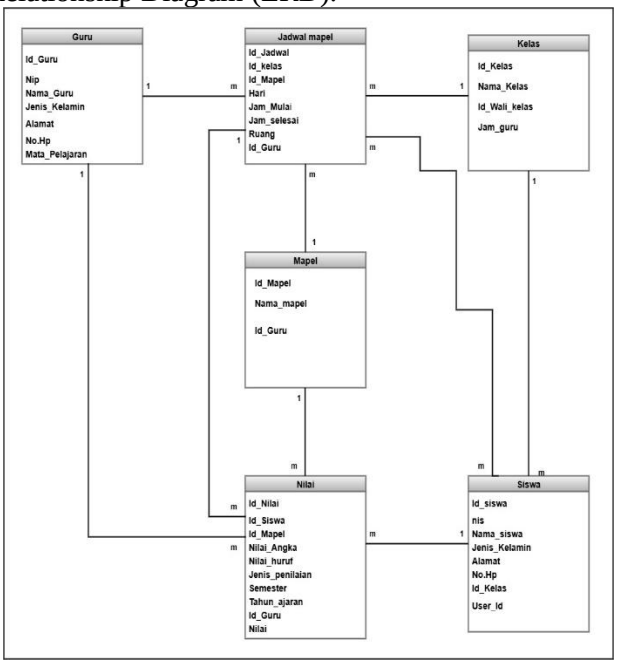

Figure 2. Logical Record Structure (LRS)

Use Case Diagram

The use case diagram serves as a tool to illustrate the associations and sets of interactions between system actors and use cases. The proposed use case design for the Student Grade Management Information System is presented in the figure below.

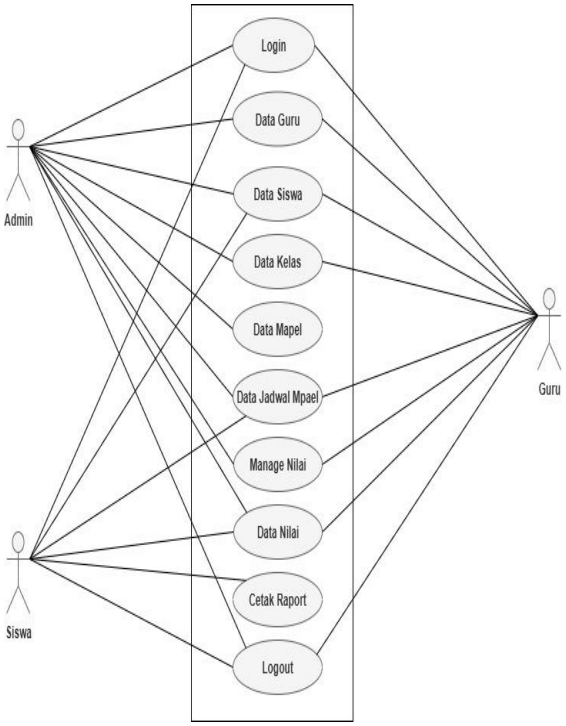

Figure 3. Use Case Diagram

Class Diagram

The class diagram depicts the relationships among the classes in the system design, illustrating how each class interacts to achieve the overall system objectives.

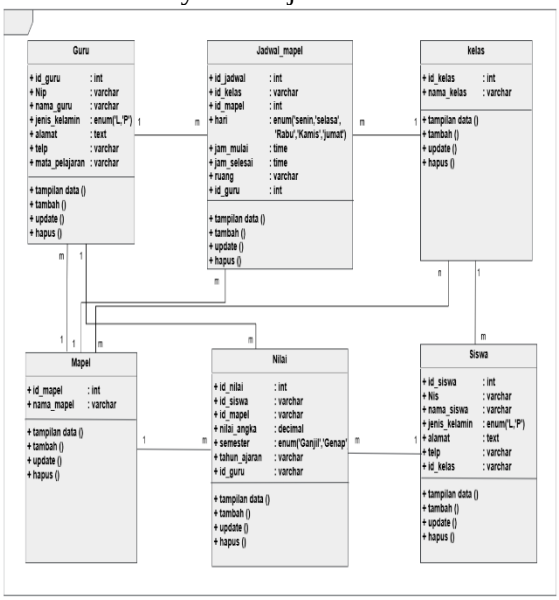

Figure 4. Use Case Diagram

Activity Diagram

Activity diagrams are used to model the various workflows and sequences of activities within the developed system, from the initiation to the conclusion of a process.

