

Research Article

Development And Evaluation of a Secure Cloud-Based Ai-Powered Academic Information System

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ABSTRACT:

This study developed a secure cloud-based AI-powered academic information system, specifically implemented at Dumpay National High School in Dumpay, Basista, Pangasinan. The increasing need for accessible, efficient and secure school information services resulted in the development of a system that can help students, teachers and administrative personnel in obtaining school and academic related information through a guided portal interface. The system was designed to answer common queries regarding announcements, office services, schedules, the school newspaper, and section-specific issues, and it also incorporated security monitoring features like query analysis, activity recording, and suspicious input flagging to encourage safer use of the platform. The study used a descriptive-developmental research design and followed the Rapid Application Development (RAD) methodology, which allowed for iterative development, user feedback, and continuous improvement of the system. The developed system was evaluated in terms of its features, validity, usability, and effectiveness. The participants included students, teachers, administrative staff, and IT experts who assessed the system through evaluation tools, technical evaluation, interviews, and try-out sessions. Results showed that the system was generally acceptable in all major areas, with overall weighted means ranging from 3.99 to 4.16. The respondents also agreed that the system was effective along administrative efficiency, user access to school-related information, timely communication, and secure handling of school information. Based on the findings, the study concluded that the developed secure cloud-based AI-powered academic information system has strong potential as a useful and reliable academic information support tool. Overall, the findings suggest that the developed system can contribute to more efficient, accessible, and secure school information services in the public basic education setting.

Keywords: Cloud-Based System, AI-Powered Academic Information System, Security Monitoring, Rapid Application Development, Public Basic Education Institution

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INTRODUCTION:

The growing use of cloud computing has significantly influenced how educational institutions deliver information services and support academic and administrative operations. Cloud-based platforms allow educational institutions to provide accessible, scalable, and internet-based services that can be reached across different locations and devices. In the educational sector, cloud technologies have been recognized as enabling access to information, flexibility of systems, and less dependence on local infrastructure maintenance but also raising important issues of security and data protection (Liando et al., 2022). In regard to this, cloud-based deployment offers a feasible environment to implement AI-assisted information services that can improve the accessibility and responsiveness of communication about schools. As educational institutions are increasingly relying on digital platforms, protection of school related

information has become an important concern. Cybersecurity risks in the education sector include unauthorized access, phishing, ransomware and other events that may disrupt operations and compromise sensitive information. Recently, the U.S. Department of Education issued guidelines indicating that K-12 schools remain highly susceptible to cyber-attacks and require better protection mechanisms, reporting standardized procedures, and integrated security measures to mitigate the impact of cyber-related incidents (U.S. Department of Education, 2026). Such concerns are particularly timely in schools where technical resources, security policies and monitoring methods may still be restricted, therefore growing the demand for safer digital information services.

In response to these concerns, educational technologies increasingly incorporate security monitoring mechanisms that help observe platform usage, record suspicious events, and support timely

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administrative review. By increasing visibility over user interactions and anomalous behavior, monitoring features including logging, alerting, and activity review assist to safer platform management in digital settings. The need of incident awareness, reporting, and coordinated response procedures in bolstering institutional resilience against cyber hazards is also emphasized in current K-12 cybersecurity guidelines (U.S. Department of Education, 2026). Within an AI-assisted information platform, such monitoring mechanisms are important in promoting safer access to school-related information and in reducing the risk of misuse.

The advancement of artificial intelligence has increased the availability of chatbots and AI assistants in educational settings, especially in providing prompt assistance, accurate information retrieval, and responsiveness to user questions. A recent literature review revealed that AI chatbots in educational settings can provide prompt support and enhanced information accessibility, yet they also raise issues regarding reliability, accuracy, ethics, and data privacy that necessitate meticulous oversight (Okonkwo et al., 2021; Labadze et al., 2023; Chauncey et al., 2023). These results indicate that AI-enhanced platforms could be beneficial in educational information settings if their outputs are directed by carefully selected institutional material and if their application is backed by suitable oversight systems. For this study, the role of artificial intelligence is not to perform broad cyber threat detection, but to assist users in accessing school-related and academic information within a monitored portal environment.

