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Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations

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Abstract.

The Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations was developed to address the challenges encountered by Silay Institute in conducting effective teacher evaluations. This developmental research aimed to design, implement, and assess a system that automates survey-based data collection and analysis, thereby improving accuracy, operational efficiency, and professional growth opportunities for educators. The system evaluates teacher performance based on six key dimensions: Subject Matter Competence, Teaching Styles, Personality Traits, Classroom Management, Learning Assessment, and Overall Impression, following established behavioral frameworks [2]. Leveraging Python's Pandas library for data analysis and the OpenAI API for AI-generated insights, the system provides personalized recommendations for faculty development workshops and activities [1]. These recommendations can be generated both online through API access and offline using preloaded datasets to ensure continuous functionality during internet outages. This dual-mode design supports uninterrupted access to evaluation results and aligns with institutional goals for integrating technology in educational leadership [3]. User feedback was collected from 30 respondents, including students and faculty members, who rated the system across 15 performance indicators using the Pomel Scale. The results indicated high ratings in user-friendliness, accuracy, interactivity, and operability, demonstrating the system's effectiveness and reliability. Moreover, the built-in recommendation deduplication mechanism ensured relevance and uniqueness in AI-driven suggestions. The successful implementation of the system significantly streamlined the teacher evaluation process, offering a sustainable and data-driven approach to professional development in higher education [4].

Keywords: Applied Sciences and Technology, Teacher Inventory, AI-Driven Recommendations, Developmental research

1. INTRODUCTION

A Teacher Behavior Inventory (TBI) is a systematic tool used by school administrators, including in the human resource and guidance departments, to assess and carefully document the various behaviors, practices, and performance metrics of school teachers. Methods such as student surveys are utilized. Teacher behavior Checklist (TBC) has been used to rate the actual behaviors of teachers. The TBC is a reliable tool for grading teacher behaviors by having different students rate the same teacher [5]. This tool creates an inventory that assists in evaluating how teachers interact with students, manage classrooms, and accurately deliver instructions for diverse learning methods tailored to different student learners.

In the ASEAN context, student ratings of teacher behaviors are increasingly recognized for their vital role in improving educational quality and teaching practices. Countries in the region are integrating these ratings into teacher evaluation systems to address unique challenges and enhance learning outcomes. The diverse educational landscape in ASEAN, characterized by varying resources and access to technology, underscores the importance of such evaluations. By analyzing student feedback, educational institutions can identify areas for teacher development and implement targeted professional growth initiatives. Like those encouraged by the ASEAN Education Sector Work Plan [6], regional frameworks promote continuous professional development and adaptive teaching strategies tailored to local contexts. These collaborative efforts aim to elevate teaching quality and improve student performance across the ASEAN member states [7].

In the Philippines, evaluating and improving teaching performance is essential for enhancing education quality. The Department of Education (DepEd) and the Commission on Higher Education (CHED) stress the importance of continuous professional development for teachers, as it directly impacts student achievement [8]. Despite efforts to align teacher practices with national standards, challenges like high dropout rates and inconsistent student performance persist. According to the Philippine Statistics Authority (PSA), a stronger framework for teacher evaluation is needed. Comprehensive teacher behavior assessments can help identify areas for improvement, guide professional development, and raise the quality of education nationwide.In the local context, developing the Silay Institute Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations addressed critical gaps in teacher evaluation practices by automating the evaluation process and integrating data analytics. Traditional manual methods often led to delayed feedback and limited insights into teaching effectiveness, hindering professional development. Existing systems, such as VSmart and GuroAko, primarily focused on course tracking but lacked comprehensive tools for analyzing teaching behaviors and tailoring professional development. This new system provided timely, actionable insights into teacher performance and leveraged AI-driven recommendations to enhance understanding of teaching effectiveness. Ultimately, it filled the void left by current systems, ensuring educators received targeted support and contributed to improved teaching practices and student outcomes.

