
DESIGN OF A WEB-BASED ACADEMIC INFORMATION SYSTEM USING THE WATERFALL METHOD AT THE GAJAH MADA FOUNDATION ELEMENTARY SCHOOL

Rita Tetilina Zebua¹, Mhd. Dicky Syahputra Lubis², Puji Chairu Sabila³, Siti Agus Kartini⁴,
Taufik Ismail Simanjuntak⁵

¹²³⁴⁵ Program Studi Sistem Informasi, Fakultas Sains dan Teknologi, Universitas Tjut Nyak Dhien,
Medan, Indonesia.

Correspondence Email: tetyrita123@gmail.com

ABSTRACT

This research was motivated by issues regarding academic data management at the Gajah Mada Educational Foundation Elementary School, where processes were still handled manually using ledgers. Consequently, the recording and retrieval of data concerning teachers, students, subjects, classes, and grades were inefficient and prone to errors. The study aimed to design and develop a web-based academic information system to assist the school in managing academic data more effectively and in an integrated manner. The Waterfall system development method was employed, comprising the stages of analysis, design, implementation, testing, and maintenance. The research resulted in a web-based academic information system featuring access rights for administrative staff, teachers/homeroom teachers, students, and the school principal. The system enables the management of data regarding users, subjects, teachers, classes, students, and grades, while also generating reports on teachers, students, and grades that can be printed or downloaded in PDF format. Testing was conducted to verify functions such as logging in, adding, modifying, deleting, displaying, and searching for data, as well as generating reports. The test results demonstrated that all functions operated as expected. Thus, the developed system can help improve the effectiveness of academic information management and presentation at the Gajah Mada Educational Foundation Elementary School.

Keywords: Academic Information System; Website; Waterfall; PHP; MySQL

Submitted: 08 August 2026	Accepted: 05 September 2026	Published: 25 September 2026
---------------------------	-----------------------------	------------------------------

INTRODUCTION

An information system is an academic system designed to manage academic data using computer technology, thereby transforming academic activities into useful information (Ilminur, 2024). The utilization of an academic information system is crucial for schools, as it supports the structured management and presentation of information. The Yayasan Perguruan Gajah Mada Elementary School currently faces several challenges in its academic management. The school lacks a dedicated website for academic information, resulting in inconsistent dissemination of information and announcements to students. Furthermore, the management of data regarding teachers, students, and grades relies on physical ledgers accessible only to the administration staff. This situation renders data retrieval and collection inefficient, while reports received by the school principal lack completeness and accuracy, as data must be gathered from various documents before being compiled.

These issues highlight the need for a system capable of integrating academic data management and presenting information through a unified web-based platform. A web-based system enables data entry and storage in a database, with information subsequently displayed on the website based on user access rights. Consequently, the management of teacher, student, and grade data becomes faster, while report generation becomes more effective and accurate.

Previous studies indicate that web-based academic information systems can help resolve challenges associated with academic information management. Ketaren and Asiking (2024) demonstrated that such systems can facilitate the management of academic activities and streamline interactions between students and teachers. Pohan, Widiana, Ketaren, and Firdaus (2024) developed a web-based academic information system using the Prototyping method, providing information on school profiles, teachers, students, subjects, classes, grades, schedules, announcements, report cards, and attendance. Similarly, Ainun, Yahya, and Amiruddin (2024) developed a web-based school academic information system using a Prototyping approach, encompassing system development and evaluation stages. Meanwhile, Rasyiid, Yusuf, Maulana, and Putra (2024) applied the Waterfall method to a web-based academic system, demonstrating that the system could accelerate data processing and make report generation more effective and efficient due to the centralized storage of data in a database.

Based on these issues and prior research, it is necessary to design an academic information system tailored to the needs of the Gajah Mada Foundation Elementary School. The proposed system aims to support the management of data regarding users, subjects, teachers, classes, students, and grades, while facilitating the presentation of academic reports via a website. The system was developed using the Waterfall method, which involves a phased approach encompassing analysis, design, implementation, testing, and maintenance. The design phase utilized Unified Modeling Language (UML)—including use case, activity, and class diagrams—alongside database and user interface designs.

This research aims to design and build a web-based academic system for the Gajah Mada Foundation Elementary School. The system is intended to address inconsistencies in the dissemination of academic information, expedite the management of teacher, student, and grade data, provide information access for students and teachers, and simplify the process for the principal to view reports on students, teachers, and student grades.