The study focuses on the development and evaluation of a secure cloud-based AI-powered academic information system for Dumpay National High School in Pangasinan. The system is intended to provide a more organized, accessible, and secure way of handling school-related inquiries through an AI-assisted portal interface. It includes application-level security monitoring features such as query evaluation, activity logging, and suspicious input flagging to help protect school information and support safer interaction within the portal. The system also includes an AI-powered chatbot, referred to as DNHS InfoBot, which assists users in accessing school-related and academic information

through the portal. By developing and evaluating this system, the study aims to address the need for a practical school-based information assistant that can improve communication, support timely access to information, and better serve the users of Dumpay National High School.

Statement of the Problem

This study aimed to develop and evaluate a Cloud-Based AI-Powered Academic Information System with Security Monitoring for Dumpay National High School in Dumpay, Basista, Pangasinan in order to improve the efficiency of accessing school records and information.

Specifically, it sought to answer the following questions:

1. What are the requirements for the development of a Cloud-Based AI-Powered Academic Information System?
2. What are the features of a Cloud-Based AI-Powered Academic Information System in terms of:
 - a. functionality;
 - b. consistency; and
 - c. security
3. What is the extent of validity of the developed system in terms of the aforementioned areas?
4. What is the level of usability and effectiveness of the developed system along:
 - a. administrative efficiency;
 - b. user access to school-related information;
 - c. timely communication; and
 - d. secure handling of school information?

Significance of the Study

The study is significant because it offers a practical approach to improving the delivery of school-related information through a secure cloud-based AI-powered academic information system. For Dumpay National High School, the system may help improve administrative efficiency by responding to routine inquiries and organizing access to school announcements, office services, schedules, and other academic information. It may also benefit teachers and students by providing

faster and more reliable access to school-related concerns, while supporting safer and more efficient communication. In addition, the study may serve as a useful reference for IT and cybersecurity practitioners in developing secure AI-assisted information platforms with appropriate monitoring features. For future researchers, it provides a foundation for further studies on AI-driven educational systems, especially those that integrate knowledge-based assistance with cloud security monitoring.

MATERIALS AND METHODS:

The research design utilized for the Development and Evaluation of a Secure Cloud-Based AI-Powered Academic Information System for Public Basic Education Institutions is based on Design Science Research (DSR) with a descriptive-developmental evaluation component. Design Science Research is appropriate for information systems studies that involve the creation and evaluation of an artifact intended to address an identified organizational problem (Hevner et al., 2004). It indicates developing a useful artifact and evaluating its usefulness and quality through systematic evaluation. This makes the approach appropriate for the design, development, and evaluation of a technology-based solution within an actual organizational setting.

The evaluation part of this study also uses a descriptive-developmental approach. It is descriptive as it establishes and communicates the condition and evaluation results of the developed system according to the study's sanctioned criteria, aligning with the perspective that descriptive research seeks to systematically and accurately depict existing phenomena without altering variables. The study is developmental since it

involves the structured production and refining of a product or tool, as well as the systematic examination of its design, development, and evaluation processes. This is consistent with design and development research, which involves the systematic study of design, development, and evaluation processes (Richey et al., 2014). In line with this design, the developed secure cloud-based AI-powered academic information system was assessed based on the approved Statement of the Problem, specifically identifying its features in terms of functionality, consistency, and security; evaluating the extent of its validity in the aforementioned areas; and determining its level of usability and effectiveness along administrative efficiency, user access to school-related information, timely communication, and secure handling of school information.

The project was conducted based on the Rapid Application Development (RAD) methodology. As the increasingly competitive software market emphasizes a stronger demand for new applications, the IT industry is feeling pressure to deliver working products faster, and Rapid Application Development is becoming a necessity (Berger et al., 2009). According to Cox (2019), the Rapid Application Development approach is a form of Agile software development methodology that prioritizes rapid prototype releases and iterations. Using this development life cycle, the researcher can make changes to the design, remove or add features, and refine interfaces based on iterative feedback.

While the RAD model supports total flexibility and modifications, it functions on four core phases that control the development process. These are Requirements Planning, User Design, Construction, and Cutover.

