



Web-Based Student Academic Information System

Hafidz Akbar Agro Pratama¹, Ahmad Chamsudin²

¹Informatics Engineering Education, Indonesia

²Muhammadiyah University of Surakarta, Indonesia

*Corresponding Author: Hafidz Akbar Agro Pratama

E-mail: a710190030@student.ums.ac.id



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Abstract

This research is aimed at designing and building a web-based academic information system for students in order to overcome data-management practices that are still carried out manually or through several disconnected applications. Such practices tend to trigger duplicated records, delayed grade reporting, limited access for students and parents, and report recaps that are slow and prone to error. These issues, in turn, lower the working efficiency of administrative staff and teachers who handle student data, grades, class schedules, and attendance, while also limiting the transparency of academic information for the parties involved. The system was developed following a waterfall approach consisting of requirements analysis, design through UML diagrams (use case, activity, and class diagrams), implementation using JavaScript and a MySQL database, and evaluation through black-box testing. Data were gathered by means of observation, interviews, and a review of relevant literature on the research object. Findings show that the resulting information system successfully offers features for managing student records, entering and processing grades, scheduling, recording attendance, and generating academic reports that students, teachers, and parents can reach online. The media-expert validation test returned a very favorable rating. Overall, the system helps streamline academic data management, speed up the delivery of information, and broaden transparency and accessibility of academic information for every stakeholder involved.

Introduction

Educational institutions are increasingly required to manage academic information accurately, efficiently, and transparently as digital transformation reshapes educational administration (George & Wooden, 2023; Dhameria et al., 2025; Coronel & Trigos, 2026; Belya & Hoi, 2025; Alzahrani et al., 2021). Student academic records, particularly grades, attendance, learning progress, and academic reports, represent important information for teachers, school administrators, students, parents, and school leaders (Oyedokun et al., 2021; Secreto et al., 2025; Sun et al., 2016). Contemporary student information systems are no longer limited to storing administrative records but increasingly support real-time access, reporting, monitoring, and evidence-based decision-making (Sharma et al., 2025; Kamal et al., 2026; Munandar, 2025).

The growing integration of digital technologies into education has consequently positioned information management as an important component of effective school governance. Digitalization can also reduce routine administrative workloads and provide stakeholders with faster access to relevant educational information (Harini et al., 2024; Solahudin et al., 2025; Fadholi et al., 2025; Tambingon, 2025; Munadi, 2026).

Despite the increasing adoption of digital technologies in education, academic data management in some educational institutions remains dependent on conventional procedures (Yidana & Akuna, 2022; Kustitskaya et al., 2023; Singun, 2025). Manual recording through notebooks, paper archives, spreadsheets, or separate applications can make academic data processing less efficient and increase the possibility of data loss, duplication, and delayed access to information. Nelfira et al. (2021), for example, found that student grades and other school data were still managed using simple applications and paper-based archives, making information vulnerable to damage or loss and slowing information dissemination. Similar conditions were identified by Fatman et al. (2023), who reported that academic data management using large record books resulted in slow processing and accumulated administrative data. These conditions demonstrate that fragmented academic data management can create additional administrative workloads, particularly when information must be repeatedly recorded, transferred, and recapitulated before it can be used by other stakeholders.

The challenges associated with conventional academic administration are also evident in school-level information management (Iwogbe et al., 2025; Widyasari et al., 2025; Sudrajat et al., 2024; Farrell, 2015). Academic records generally contain various types of information, including student profiles, teacher data, grades, attendance, schedules, and academic reports. When these data are managed separately, the process of updating and retrieving information becomes less efficient. Manuhutu (2021) demonstrated the relevance of a web-based academic information system in a junior high school context by developing a system that integrated learning materials, assignments, and student assessment information. Similarly, Yulianti et al. (2022) developed a web-based academic information system for SD Muhammadiyah 3 Ciledug to manage student, teacher, classroom, and scheduling information. These studies indicate that the transition from conventional administrative procedures to integrated information systems can provide a more structured approach to managing school academic information.

This situation is relevant to the academic administration at SMK Negeri 1 Magelang, where student grade processing has not yet been fully computerized. The existing procedure begins with the collection of grade files from individual subject teachers, followed by manual recording in grade books and subsequent transfer of the information into report cards. Although this procedure can produce the required academic reports, it involves repetitive data entry and creates opportunities for inconsistencies or human error. The separation between teachers who generate assessment data and administrative personnel who process the information can also increase the time required to compile academic records (Marsh & Farrell, 2015; Cheng, 2018; Ahmad et al., 2022). Comparable problems have been addressed through the development of web-based academic systems in other educational institutions. Fatman et al. (2023) developed a website-based academic information system to overcome slow manual academic data processing, while Yaqin and Handayani (2023) developed a mobile and web-based system in response to difficulties experienced by parents in monitoring student grades and the continued use of manual Excel-based report-card processing. These findings provide a relevant basis for considering a similar technological solution at SMK Negeri 1 Magelang.