RESEARCH METHODS

This study focuses on the design of a web-based academic information system for the Gajah Mada Foundation Elementary School. The scope of the research encompasses the management of data regarding users, subjects, teachers, classes, students, and grades, involving the following actors: the principal, administrative staff, teachers, homeroom teachers, and students. Data collection was conducted through a preliminary study of the existing system, interviews with relevant personnel, and the gathering of documents related to the school's academic activities. System development employed the Waterfall method, comprising the stages of analysis, design, implementation, testing, and maintenance. The design phase utilized the Unified Modeling Language (UML)—including use case diagrams, activity diagrams, and class diagrams—alongside database and interface designs. The system was built using the PHP programming language and a MySQL database, utilizing Visual Studio Code as the text editor and XAMPP as the development environment. Testing was performed by verifying the system's core functions: login, add, edit, delete, display, data search, and report

generation. The test results served to ensure that every system function operated in accordance with the design specifications.

RESULTS AND DISCUSSION

The research resulted in a web-based academic information system designed to assist with academic data management at the Gajah Mada Foundation Elementary School. The system supports various user roles specifically administrative staff, teachers/homeroom teachers, students, and the school principal each with corresponding access rights. System features include the management of data regarding users, subjects, teachers, classes, students, and grades, as well as the generation of academic reports.



Figure 1. Academic Information System Main Page

The main page serves as the initial interface of the web-based academic information system. It acts as the entry point for users to access information and log in to the system based on their specific access rights. The existence of this main page demonstrates that the designed system provides a web-based platform to facilitate the dissemination of the school's academic information.

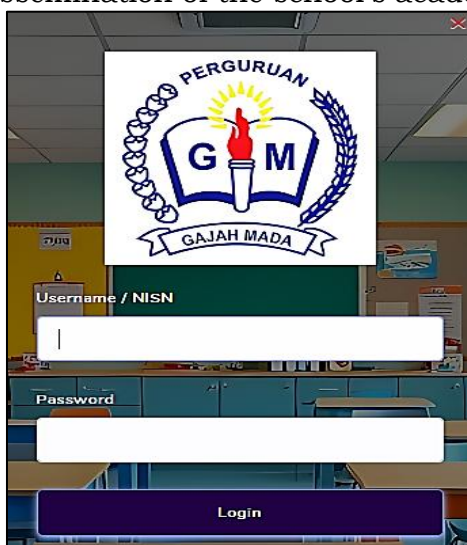


Figure 2. Login Page

The login page facilitates user authentication prior to system access. Users enter their username and password to log in according to their assigned roles. The login feature is a crucial component of the system, as different users administrative staff, teachers/homeroom teachers, students, and the school principal have distinct functions and access privileges.



Figure 3. Administrative Staff Dashboard

The administrative staff dashboard provides access to academic data management functions. Administrative staff can manage data regarding users, subjects, teachers, classes, and students. This interface illustrates the transition from manual data management (using ledgers) to a web-based system, allowing data to be managed centrally and stored within a database.

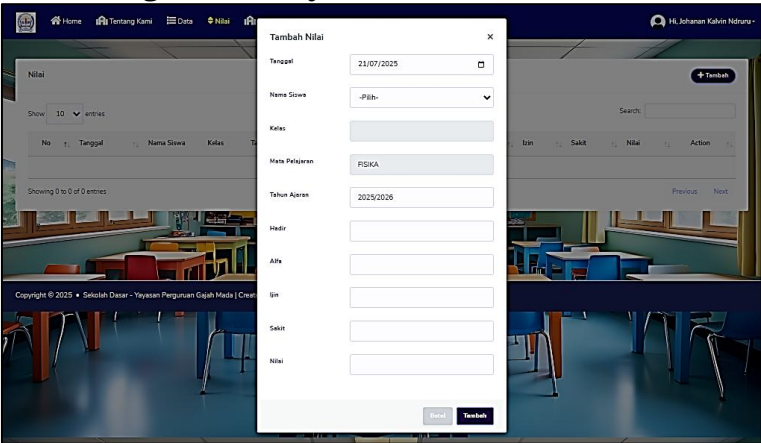


Figure 4. Grade Management Page

The grade management page allows teachers or homeroom teachers to input and manage student grades. Once entered, grade data is stored in the database and remains accessible according to user permissions. This feature structures the grading process and simplifies the task of recording student grades for teachers.