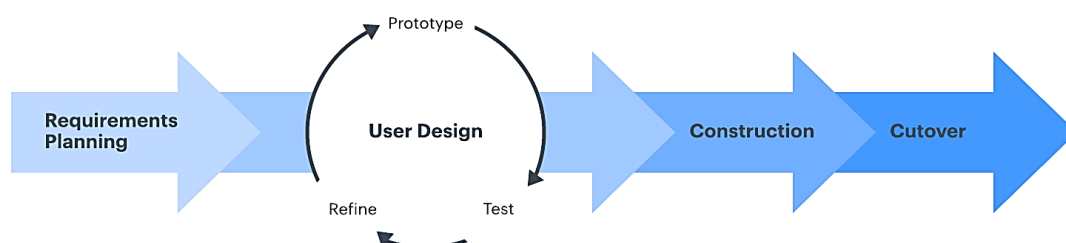


Figure 1. Rapid Application Development (RAD)

Requirements Planning. According to Glaschenko (2023), in the requirements planning, users and the project team collaborate to define the objectives of the upcoming system. In this phase of this study, the researcher determined the functional and security needs of the proposed secure cloud-based AI-powered academic information system for Dumpay National High School. The requirements, which included workflows for school communication and guided information access, were generated from the current school information processes as well as the anticipated roles and activities of intended users, including teachers, students, and administrative personnel. This phase also addressed needs for secure authentication, role-based access control, data privacy protections, activity logging, event monitoring, and alerting for suspicious or policy-violating behavior, since the system incorporates security monitoring mechanisms.

User Design. According to Glaschenko (2023), user design is a part of the rapid application development methodology, setting it apart from the classic waterfall model. This is the most essential element of RAD, and what makes it different from other project management strategies. During this phase, the researcher created iterative prototypes of the posed secure cloud-based AI-powered academic information system interface and user flows with an emphasis on usability and compatibility with real-world educational procedures. Role-based screens and features pertinent to teachers, administrators, and students were covered in the prototype iterations. These encompassed user authentication and access management, system engagement, educational notifications, informational pages, dashboard displays, knowledge-based upload capabilities permitted users, and facilitated interactions through AI-assisted support.

Construction. According to Glaschenko (2023), the focus in construction is on quality, scalability, and maintainability. During this phase, the researcher created and tested the system based on the authorized scope and the improved user design stage prototypes. The platform components identified in the technical background of the study were used to implement the secure cloud-based AI-powered

academic information system in a cloud-supported environment. The backend service was developed in Python using FastAPI, while the frontend portal interface was developed in Python using Streamlit. AI-assisted interaction was supported through Azure OpenAI integration. For authentication and access control, the system used JSON Web Token (JWT)-based authentication and role-based access control. MySQL was used as the primary database for user records, chat history, administrative data, and monitored system records, while Azure Blob Storage was used for uploaded knowledge files. In addition, application-level security monitoring was supported through query evaluation, flagged-event recording, activity logging, and where configured, workflow-based alert notification through Azure Logic Apps.

Cutover. According to Glaschenko (2023), cutover is the final phase, including acceptance testing, rollout, and user training. During the cutover phase, it marked the transition from system construction to the completed state of the developed cloud-based AI-powered academic information system. At this point, the system was prepared for evaluation and testing in relation to the requirements of the study.

Data Gathering Techniques

The study was conducted at Dumpay National High School during School Year 2025-2026. The researcher secured approval from the school principal and coordinated with the identified participants, which included selected students, teachers, administrative personnel, and IT experts, depending on the data required for each research question. After approval, the researcher oriented the participants, conducted the system try-out and evaluation activities, administered the appropriate instruments, and explained the purpose of the study, the scope of participation, and the confidentiality of responses. The collected data were then consolidated and used for analysis and interpretation.

For the first statement of the problem, data were gathered through interviews, observation, and system try-out sessions to determine the requirements for the development of the secure

cloud-based AI-powered academic information system. The researcher observed the existing manual information inquiry process and conducted structured interviews with school personnel to identify the needed functions, limitations, and system requirements to be incorporated into the developed system.

For the second problem, data were gathered through the evaluation questionnaire, observation during try-out sessions, and User Acceptance Testing (UAT) to assess the features of the developed system in terms of functionality, consistency, and security. Participants used the system based on defined scenarios, and their responses, interactions, and feedback were recorded to determine whether the system operated as intended.