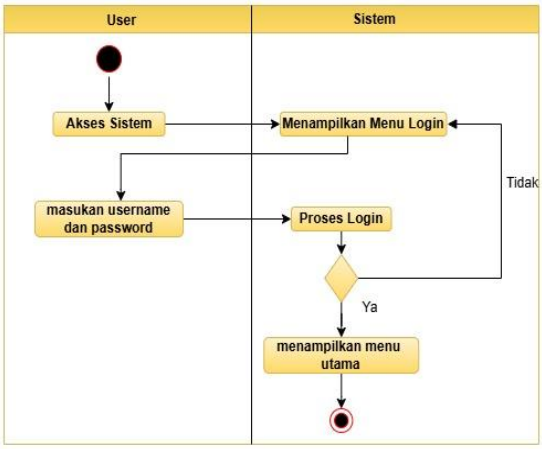

Figure 5. Activity Diagram

User Interface

Homepage

This homepage serves as the primary landing page and main interface of the developed Student Grade Management Information System website.

Figure 6. Homepage

Admin, Teacher, and Student Login Page

The login page is the access point for entering the system. Users must input a valid username and password. This authentication mechanism protects user data from unauthorized access.

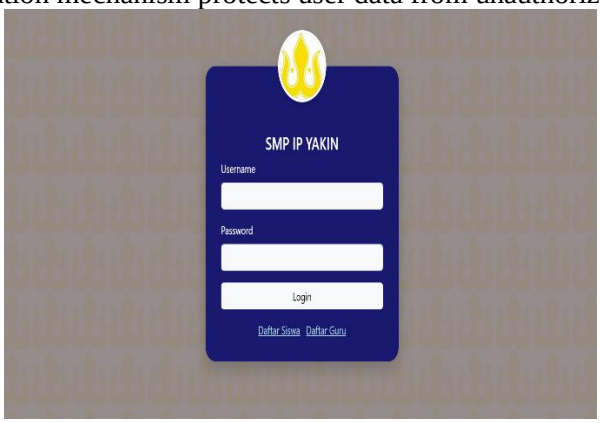

Figure 7. Login Page

Admin Dashboard (Teacher Data List)

This page within the admin dashboard displays a list of previously entered teacher records and provides functionality for adding new teacher data.

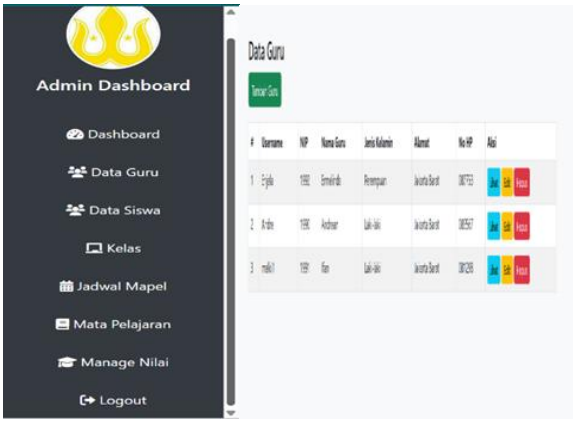

Figure 8. Teacher Data List

Admin Dashboard (Add Teacher Data)

This interface allows administrators to add new teacher records to the system.

Figure 9. Add Teacher Data

Admin Dashboard (Student Data List)

This page functions to display information for all student records stored within the system.