A web-based academic information system offers a practical approach to addressing these limitations by integrating academic data within a centralized database. Such systems enable authorized users to input, store, retrieve, update, and report student information through an integrated platform. Makkaraka et al. (2024) specifically designed a web-based student academic information system to address inefficiencies and errors associated with manual academic data management. Their system incorporated different user roles, including administrators, teachers, students, and homeroom teachers, allowing each user to access functions according to their responsibilities. The study also reported that users perceived the

system as effective because of its ease of use, real-time access to data, and streamlined academic workflows. Similar benefits were demonstrated by Manuhutu (2021), Makkaraka et al. (2024), Makruf et al. (2022), Aeiad & Meziane (2019), Yakubu & Dasuki, (2018) whose web-based academic information system was designed to support the management of learning materials, assignments, and student assessments. These findings suggest that centralized web-based systems can improve the organization and accessibility of academic information.

The value of such a system extends beyond administrative efficiency because academic information is also important for communication between schools, students, and parents. Yaqin and Handayani (2023) identified parental difficulty in continuously monitoring student grades as one of the problems addressed through their mobile and web-based academic information system. By providing digital access to academic records, such systems can make student performance information available more conveniently and reduce dependence on periodic report-card distribution. Makkaraka et al. (2024) similarly emphasized that web-based academic systems can enable students, teachers, and parents to access and monitor academic information more efficiently, supporting communication and decision-making. Therefore, the development of an academic information system should consider not only the technical capability of storing and processing data but also accessibility and the information requirements of different users.

Based on these considerations, the development of a web-based student academic information system at SMK Negeri 1 Magelang is important for transforming the existing manual grade-processing procedure into a more integrated, efficient, and accessible process. The proposed system is expected to facilitate teacher grade input, centralized academic data management, report generation, and access to student academic information for authorized users. By integrating these functions into a single platform, the system is expected to reduce repetitive administrative work, minimize potential recording errors, accelerate academic reporting, and improve the availability of academic information for students, parents, teachers, and school management. This study therefore focuses on the design and development of a Web-Based Student Academic Information System at SMK N 1 Magelang as a technological solution for strengthening the efficiency, accuracy, accessibility, and transparency of academic data management.

Methods

This study employed a software development method based on the waterfall model within the System Development Life Cycle (SDLC). The waterfall model organizes the development process sequentially through communication, planning, modeling, construction, and deployment. However, the deployment stage was not implemented in this study because the developed system had not yet been used routinely at the school. Therefore, the development process was limited to requirements identification, system planning and design, construction, and evaluation.

The initial stage involved collecting data through direct observation and an interview with the Vice Principal for Curriculum at SMK Negeri 1 Magelang. These activities were conducted to identify the problems associated with the existing manual academic data management process and determine the system requirements. The identified requirements covered the management of student and teacher data, classes, subjects, lesson schedules, attendance, grades, teaching journals, assignments, announcements, and academic reports. The requirements were then organized according to four user roles: administrator, teacher, student, and parent. The waterfall development stages applied in this study are presented in Figure 1.

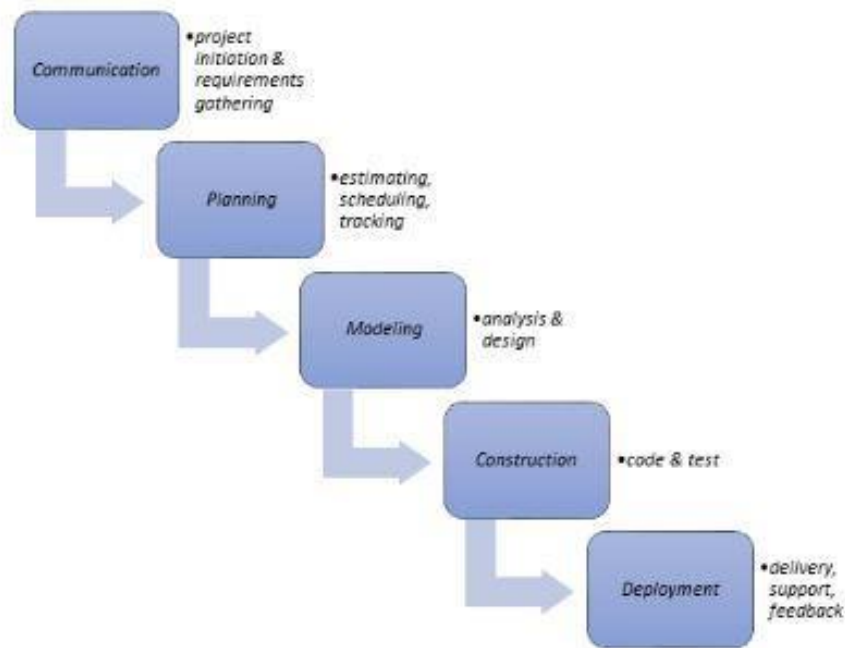


Figure 1. Waterfall Diagram

The system design stage used wireframes and Unified Modeling Language (UML) diagrams. Use case diagrams were used to describe the interactions between administrators, teachers, students, and parents and the functions available to each user. Activity diagrams were used to illustrate system processes, including login, grade entry, and attendance recapitulation. Meanwhile, class diagrams were used to represent the structure and relationships of database entities, including students, teachers, classes, subjects, schedules, grades, and attendance. Wireframes were also created for the login page and the administrator, teacher, student, and parent dashboards before the system was developed.