The literature revealed a significant gap in systems that effectively integrated data analytics into teacher evaluation processes. Platforms like TeachBoost and TalentEd provided observation and feedback but lacked tailored professional development opportunities based on specific performance metrics, limiting targeted support for educators [1]. Additionally, systems such as VSmart and GuroAko focused mainly on course tracking and overlooked the critical analysis of teaching behaviors and their effects on student outcomes. The absence of analytical tools hampered the creation of customized professional growth pathways for teachers. Despite recent studies highlighting the importance of data-driven approaches and explainable AI in evaluations, these insights were not fully utilized in existing Philippine systems [9]. Thus, there was an urgent need for innovative solutions that leveraged data analytics and automation to enhance teacher evaluations and inform professional development. This study addressed these gaps by proposing an Automated Teacher Behavior Inventory Management System that streamlined evaluation processes and offered real-time insights into teacher performance and development needs.

The rationale for developing the Silay Institute Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations focused on improving the efficiency of teacher evaluations and fostering targeted professional development. By automating evaluations, the system alleviated the burden of manual assessments, enabling administrators to dedicate more time to supporting educators. The integration of data analytics allowed for real-time feedback and identified specific areas for improvement in teaching practices, aligning to enhance teaching quality in the Philippines. Specifically, the system utilized Natural Language Processing (NLP) and Generative AI technologies through the integration of the OpenAI ChatGPT API to analyze survey data and generate tailored recommendations for teacher development. This development aligned with the mission and vision of the Silay Institute, which was dedicated to providing quality Christian education. By refining

teacher evaluations, the system supported the Institute's commitment to continuous improvement and educational excellence, ultimately shaping students into morally upright and globally competitive professionals. Recognizing the link between effective classroom management and student success, this innovative system integrated advanced tools to enhance teacher engagement and achievement within the classroom.

2. PRODUCT DESCRIPTIONS

In the product perspective, the Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations is an innovative solution developed for the Silay Institute to automate the teacher performance evaluation process. This hybrid system replaces the manual, paper-based approach with a combination of a web-based survey tool for students and a desktop application for administrators. It was designed to ensure accurate data collection, generate AI-powered recommendations, and support data-driven decision-making.

The system focuses on gathering feedback from students and analyzing it using real-time data analytics. The collected survey data is categorized into six domains: Subject Matter Competence, Teaching Styles, Personality Traits, Classroom Management, Learning Assessment, and Overall Impression. Based on the data, the system generates personalized professional development suggestions such as training seminars and workshops, either by connecting to the OpenAI API or using a preloaded offline dataset. Figure 1 shows the overall design and core components of the system.

Meanwhile, the system offers several key features, including user-friendliness, accessibility, adaptability, and intelligent recommendation generation. In terms of user-friendliness, both student and administrator interfaces were designed for ease of use and minimal training, with clearly labeled options and a guided workflow. Regarding accessibility, the survey system is hosted on a local private network within the campus, allowing students to answer surveys via standard web browsers in computer laboratories. This ensures fast access without relying on external internet connections. In terms of adaptability, the system functions in both online and offline modes, automatically switching based on internet availability. This hybrid capability ensures uninterrupted operation, especially during connectivity issues. Lastly, the AI-driven recommendation feature enables the system to provide actionable insights, helping improve instructional quality and professional growth.

In the operational environment, the system’s hardware and software components were designed to meet specific requirements to ensure smooth performance. Regarding hardware components, the system functions optimally with the following minimum specifications: an Intel Core i5 processor running at 2.4GHz or higher, 8 GB of RAM, and at least 250 GB of available storage (SATA or SSD). The system also requires a screen resolution of at least 1366x768, with a recommended monitor size of 21 inches to properly display graphical reports and data visualizations.