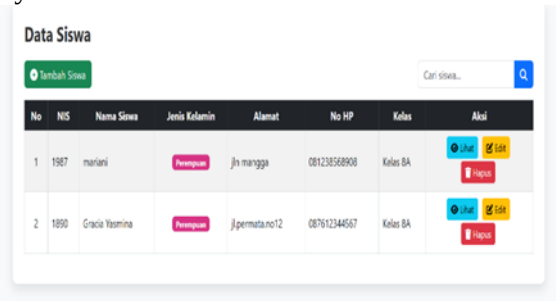

Figure 10. Student Data List

Admin Dashboard (Student Data Details)

This page presents the complete details of a registered student, such as name, Student Identification Number (NIS), gender, and other stored information.

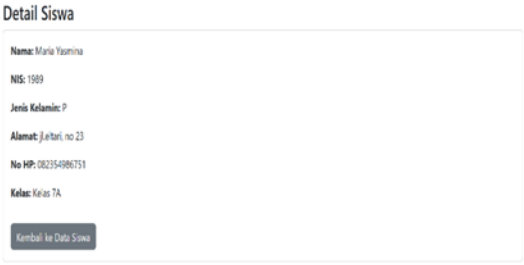

Figure 11. Student Data Details

Admin Dashboard (Class Data List)

This interface is used to manage information regarding classes stored in the system. It provides functionality to view class details, edit existing class data, or delete class records.

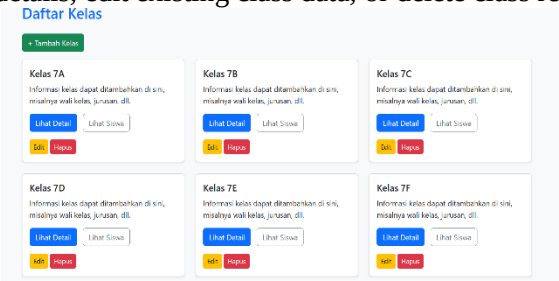

Figure 12. Class Data List

Admin Dashboard (Subject Schedule List)

This page is used to manage subject schedules. Administrators can add new subject data, edit existing schedules, delete entries, and view detailed schedule information.

Figure 13. Subject Schedule List

Teacher Dashboard

The following figure represents the main dashboard interface for teachers after successful login. This page displays information such as the teacher's personal data, student lists, assigned teaching schedules input by the admin, a module for inputting student grades, and announcements from the administrator.

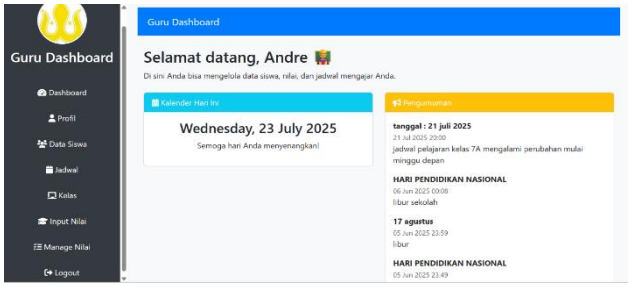

Figure 14. Teacher Dashboard

Teacher Dashboard (Input Student Grades)

This input page allows teachers to enter grades for students according to the subjects they teach. The teacher can select the relevant subject and then enter grades for each student. Inputted grade data is saved automatically within the system.

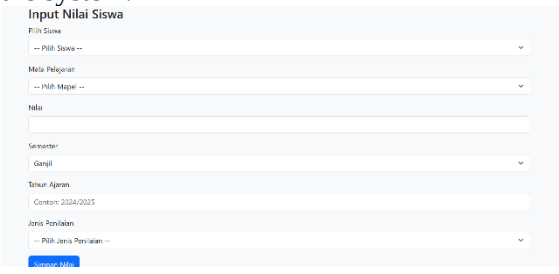

Figure 15. Input Student Grades

Teacher Dashboard (Inputted Grade Data)
This page displays the grade data entered by the teacher, who is authorized to add, edit, or delete these records.