During the construction stage, the system design was implemented as a web-based Student Academic Information System. The front end was developed using React 19 with Vite, while Tailwind CSS was used for interface styling. Supabase, which uses PostgreSQL, was used to provide database, authentication, Row Level Security, and file-storage functions. The Fonte API was integrated to support the delivery of automatic WhatsApp attendance notifications. The application was hosted through Vercel, which supports continuous deployment from the GitHub repository.

The completed system was evaluated through black-box testing, media-expert validation, and user usability testing. Black-box testing involved 37 users and covered 23 scenarios related to the system's main functions, including login, logout, and the display, addition, editing, or deletion of relevant academic data. Each test result was compared with its expected output and classified as successful or unsuccessful.

Media feasibility validation was conducted by two lecturers from the Informatics Engineering Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta. The assessment covered 12 aspects of system appearance and interaction, including layout, color and typography, icons, navigation, interactive elements, design consistency, search functions, dashboard summaries, input forms, color contrast, and error-message clarity. Each aspect was assessed using a four-point scale ranging from 1 (Poor) to 4 (Very Good). The scores were converted into percentages and interpreted using five

categories: Not Feasible (1–20%), Less Feasible (21–40%), Sufficient (41–60%), Feasible (61–80%), and Very Feasible (81–100%).

Usability testing was conducted with 37 respondents using the System Usability Scale (SUS). The respondents represented the intended system users, including teachers, administrative personnel, and students. Each statement was assessed using a five-point response scale. The final SUS score for each respondent was calculated according to the SUS scoring procedure. The scores of all respondents were subsequently averaged and interpreted using the SUS grade classification presented in the Results section.

Results and Discussion

The web-based Student Academic Information System is an integrated application designed to manage student academic data efficiently, transparently, and in real time. Built using modern web technologies like HTML, CSS, JavaScript (React/Vue.js), and the Supabase database, the system is accessible through browsers on various devices, including desktops, tablets, and smartphones.

This system was developed due to the manual nature of academic management at SMK Negeri 1 Magelang, particularly in the use of Excel for grade recording. This poses a risk of data loss and burdens teachers due to the large number of worksheets they must manage. The web-based is expected to assist teachers, students, parents, and the school in monitoring student academic progress while minimizing the risk of data loss.

In general, the system is divided into three main dashboards: the admin dashboard (managing user data, classes, schedules, and announcements), the teacher dashboard (attendance, grade input, teaching journals, and assignment assignments), and the student and parent dashboard (semester grade reports, attendance, and assignment submission). The development process was also tested directly by the school to ensure that the menu provided truly met real needs in the field.

Explain the results of the research in the form of problem-solving analyzed using relevant theories. The results of the study also revealed the findings of the research. Discussion is accompanied by logical arguments by linking the results of research with theory, the results of other studies.

Needs Analysis

This stage is the initial step in accordance with the research methodology, namely identifying system requirements through interviews with the Vice Principal of Curriculum at SMK Negeri 1 Magelang and direct observation. The analysis revealed two main findings: (1) grade recapitulation was still done conventionally using Excel; and (2) the large number of manual worksheets made teacher performance less effective. These two findings served as the basis for designing SIAS features in the next stage.

Based on the needs analysis results, the system's functional requirements were formulated, divided into four user roles. Admins require student and teacher data management features (including bulk imports via Excel), class and subject management, class schedule management with automatic clash detection, and school announcement management. Teachers require digital attendance features integrated with WhatsApp, multi-component grade input (assignments, mid-term exams, and final exams), teaching journals, and assignment assignments with file attachments. Meanwhile, students and parents require real-time access to semester grade recaps, attendance history in an interactive calendar display, daily lesson schedules, and notifications of outstanding assignments. All user roles also require a role-based authentication mechanism (role-based access control) so that each user can only access the

menu according to their respective rights (Hamza et al., 2018; Keshireddy, 2021; Uddin et al., 2019).

Wireframe Design

In line with the design phase of the research method, a wireframe was prepared as an initial framework for the system layout before entering the development phase. The wireframe serves as an initial overview of the product to be built, including the placement of image and text elements, thus simplifying the process of creating the product that the researcher has planned. The wireframe was designed for four main views: the login page, admin dashboard, teacher dashboard, and student and parent dashboards, with menu placement tailored to the needs of each user role.