For the third problem, data were gathered through the validity evaluation questionnaire and supporting feedback from respondents and IT experts to determine the extent of validity of the developed system in terms of functionality, consistency, and security. The results of the evaluation were used to determine whether the system met the required standards for the identified indicators.

For the fourth problem, data were gathered through usability and effectiveness questionnaires, observation during try-out sessions, UAT, and supporting system evidence. Selected users

accomplished the questionnaire to assess the system's usability and effectiveness in terms of administrative efficiency, user access to school-related information, timely communication, and secure handling of school information.

Statistical Treatment of Data

For this study, the data gathered from the respondents were organized, tabulated, and analyzed to determine the validity, usability, and impact of the developed secure cloud-based AI-powered academic information system. The descriptive statistical tools were used to interpret the collected data. Frequency count and percentage were utilized to present the profile of the respondents involved in the evaluation of the system. These statistical tools helped describe the distribution of the respondents according to demographic variables such as gender and age.

For the third and fourth research questions, to determine the extent of the system's validity in terms of functionality, consistency, and security, as well as the level of usability and effectiveness of the system on administrative efficiency, user access to school-related information, timely communication, and secure handling of school information, the weighted mean was used. The weighted mean was computed based on the responses obtained from the evaluation questionnaire accomplished by the selected respondents during the system try-out. The responses of the respondents were measured using a five-point Likert scale. The following scale was used to interpret the computed weighted mean values.

Table 1. Likert Scale for the Evaluation of the Developed System

Numerical Equivalent	Statistical Limit	Descriptive Equivalent	Descriptive Interpretation
5	4.21–5.00	Strongly Agree	Very Acceptable
4	3.41–4.20	Agree	Acceptable
3	2.61–3.40	Neutral	Moderately Acceptable
2	1.81–2.60	Disagree	Less Acceptable
1	1.00–1.80	Strongly Disagree	Not Acceptable

The developed secure cloud-based AI-powered academic information system is considered very acceptable, acceptable, moderately acceptable, less acceptable, or not acceptable based on the weighted mean obtained from the evaluation results. A mean score of 4.21 to 5.00 indicates that the

developed system is very acceptable, 3.41 to 4.20 indicates acceptable, 2.61 to 3.40 indicates moderately acceptable, 1.81 to 2.60 indicates less acceptable, and 1.00 to 1.80 indicates not acceptable. These results reflect the extent to which the developed system meets the required standards

in terms of functionality, consistency, security, usability, and overall system performance.

The respondents of the study consisted of students, teachers, administrative staff, and IT experts associated with the evaluation of the developed system at Dumpay National High School during the School Year 2025–2026. A total of 105 participants were involved in the study, composed of 102 respondents and three IT experts. Among the respondents, 85 were students who represented the primary users of the system. Fifteen teachers participated in evaluating the validity, usability, and perceived impact of the system. Two administrative staff members were included to evaluate the system's support for administrative work and school-related information access, as well as its overall usability and impact. In addition, three external IT experts were invited to provide supporting technical evaluation of the developed system. These IT experts were not affiliated with Dumpay National High School and were selected based on their professional experience in information technology and cybersecurity in order to provide an objective and independent technical assessment of the possible constraints, concerns, and implementation issues of the developed system.

RESULTS

This section presents the results of the study based on the objectives stated in the manuscript. The findings cover the requirements for the development of the secure cloud-based AI-powered academic information system, the validity of the developed system in terms of functionality, consistency, and security, its usability, and its effectiveness in supporting administrative efficiency, user access to school-related information, timely communication, and secure handling of school information.

Requirements for the Development of the Secure Cloud-Based AI-Powered Academic Information System

The first objective of the study focused on identifying the requirements for the development of the secure cloud-based AI-powered academic information system. These requirements were derived from the existing manual information inquiry process, the proposed automated system architecture, and the hardware and software components needed to support the development and deployment of the system. Table 2 presents the summarized development requirements.