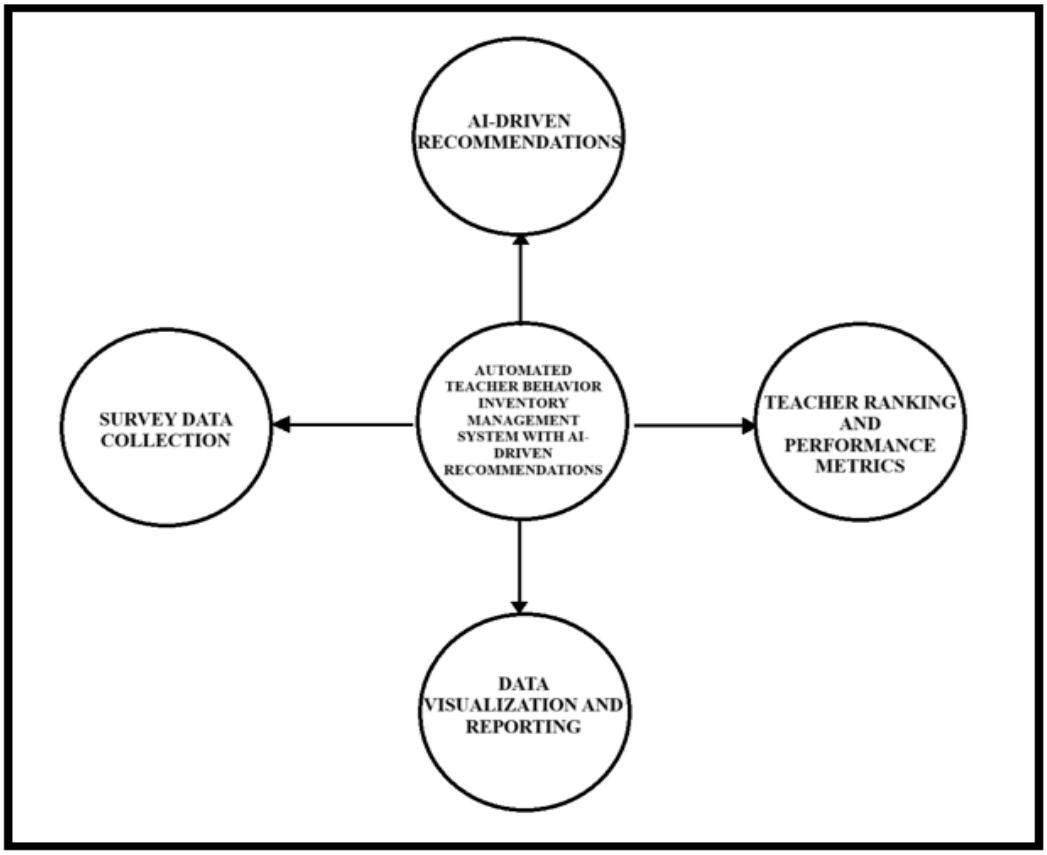
Computer lab desktops used by students to access the survey component must also meet general hardware standards to ensure stability and responsiveness. The local hosting setup prevents server congestion and facilitates faster processing within the institution’s network.

For software components, the system was developed using Microsoft Visual Basic .NET for the administrator application, integrated with a Python-based AI module for recommendation generation. The student web-based survey tool was developed using PHP, HTML, CSS, and JavaScript. The AI module utilizes Python’s pandas and tkinter libraries, and connects to the OpenAI API when online. Offline operation is enabled by storing precomputed recommendation datasets. The database used is MySQL for managing survey data, user accounts, and ranking results.

The recommended operating systems for running this system are Windows 10 or Windows 11 for the desktop-based administrative side, and any modern web browser such as Google Chrome, Mozilla Firefox, or Microsoft Edge for accessing the survey tool. With a hybrid functionality and well-defined infrastructure, the system meets the performance and reliability standards expected in academic

institutions. Lastly, constraints during development may include system compatibility issues, offline database synchronization, and communication interfaces across platforms.

Figure 1. *Automated Teacher behavior Inventory Management System with AI-Driven Recommendations Features.*



3. SYSTEM FEATURES

There are four types of users for system access: the students, who evaluate teachers through a survey form; the teachers, who receive performance feedback and access their evaluation results; and the administrators, which include the guidance personnel and HR officers, who manage the survey process and generate AI-driven recommendations. Each user type has specific roles and levels of access in the system.

Students are required to log in to the system to answer a set of survey questions based on specific teacher behavior categories. Once submitted, these responses are stored in a secure database for evaluation. Teachers, on the other hand, can view their performance reports and the corresponding professional development suggestions generated by the system. Guidance and HR administrators oversee the management of users, teacher profiles, subjects, sections, survey deployment, automated score computations, and recommendation results.

Figure 2 shows the decomposition structure of the Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations. The system is divided into three core subsystems: the Student Survey System, the Administrator System, and the AI Analysis System.