Table 1. System Wireframe Design

No	Design	Information
1	Login view	The home page contains a logo, ID column, and password column to enter each user's dashboard.
2	Admin dashboard	Home menu, student data, teacher data, classes, subjects, lesson schedules, and announcements.
3	Teacher dashboard	Home menu, teaching schedule, grade input, student absence, teaching journal, assignments/assessments, and announcements.
4	Student & parent dashboard	Home menu, class schedule, grades, attendance recap, assignments, and announcements.

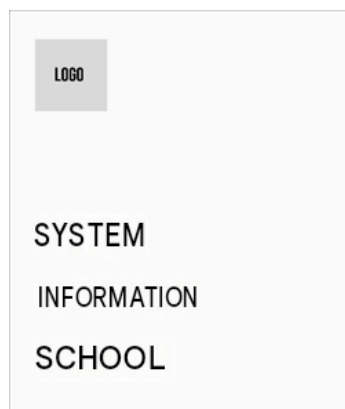


Figure 2. Login Page Wireframe

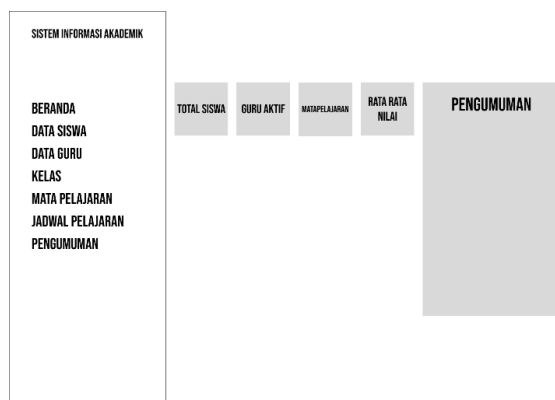


Figure 3. Admin Dashboard Wireframe

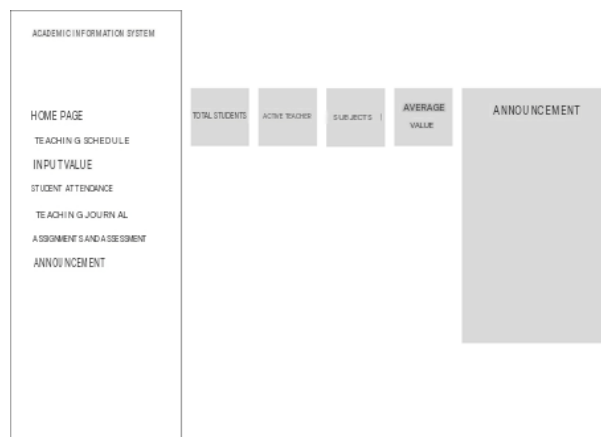


Figure 4. Teacher Dashboard Wireframe

Development

The development phase is the process of transforming the wireframe into a fully functional system, aligning with the development phase of the research methodology. The implementation includes a login page and three dashboards for user roles: admin, teacher, and student/parent. These dashboards are built using JavaScript on the front-end and Supabase as the server-side database.

Login Page

On the login page, users are asked to enter their ID and password. The system then verifies these credentials and directs users to the dashboard appropriate to their respective role (admin, teacher, or student/parent). This mechanism ensures that each user can only access menus relevant to their role, as shown in Figure 5.

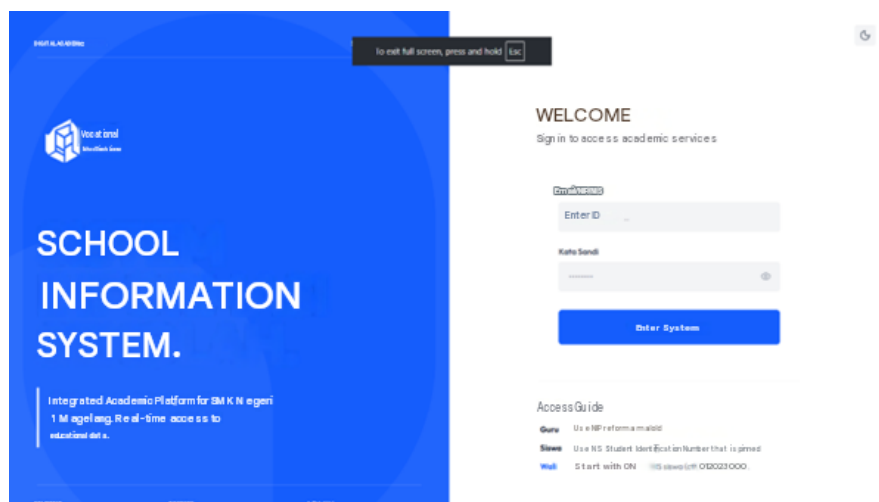


Figure 5. Login page

Admin Dashboard

The admin dashboard displays a home menu with a summary of total students, active teachers, subjects, average grades, and attendance. Admins can also manage student and teacher data, classes, subjects, lesson schedules, print documents (letter templates), and create announcements. Data can be added to all menus either manually or through Excel import, accelerating large data input processes, as shown in Figure 6.