Table 2. Requirements for the Development of the Secure Cloud-Based AI-Powered Academic Information System

Requirement Area	Identified Requirement
Existing information process	Manual inquiry through face-to-face communication, phone calls, Messenger, or direct messages
System access	Web portal for students, teachers, and administrative users
Main system function	AI-assisted access to school-related and academic information
Knowledge support	Knowledge base containing school information and uploaded reference materials
Security monitoring	Query evaluation, activity logging, flagged-event recording, and administrative review
Authentication and access control	Secure login, JWT-based authentication, and role-based access control
Hardware requirements	Intel Core i3 or AMD Ryzen 5 processor, minimum 8 GB RAM, at least 100 GB SSD, reliable internet connection, scalable cloud instance, and automated backup
Software requirements	Microsoft Azure, FastAPI, Streamlit, Azure OpenAI, MySQL, XAMPP, Azure Blob Storage, Azure Logic Apps, and modern web browsers

Table 2 shows that the development of the system required both functional and technical components. The requirements indicate that the

system was designed to shift the school's manual information inquiry process into a web-based, AI-assisted, and monitored portal environment. These

requirements also supported the need for secure access, reliable information retrieval, and controlled handling of school-related data.

Features of the Developed Secure Cloud-Based AI-Powered Academic Information System

The second objective of the study identified the features of the developed secure cloud-based AI-powered academic information system in terms of functionality, consistency, and security. The system implemented role-based access control through three primary user levels: administrator, teacher, and student. The administrator had the broadest access, including user management, knowledge resource uploading, dashboard monitoring, and announcement control. The teacher had limited authorized access based on assigned functions, while the student had restricted access to viewing school-related information and interacting with the system.

A. Functionality Features.

The functionality features of the developed system supported school-related information access and user interaction. These included the overview dashboard, announcements page, school newspaper page, key offices page, and DNHS InfoBot. The overview dashboard presented user and account summaries, student distribution by grade level, and student distribution by section. The announcements page provided current school advisories, notices, and updates, while the school newspaper page gave access to school publication content. The key offices page presented office-related information to help users identify where to direct specific concerns or inquiries. The DNHS InfoBot allowed users to submit school-related questions in conversational form and receive automated responses based on available knowledge resources.

B. Consistency Features.

Table 3. Validity of the Developed System in Terms of Functionality, Consistency, and Security

Indicator	Weighted Mean	Descriptive Equivalent	Descriptive Interpretation
Functionality	4.04	Agree	Acceptable
Consistency	3.99	Agree	Acceptable
Security	4.13	Agree	Acceptable

The consistency features of the developed system supported stable and controlled information management. These included the knowledge base upload page and the manage announcements page. The knowledge base upload page allowed authorized users to add reference materials that served as sources for the system's AI-assisted responses. Access to this function was limited to authorized roles, particularly the administrator and, where permitted, the teacher. The manage announcements page allowed the administrator to create, edit, reorder, remove, and control the visibility of school-wide announcements.

C. Security Features

The security features of the developed system supported controlled access, monitoring, and secure management of user activity. These included the login page, security monitoring dashboard, blocked query response page, create user page, and users directory page. The login page allowed access only after account credentials were verified. The security monitoring dashboard displayed recorded security-related events and classified queries based on security categories and risk levels. The create user page and users directory page supported secure account registration and management.

Validity of the Developed System

The third objective of the study determined the validity of the developed system in terms of functionality, consistency, and security. Instead of presenting the questionnaire items separately, the results are summarized according to the three major validity indicators. Table 2 presents the summarized validity results.

Table 3 shows that the developed system was rated acceptable in all three validity indicators. Security obtained the highest weighted mean of 4.13, while functionality obtained 4.04 and consistency obtained 3.99. These results indicate that the system was acceptable in securing user accounts, restricting access to authorized users, recording user activities, performing its intended functions, supporting access to school-related information, and providing reliable outputs during repeated use.

Usability and Effectiveness of the Developed System

The fourth objective of the study assessed the usability and effectiveness of the developed system. The usability evaluation focused on whether the system was easy to learn, easy to use, understandable, navigable, convenient, satisfying, suitable for intended users, and usable in the school setting. Table 4 presents the summarized usability result.

Table 4. Usability of the Developed System

Indicator	Weighted Mean	Descriptive Equivalent	Descriptive Interpretation
Usability	4.16	Agree	Acceptable

Table 4 shows that the developed system was rated acceptable in terms of usability, with a weighted mean of 4.16. This result indicates that the respondents found the system easy to learn, easy to use, clear, understandable, and suitable for students, teachers, and school personnel. The fourth objective

also determined the effectiveness of the developed system along administrative efficiency, user access to school-related information, timely communication, and secure handling of school information. Table 5 presents the summarized effectiveness results.