YAYASAN PERGURUAN GAJAH MADA
JL.BUNGA KENANGA NO.2 PD.BULAN KECAMATAN MEDAN SELAYANG,KOTA
MEDAN, SUMATERA UTARA

LAPORAN GURU

Mata Pelajaran : Bahasa Indonesia

No	Nama Guru	Jenis Kelamin	Tempat, Tanggal Lahir	Alamat	Mata Pelajaran
1	Sarah Taraigan Spd	Perempuan	Medan, 01 Jan 1970	Medan	Bahasa Indonesia

Medan, 18 Sep 2025
Kepala Sekolah

(Sugiatmi)

Figure 5. Teacher Data Report



YAYASAN PERGURUAN GAJAH MADA
JL.BUNGA KENANGA NO.2 PD.BULAN KECAMATAN MEDAN SELAYANG,KOTA
MEDAN, SUMATERA UTARA

LAPORAN SISWA

Kelas : 2

No	NISN	Nama Siswa	Jenis Kelamin	Tempat, Tanggal Lahir	Alamat	Kelas
1	216541	Andrew	Laki-laki	Medan, 01 Jan 1970	Medan	2
2	314259	Chelsya	Perempuan	Medan, 01 Jan 1970	Medan	2
3	342517	Hanna	Perempuan	Medan, 01 Jan 1970	Medan	2
4	653429	Otniel	Laki-laki	Medan, 01 Jan 1970	Medan	2
5	715342	Achile	Laki-laki	Medan, 01 Jan 1970	Medan	2

Medan, 18 Sep 2025
Kepala Sekolah

(Sugiatmi)

Figure 6. Student Report



YAYASAN PERGURUAN GAJAH MADA
JL.BUNGA KENANGA NO.2 PD.BULAN KECAMATAN MEDAN SELAYANG,KOTA
MEDAN, SUMATERA UTARA

LAPORAN GURU

Kelas : 1
Tahun Ajaran : 2025/2026
Mata Pelajaran : Mate-matika

No	NISN	Nama Siswa	Mata Pelajaran	Hadir	Alfa	Izin	Sakit	Nilai
1	546372	Firman	Mate-matika	67	19	15	14	79
2	324156	Natasyah Lia	Mate-matika	69	17	14	16	79
3	534279	Fajar	Mate-matika	71	19	16	12	80

Medan, 18 Sep 2025
Kepala Sekolah

(Sugiatmi)

Figure 7. Grades Report

The academic report page displays reports on teacher data, student data, and grades. The school principal can view available reports and either print or download them in PDF format. This feature addresses previous reporting challenges that required manual data collection and aggregation from various documents and ledgers.

System testing is conducted to determine whether the system operates according to user requirements. The testing is carried out using an independent testing approach. The functions to be tested include login, adding data, modifying data, deleting data, displaying data, searching for data, and generating reports.

Table 1. Self-testing

No	Test Name	Expected Results	Results
1	Login	Users can log in/log in to the website	Conform
2	Add data	Users can add data	Conform
3	Change data	Users can change the data	Conform
4	Clear data	Users can delete data	Conform
5	Display data	Users can view the data that has been stored in the database.	Conform
6	Search data	Users can search for data that has been stored in the database.	Conform
7	Appear report	Users can view reports that can be printed or downloaded in pdf format.	Conform

System Strengths and Weaknesses

The system has both strengths and weaknesses, resulting from various factors such as limited research time, human error, and so forth. The weaknesses of the developed system are as follows:

1. Parents do not have accounts separate from their children; consequently, they can only log in using their child's student ID number (NISN).
 2. There is currently no feature to add report card grades for each student on a per-semester basis.
- In addition to its weaknesses, the system offers several advantages regarding the management of school academic data:
1. The system facilitates the management of data concerning users, subjects, teachers, classes, and students.
 2. The school principal can view student information and grades via the web.
 3. Teachers can input student grades, including those for assignments, daily assessments, and final exams (UAS).
 4. Students can log in and view their grade data.

CONCLUSIONS

Gajah Mada Foundation Elementary School provides an integrated platform for managing academic data and supporting school administrative activities. The system accommodates four main user groups, namely the school principal, administrative staff, teachers or homeroom teachers, and students, each with specific access rights and responsibilities. Administrative staff can manage essential academic information, including user accounts, subjects, teachers, classes, and student records. Teachers can access the system using usernames registered by administrative staff and default passwords that can be changed after logging in, allowing them to input and manage students' academic grades according to their respective subjects. Meanwhile, students can log in using their National Student Identification Number (NISN) to access their academic grade information. The system also enables the school principal to monitor academic information and access reports that can be printed or downloaded in PDF format. Overall, the developed system facilitates centralized academic data management, simplifies grade recording and reporting procedures, and provides a more structured approach to academic information management at the Gajah Mada Foundation Elementary School.