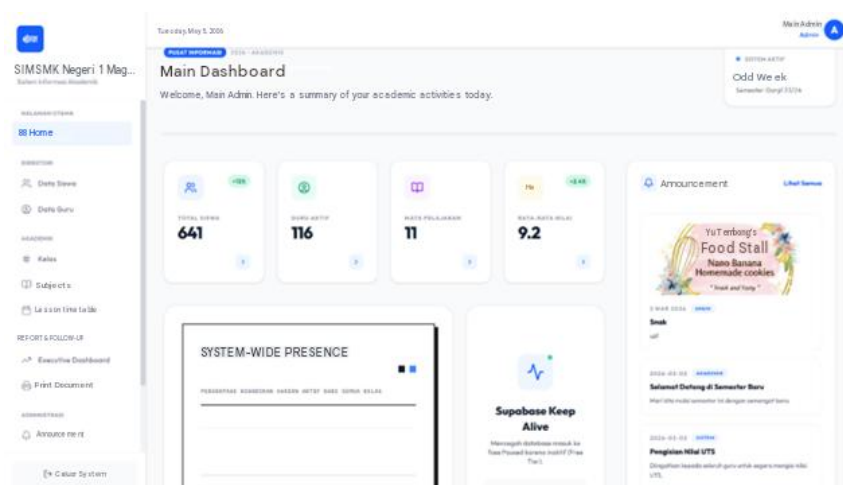


Figure 6. Admin Dashboard

Teacher Dashboard

The teacher dashboard features a homepage that summarizes the number of classes taught, the number of active students, the number of assignments issued, and the overall attendance percentage. This information is presented in a summary card that is immediately visible when teachers first open the system, allowing them to quickly obtain an overview of their class activity.

Additionally, teachers can access the teaching schedule, grade input, student absences, teaching journals, and announcements. The attendance system is developed in real-time, allowing daily attendance records to be accessed in real time and notifications to be easily monitored. This allows all teaching and learning activities to be digitally documented, as shown in Figure 7.

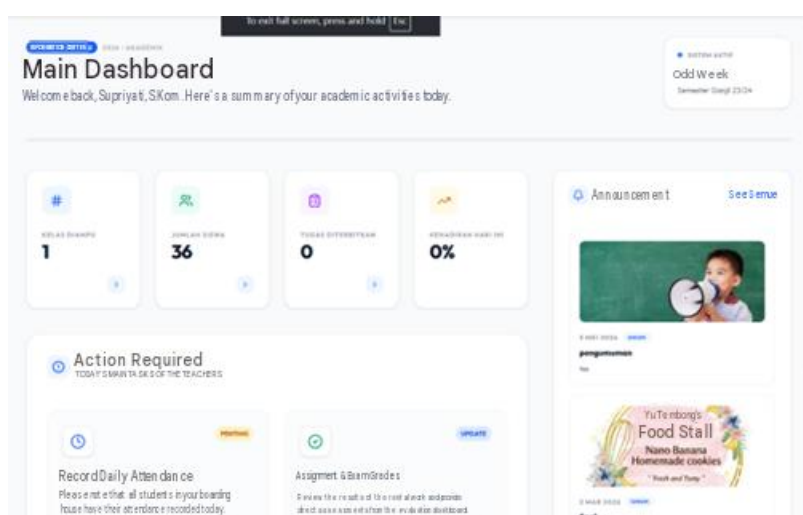


Figure 7. Teacher dashboard

Student and Parent Dashboard

The student and parent dashboard displays a home menu containing a summary of current lessons, average grades, number of subjects, attendance percentage, and assignments. Through this dashboard, students and parents can independently monitor semester grades, class schedules, attendance summaries, assignments, and school announcements, allowing students to track their academic progress in real time without having to wait for printed reports, Figure 8.