Figure 16. Inputted Grade Data

Student Dashboard
The student dashboard is displayed as the main homepage after a successful student login. It presents various information, including the student's personal data, class schedule, recently updated grades from teachers, a report card printing feature, and announcements from the administrator.

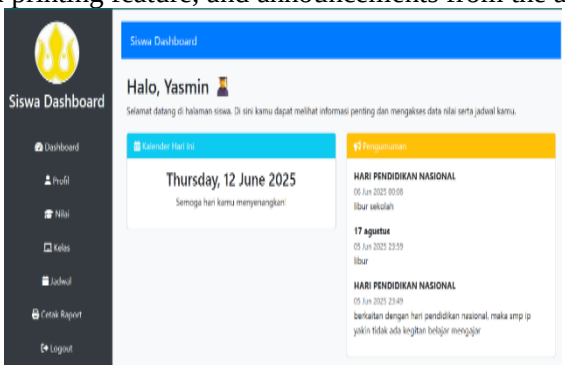

Figure 17. Student Dashboard

Student Dashboard (Student Grade Data)
This page is used to display a detailed breakdown of the student's grades for each subject.

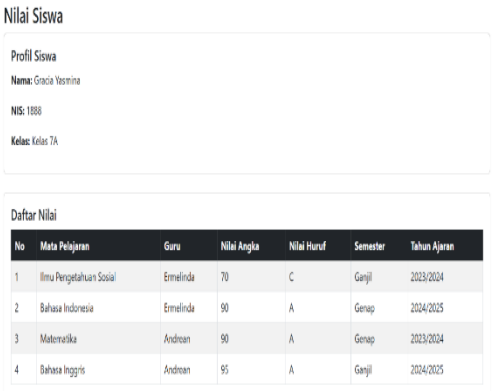

Figure 18. Student Grade Data

Student Dashboard (Print Report Card)
The grade data displayed on this page can be printed by the student as an archive or formal learning progress report.

Raport Siswa

Gracia Yasmina

Kelas: Kelas 7A

NIS: 1888

No	Mata Pelajaran	Nilai Angka	Predikat
1	Bahasa Inggris	95	A
2	Matematika	90	A
3	Bahasa Indonesia	90	A
4	Ilmu Pengetahuan Sosial	70	B

Wali Kelas

Kepala Sekolah

Figure 19. Print Report Card

Testing (Black Box Testing)

Admin Login Testing

Tabel 1. Admin Login Testing

No	Skenario Pengujian	Test Case	Hasil Yang Diharapkan	Hasil Pengujian	Kesimpulan
1.	Mengosongkan field login yang tersedia lalu menekan tombol untuk masuk ke sistem.	Bagian username: kosong, bagian password: kosong.	Sistem tidak akan memproses dan akan menampilkan peringatan berupa pesan "harap isi bidang ini"	Berhasil	Valid
2.	Mengisi kolom Username saja lalu membiarkan password kosong, kemudian menekan login	Usernama : (Admin) Password : (kosong)	Sistem akan menolak dan menampilkan pesan "harap isi bidang ini"	Berhasil	Valid
3.	Hanya mengisi password dan membiarkan kolom username kosong lalu menekan login	Username : (kosong) password : (admin123)	Sistem akan menolak dan menampilkan "harap isi bidang ini"	Berhasil	Valid
4.	Mengisi salah satu data dengan benar, sementara data lainnya salah	Username : admin (benar) Password : 12345 (salah)	Sistem akan menampilkan notifikasi "password salah" dan menolak akses.	Berhasil	Valid
5.	Mengisi kolom login menggunakan data yang sesuai	Username: admin Password : admin123	Sistem memproses permintaan login dan menampilkan tampilan berdasarkan peran pengguna, seperti admin, guru, atau siswa.	Berhasil	Valid