Table 5. Effectiveness of the Developed System

Indicator	Weighted Mean	Descriptive Equivalent	Descriptive Interpretation
Administrative efficiency	4.10	Agree	Acceptable
User access to school-related information	4.05	Agree	Acceptable
Timely communication	4.08	Agree	Acceptable
Secure handling of school information	4.06	Agree	Acceptable
Overall Weighted Mean	4.08	Agree	Acceptable

Table 5 shows that the developed system was rated acceptable in all effectiveness indicators, with an overall weighted mean of 4.08. Administrative efficiency obtained the highest sub-mean of 4.10, followed by timely communication with 4.08, secure handling of school information with 4.06, and user access to school-related information with 4.05. These results indicate that the system helped improve administrative processes, supported prompt responses to user inquiries, promoted responsible handling of school information, and improved access to school-related information.

DISCUSSION:

The findings of the study showed that the developed secure cloud-based AI-powered academic information system was generally found acceptable by the respondents. In terms of validity, functionality received a weighted mean of 4.04, consistency obtained 3.99, and security obtained the highest weighted mean of 4.13, all with a descriptive equivalent of Agree and a descriptive interpretation of Acceptable. These results indicate that the system was able to perform its intended tasks, provide stable outputs, and maintain appropriate safeguards for user access and school information.

In terms of usability, the developed system obtained a weighted mean of 4.16, with a descriptive equivalent of Agree and a descriptive interpretation of Acceptable. This indicates that the respondents generally found the system easy to learn, easy to use, understandable, navigable, convenient, satisfying, suitable for its intended users, and usable in the school setting.

The findings further showed that the developed system was acceptable in terms of effectiveness, with an overall weighted mean of 4.08, a descriptive equivalent of Agree, and a descriptive interpretation of Acceptable. Among the effectiveness indicators, administrative efficiency obtained the highest sub-mean of 4.10, followed by timely communication with 4.08, secure handling of school information with 4.06, and user access to school-related information with 4.05. These results indicate that the system helped improve administrative processes, supported access to school announcements and activities, enabled quicker responses to inquiries, and promoted more secure handling of school data.

Overall, the developed system can support the information service needs of Dumpay National High School by improving access to school-related information, supporting timely communication, and promoting safer handling of school data. Thus, the developed system may serve as a useful and practical technological solution for public basic education institutions, provided that implementation readiness and sustainability concerns are properly addressed.

CONCLUSION:

The study determined the requirements for the development of the Cloud-Based AI-Powered Academic Information System, including the existing manual process, the proposed system architecture, and the hardware and software needs of the system.

The developed secure cloud-based AI-powered academic information system had features in terms of functionality, consistency, and security. It provided school-related information access, AI-assisted inquiry support through DNHS InfoBot, organized information pages, and security functions for controlled access and monitoring.

The developed system was found valid in terms of functionality, consistency, and security. The findings showed that the system was acceptable in performing its intended functions, providing stable outputs, and protecting user access and school-related information.

The developed secure cloud-based AI-powered academic information system was found acceptable in terms of usability and effectiveness. It was easy to learn and use, and it helped improve administrative efficiency, user access to school-related information, timely communication, and secure handling of school information.

RECOMMENDATIONS:

The developed secure cloud-based AI-powered academic information system may be adopted for school use at Dumpay National High School, subject to proper implementation and administrative approval.

Based on the recommendations and observations of the IT experts, the following implementation concerns should also be considered to support the successful and sustainable use of the developed system:

The school should ensure stable internet connectivity, adequate devices, and sufficient technical resources to support the system's operation.

The school administration should establish clear policies on user access, acceptable use, data handling, privacy protection, and security monitoring.

Data privacy and cybersecurity measures should be continuously strengthened through secure authentication, access restriction, activity monitoring, and regular log review.

Students, teachers, and school personnel should be given orientation and training to improve readiness and confidence in using the system.

The system should be regularly maintained and updated so that school information remains accurate and the chatbot responses remain relevant.

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