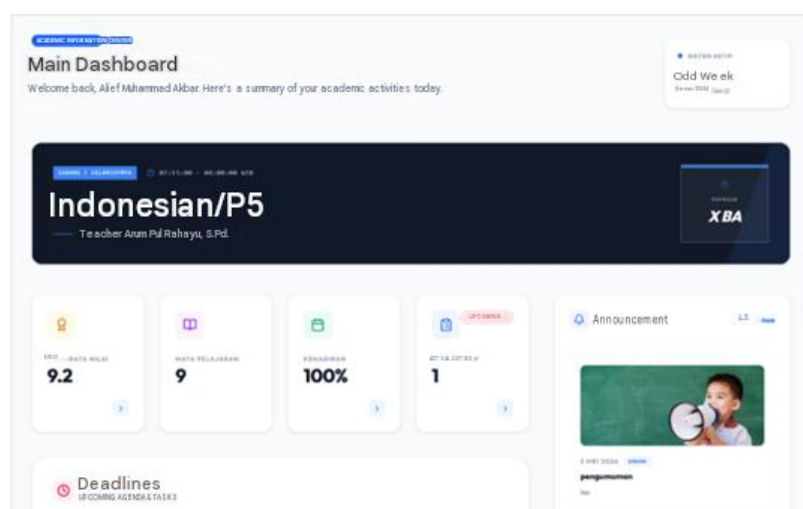


Figure 8. Student & Parent Dashboard

System Test Results

The testing stage is carried out to measure the level of system feasibility in accordance with the evaluation stage in the research method, which includes three types of testing, namely black box testing, media expert validation, and user acceptance testing using the System Usability Scale (SUS) instrument.

Black Box Testing Results

Black box testing involved 37 users of SMK Negeri 1 Magelang to test the system's main functions, including users, researchers, and practitioners. This testing included 23 scenarios covering login, logout, and management (displaying, adding, editing, and deleting) of student, teacher, class, subject, class schedule, grades, attendance recap, and announcement data. A summary of the test results is presented in Table 2.

Table 2. Black Box test results

No	Tested Needs	Test Scenario	Which are expected	Results
1	User Login	Login with correct username and password	Enter the dashboard according to your role	Succeed
2	User Log Out	Click the exit button	Exit the system, return to the login page	Succeed
3	Student Data	Display, add, edit, delete student data	Data is displayed/saved/updated/deleted according to input	Succeed
4	Teacher Data	Display, add, edit, delete teacher data	Data is displayed/saved/updated/deleted according to input	Succeed
5	Class	Display, add, edit, delete class data	Data is displayed/saved/updated/deleted according to input	Succeed
6	Subjects	View, add, edit, delete subjects	Data is displayed/saved/updated/deleted according to input	Succeed
7	Lesson timetable	View, add, edit class schedule	Data is displayed/saved/updated according to input	Succeed
8	Grades, Attendance and Announcements	Displays the value menu, attendance recap, announcements	The menu appears according to its function	Succeed

Based on black box testing involving 37 users, all test items were successfully executed with a 100% success rate. This finding indicates that the system developed by the researchers performed well, and all tested functions functioned as expected, with no failures found in any test scenarios.

Results of Media Expert Feasibility Validation Test

This stage is a functional testing of the web-based academic information system conducted by media experts, namely lecturers of the Informatics Engineering Education Study Program, Faculty of Teacher Training and Education, Muhammadiyah University of Surakarta. The assessment covers 12 aspects of system appearance and interaction, including layout, color and typography, use of icons, menu navigation, interactive elements, design consistency, search

features, dashboard summary, input form, color contrast, and clarity of error messages, with a rating scale range of 1 (Poor) to 4 (Very Good).

Table 3. Results of Media Expert Feasibility Validation Test

Validator	Score Obtained	Maximum Score	Eligibility Percentage
Media Expert 1	45	48	93,75%
Media Expert 2	40	48	83,33%

The feasibility percentage was calculated using the feasibility formula = (obtained score / total score) x 100%, referring to the formula used. The average feasibility percentage from the two media experts was recorded at 88.54%. Referring to the feasibility interpretation criteria (1-20% Not Feasible, 21-40% Less Feasible, 41-60% Sufficient, 61-80% Feasible, 81-100% Very Feasible), the score is included in the "Very Feasible" category, which indicates that the system's appearance and interaction have met the media feasibility standards for implementation in the school environment.

User Test Results

User testing was conducted on 37 respondents using the System Usability Scale (SUS) to determine the website's level of usability. Each statement was scored on a scale of 1 to 5, as shown in Table 4.

Table 4. SUS Grading Scale

Question Type	Score	Brief Description
Very difficult	1	Quality/indicator rated as Very Difficult
Difficult	2	Quality/indicator rated as Difficult
Neutral	3	Quality/indicator rated as Neutral
Easy	4	Quality/indicator rated as Easy
Very Easy	5	Quality/indicator rated as Very Easy

The calculation of the SUS score follows the provisions proposed by Komang Adyanata et al., where each statement has a contribution score between 1 and 5. The average SUS score is calculated using the formula $x = (\sum x) / n$, with $\sum x$ as the total SUS score of all respondents and n as the number of respondents. The recapitulation of the total final scores of the 37 respondents is presented in Table 5.