Teacher Login Testing

Tabel 2. Teacher Login Testing

No.	Skenario Pengujian	Test Case	Hasil Yang Diharapkan	Hasil Pengujian	Kesimpulan
1.	Tidak mengisi satu pun kolom pada form login kemudian menekan tombol untuk login	Username : (kosong) passwors : (kosong)	Sistem akan menolak dan menampilkan pesan "harap isi bidang ini"	Berhasil	Valid
2.	Hanya mengisi kolom username, sementara password dibiarkan kosong, lalu menekan tombol login.	Username : andre (benar), password : (kosong)	Sistem secara otomatis menolak input dan memunculkan pesan "harap isi bidang ini"	Berhasil	Valid
3.	Hanya mengisi password dan mengosongkan username dan menekan tombol login	Username : (kosong) password : 333 (benar)	Sistem akan menolak dan menampilkan pesan "harap isi bidang ini"	Berhasil	Valid
4.	Menginput dengan satu data salah dab satu benar	Username : andre password : 12345	Sistem akan menolak dan menampilkan pesan " harap isi bidang ini"		
5.	Menginput data login dengan semuanya benar	Username : andre (benar) password : 333 (benar)	Setelah login berhasil, sistem akan mengarahkan pengguna ke halaman yang sesuai dengan peran masing-masing, seperti admin, guru, atau siswa.	Berhasil	Valid

Student Login Testing

Tabel 3. Student Login Testing

No.	Skenario Pengujian	Test Case	Hasil Yang Diharapkan	Hasil Pengujian	Kesimpulan
1.	Tidak mengisi data apa pun ke dalam kolom login dan langsung menekan tombol login	Username: (tidak diisi), password: (tidak diisi)	Sistem tidak akan memproses dan akan memberikan peringatan berupa pesan "harap isi bidang ini"	Berhasil	Valid
2.	Mengisi bagian username saja dan membiarkan kolom password kosong kemudian menekan login	Username yasmina (benar), password : (kosong)	Sistem akan menolak dan menampilkan pesan "harap isi bidang ini"	Berhasil	Valid
3.	Hanya mengisi password dan mengosongkan data username dan menekan tombol login	Username: (kosong) password :12345(benar)	Sistem akan menolak dan menampilkan pesan "harap isi bidang ini"	Berhasil	Valid
4.	Menginput dengan satu data salah dan satu data benar	Username : yasmina (benar) password : 54321	Sistem akan menolak dan menampilkan pesan "harap isi bidang ini"	Berhasil	Valid
5.	Menginput data login dengan benar	Username: yasmina password :12345	Sistem menerima akses login dan menampilkan halaman sesuai hak akses siswa		

CONCLUSION

Based on the analysis and design of the Web-Based Student Grade Management Information System at SMP IP YAKIN, West Jakarta, several key conclusions can be drawn as follows:

1) This web-based information system can be accessed by three user categories: administrators, teachers, and students. Each user is granted distinct access privileges aligned with their specific roles and responsibilities within the system.
2) The system is expected to facilitate teachers in entering student grades and retrieving information related to student learning outcomes.
3) The system also provides convenience for parents in monitoring their children's academic progress, specifically regarding assessment.
4) It can save time in recording student grades, thereby making the process of disseminating information more efficient.

The development of this web-based grade management information system still has areas for improvement. Further development is necessary to enhance the system's effectiveness. The following recommendations are proposed:

1) The system requires an expansion of the information it contains. This should include detailed records of daily quiz scores, teacher comments on students, and documentation of achieved improvements or accolades.
2) There is a need to increase the volume of data, particularly concerning teacher records, student profiles, and grade entries. Furthermore, it is advisable to add profile photographs for both student and teacher records.
3) The implementation of newer information technologies, especially concerning data security, is necessary to enhance the overall security posture of the system.
4) A dedicated data backup system is essential, as the increasing volume of data may otherwise slow down system performance.

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