BIBLIOGRAPHY

- Asyifa, & Dian, Y. (2023). Design of a Financial Management Information System for Zakat and Donations at the National Zakat Agency (BAZNAS) of Padang City Using PHP and MySQL. *Jurnal Sains dan Teknologi Informatika*, 1, 90-101.
- Catriwati, & Chofifah, R. D. (2023). Design of a Savings and Loan Information System for the Usaha Madani Village-Owned Enterprise (BUMDes) in Air Panas Village. *Jurnal Intra Tech*, 7, 12-24.
- Dharmawan, E. A. (2023). Design of a Geographic Information System for Mangrove Zoning Distribution on Ambon Island. *Elektrikal dan Komputer*, 4, 283-290.
- Fachri, B. (2024). Application of the Waterfall Method in Designing a Web-Based "Merdeka Belajar Kampus Merdeka" (Independent Learning, Independent Campus) Information System. *JUKTISI*, 2, 591-597.
- Fadinur, M., Iqbal, & Sriwinar. (2023). Analysis of the Web-Based Information System for CV. Sukma Jaya Motor. *Jurnal Ilmu Komputer Aceh*, 1, 21-24.
- Gultom, A. G., & Haswanto, N. (2022). A Study of Minimalist Design Trends in the Logo Rebranding of Google Workspace Icons and Microsoft Edge. *Journal of Graphic Design Studies*, 1, 8-15.
- Ilmawati. (2023). Design of a Web-Based Information System for Monthly Tax Report Data Processing at the Unilever Padang Depot. *Jurnal Sains Informatika Terapan*, 2, 16-20.
- Iminur, M. (2024). Academic Information System for MTs Ma'Had Al-Hidayah, Teluk Dalam Village. *Jurnal Sistem Informasi (TEKNOFILE)*, 2, 282-291.
- Lengkong, G. R., & Joshua, S. R. (2023). Web-Based Queueing Application for Civil Registration Document Processing Services at the South Minahasa Population and Civil Registration Agency. *Jurnal Ilmiah Teknik Informatika dan Komunikasi*, 3, 45-56.
- Melanda, D., Surahman, A., & Yulianti, T. (2023). Development of Web-Based Science Learning Media for Grade IV (Case Study: SDN 02 Sumberejo). *Jurnal Teknologi dan Sistem Informasi*, 4, 28-33.
- Muna, F., Khotimah, T., & Jazuli, A. (2023). Web-Based Library Administration System for Kaliputu Village. *Jurnal Mahasiswa Teknik Informatika*, 7, 1395-1402.

- Permana, I., & Ariyanto, E. E. (2025). Database Implementation at the Sa'Arina Roti Gambang MSME Using Microsoft Access. *Journal of Information Systems Management and Digital Business*, 2, 91-102.
- Pratama, A. (2023). Development of an Inventory Inflow and Outflow Website for Ciko Petshop. *Teknologipintar*, 3, 1-18.
- Putro, D. P., Gunawan, I., & Suryani, P. E. (2022). Web-Based Correspondence Disposition Push Notification Software Using Firebase Cloud Messaging. *Journal of Information Technology Ampera*, 3, 370-381.
- Satria, A., Ramadhani, F., & Sari, I. P. (2023). Design and Development of a New Student Admission (PPDB) Information System for Telkom 2 Vocational High School Medan Using CodeIgniter. *Jurnal Pengabdian Masyarakat*, 2, 23-31.
- Siregar, M. E. (2023). Analysis and Implementation of Online Advertising Cost Calculations. *Jurnal Inovasi Informatika Universitas Pradita*, 7, 01-11.
- Stair, R. M., & Reynolds, G. W. (2021). *An Introduction to Information Systems*. USA: Course Technology, Cengage Learning.
- Sudjana, A., & Noel, I. d. (2023). Design of a Web-Based Library Book Borrowing and Return Application. *Isu Teknologi STT Mandala*, 18, 111-115.
- Suharni, Susilowati, E., & Pakusadewa, F. (2023). Design of the Ninik Restaurant Website as a Promotional Medium Using Unified Modeling Language. *Jurnal Rekayasa Informasi*, 12, 1-12.
- Taufiqurrahman, Subana, B., & Chandraputra, R. (2023). Web-Based E-Course Application at Universitas Saintek Muhammadiyah. *Jurnal VISUALIKA*, 9, 01-17.