Table 5. Recapitulation of Final SUS Scores For 37 Respondents

Respondents	Total Score	Final Score	Respondents	Total Score	Final Score
R1	32	80	R20	31	77,5
R2	31	77,5	R21	28	70
R3	30	75	R22	26	65
R4	31	77,5	R23	34	85
R5	30	75	R24	35	87,5
R6	30	75	R25	24	60
R7	31	77,5	R26	35	87,5
R8	25	62,5	R27	27	67,5
R9	39	97,5	R28	30	75
R10	36	90	R29	31	77,5
R11	30	75	R30	20	50
R12	32	80	R31	34	85

R13	30	75	R32	30	75
R14	40	100	R33	21	52,5
R15	37	92,5	R34	22	55
R16	33	82,5	R35	37	92,5
R17	24	60	R36	38	95
R18	34	85	R37	30	75
R19	38	95	Total		2865

The total SUS score of the 37 respondents was 2,865, resulting in an average of:

$$x = 2,865 / 37 = 77.43$$

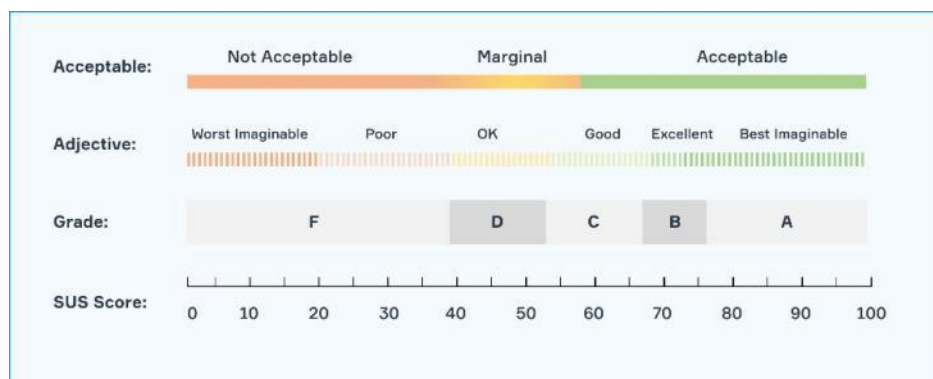


Figure 9. SUS Final Score Graph

The average score of 77.43 is classified as grade B according to the SUS standard interpretation, indicating that the system is deemed to have a good level of usability by users and is suitable for implementation to support academic activities in schools. Compared with similar studies, this achievement is competitive. Research by Atmajawich evaluated a web-based academic information system in a higher education environment, obtained an average SUS score of 72.5 (Grade C), while research by Santoso and Nurhasanah on a vocational high school academic information system produced a SUS score of 74.8. The SIAS score in this study, 77.43, is higher than both of these studies, indicating that the developed system interface is easier to learn and use, especially by vocational high school teachers and students with diverse digital literacy backgrounds. This superiority is thought to stem from the implementation of an intuitive glassmorphism-based interface design and menu navigation structured based on user roles.

The findings indicate that the developed Student Academic Information System addresses not only a technical problem but also the fragmentation of academic administration at SMK Negeri 1 Magelang. The integration of grades, attendance, schedules, assignments, and announcements into one platform reduces repeated data entry and establishes a single source of academic information. Nelfira et al. (2021) similarly found that dependence on simple applications and paper archives increased the risk of data loss and slowed information retrieval. However, the present system extends their contribution by integrating academic processes according to user roles rather than merely digitizing individual records. Manuhutu (2021) demonstrated that web-based systems can organize learning materials, assignments, and assessment data more effectively. The present findings reinforce this conclusion while showing that integration can also cover administrative and monitoring functions required by teachers, students, parents, and administrators. Yulianti et al. (2022) further showed that the waterfall model is suitable for school information systems when user requirements can be identified clearly at the beginning of development. In this study, the alignment between the needs analysis

and the resulting dashboards confirms the importance of defining school workflows before system construction.

The role-based dashboard is an important contribution because it transforms the same academic data into information appropriate to each stakeholder. Administrators require institutional control over users, schedules, and announcements, whereas teachers require operational functions for attendance, grades, journals, and assignments. Students and parents require simpler access to academic progress. Makkaraka et al. (2024) found that separating system functions according to administrators, teachers, students, and homeroom teachers improved the efficiency and accessibility of academic information. The current findings support that conclusion and expand it by incorporating parental access and WhatsApp attendance notifications. Kustitskaya et al. (2023) argued that educational databases should be structured around interconnected entities so that institutional decisions are based on consistent data. The use of related student, teacher, class, subject, schedule, grade, and attendance entities in the present system provides such a foundation. Therefore, the system's value lies not only in storing data but also in maintaining relationships among academic records that were previously managed through separate worksheets.

The provision of real-time academic information also has implications for transparency and school decision-making. Secreto et al. (2025) explained that real-time student-progress monitoring enables administrators to identify academic conditions more quickly and make decisions based on current information. In the present study, summary dashboards and continuously accessible academic records create a similar monitoring mechanism at the vocational-school level. Munandar (2025) emphasized that the integration of technology and governance is essential for developing a smart-school ecosystem because isolated applications cannot support coordinated decision-making. The current system responds to this concern by centralizing academic and administrative functions within one platform. Sudrajat et al. (2024) also reported that academic management information systems improve access to learning and administrative information. Nevertheless, the present findings suggest that transparency depends on differentiated access: stakeholders should receive relevant information without being given unrestricted access to the entire database.

The successful execution of all black-box testing scenarios demonstrates that the implemented functions were consistent with the specified requirements. This result is particularly important because the system contains interconnected operations; errors in student, class, schedule, attendance, or grade data could affect other functions. Fatman et al. (2023) found that waterfall-based academic system development can reduce problems arising from slow and accumulated manual data processing when functional requirements are translated systematically into system modules. The present study supports this finding because the tested functions correspond directly to the problems identified during the initial observation and interview. Harini et al. (2024) further argued that digital transformation improves educational management efficiency when technology is integrated with actual administrative processes. Thus, the functional success obtained in this study should be understood as evidence of alignment between the system and the defined workflow, rather than as proof of long-term operational effectiveness.

The media-expert validation result indicates that the interface and interaction design were considered highly feasible. This finding is relevant because a technically functional system may still fail when navigation, forms, icons, typography, or error messages are difficult to understand. George and Wooden (2023) emphasized that successful digital transformation in educational institutions requires organizational systems that users can understand and incorporate into routine activities. The expert assessment in the present study suggests that the interface provides an adequate basis for such adoption. Ahmad et al. (2022) similarly explained

that educational technologies should support administrative work without creating additional complexity for teachers and staff. The role-based menu structure appears to address this requirement by limiting each dashboard to functions associated with the responsibilities of its users. Nevertheless, expert validation primarily establishes design feasibility; it does not fully represent user performance during prolonged use.

The mean SUS score of 77.43, classified as Grade B, indicates that the system achieved a good level of perceived usability. This result suggests that users could understand the navigation and perform the available academic tasks without excessive difficulty. Alzahrani et al. (2021) argued that institutional readiness for digital transformation depends partly on whether users perceive new systems as manageable and compatible with existing work practices. The positive usability result therefore provides initial evidence that the system can be accepted within the school environment. Singun (2025), however, identified user resistance, limited digital competence, inadequate infrastructure, and weak organizational support as persistent barriers to digital transformation in educational institutions. Consequently, the SUS result should not be interpreted as guaranteeing sustained adoption because usability is only one component of implementation readiness. Solahudin et al. (2025) also reported that digital school-management systems improve administrative efficiency when their implementation is supported by staff competence and institutional commitment. Training, technical assistance, and routine monitoring therefore remain necessary even when the initial usability score is favorable.

The use of cloud-based data storage, role-based authentication, and Row Level Security strengthens accessibility while controlling access to academic information. Yidana and Akuna (2022) noted that academic-record management is often weakened by fragmented storage, inconsistent procedures, and insufficient protection of institutional records. Centralized cloud storage can reduce these problems by ensuring that authorized users access the same updated data. Iwogbe et al. (2025) likewise emphasized that Educational Management Information Systems should support reliable data collection and administration, but warned that sustainability depends on infrastructure, human capacity, and data governance. Accordingly, the technical architecture used in the present system provides a useful foundation, although the school must still establish procedures for account management, data backup, privacy protection, and system maintenance.

The study demonstrates that a web-based academic information system can convert fragmented academic procedures into an integrated and role-based workflow. Its main contribution is the combination of centralized academic data, differentiated stakeholder access, real-time monitoring, and usability-oriented interface design within a vocational-school context. Nevertheless, the evaluation was conducted before routine deployment and mainly assessed functional correctness, media feasibility, and perceived usability. The findings therefore cannot yet establish long-term effectiveness, system reliability under sustained workloads, actual reductions in administrative time, or improvements in student academic outcomes. Future evaluation should examine system use after implementation, compare administrative performance before and after adoption, assess data security and service reliability, and explore the experiences of teachers, students, parents, and administrators over a longer period.

Conclusion

Based on the design, implementation, and testing phases, it can be concluded that the web-based Student Academic Information System at SMK Negeri 1 Magelang was successfully developed and effectively implemented. The system has proven capable of digitizing academic data management processes ranging from well-organized, conflict-free scheduling and structured multi-semester grade recaps to an integrated digital attendance system. Black-box

testing demonstrated a 100% success rate across all key feature scenarios, with no functional errors detected. In the feasibility test conducted by media experts, the system achieved an average score of 88.54%, placing it in the "Highly Feasible" category. Furthermore, user acceptance testing using the System Usability Scale (SUS) questionnaire with 37 respondents yielded an average score of 77.43, corresponding to a "Grade B" classification. These results demonstrate that the developed information system is user-friendly, features an interface well-received by users, and contributes significantly to accelerating information delivery and enhancing academic transparency.

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