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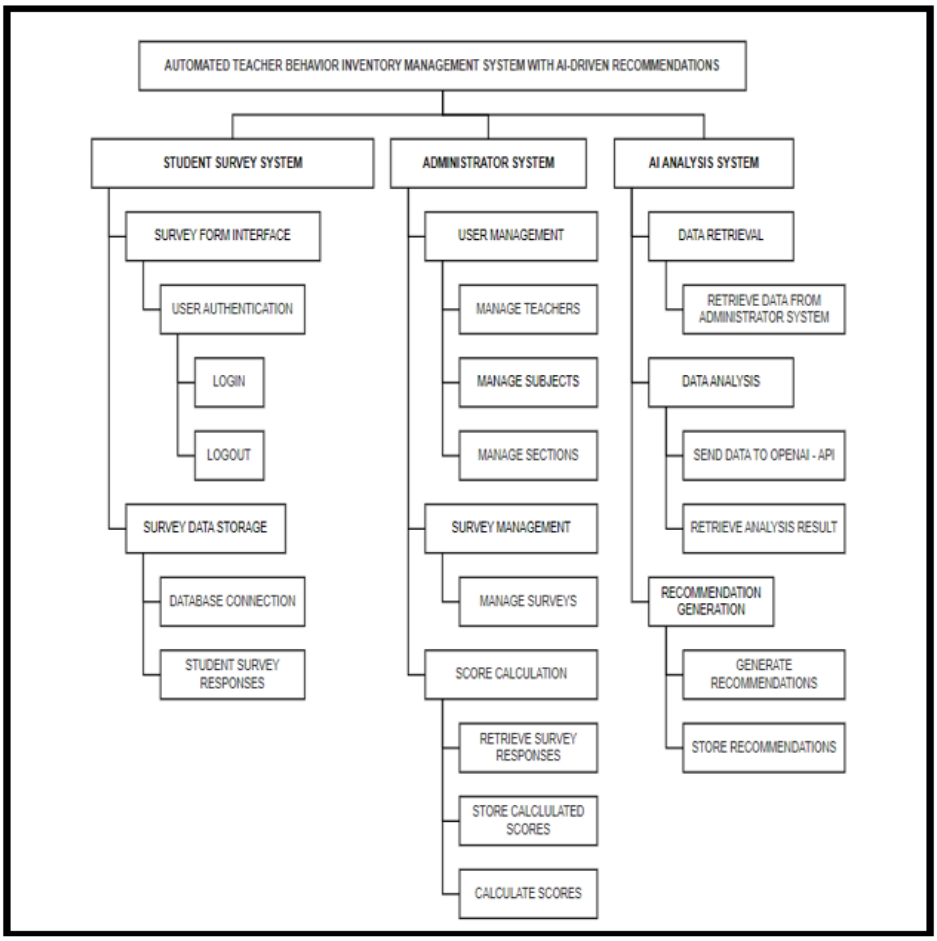
Figure 2. *System Decomposition*



The system features include the following: student survey participation, management of users, automated calculation of scores, AI-driven analysis and recommendation generation, and visual report dashboards. It is designed to streamline the evaluation process of teacher behavior and to provide professional development recommendations through intelligent analytics. The system involves four primary user roles: students, teachers, administrators (guidance and HR), each with distinct access and functions.

Regarding the student survey system, students are the primary users who will participate in the teacher behavior inventory surveys. The survey can only be accessed from designated computers within the school's computer laboratory; the use of smartphones or personal devices is strictly prohibited to ensure data integrity and proper supervision. The system generates unique student accounts, which are managed and distributed by the guidance staff assigned to the computer lab. Each student logs in using the provided section and password. Once authenticated, the student gains access to the survey interface, which presents a series of questions categorized into six domains: Subject Matter Competence, Teaching Styles, Personality Traits, Classroom Management, Learning Assessment, and Overall Impression. The student selects their responses using a five-point Likert scale. After completing the survey, the student clicks the "Submit" button, and the responses are stored in the system database for further processing. If the student attempts to skip any required questions, the system prompts them to complete the unanswered items before submission to ensure complete and valid data.

In managing users and survey setup, administrators—specifically guidance counselors and HR staff—access the administrative system via a secure login portal. From there, they can manage the list of teacher participants. While teachers cannot be permanently deleted from the system, guidance

counselors have the authority to activate or deactivate their participation status depending on their current role or teaching assignment. For instance, substitute teachers may be excluded from the current survey cycle if deemed inapplicable. The user management module allows these administrators to assign roles, monitor login activity, and maintain accurate teacher profiles.

To manage the creation and deployment of surveys, administrators use the survey management module, where they can create survey templates, assign them to specific academic terms, and monitor survey progress. After the survey period ends, administrators can generate summary reports to visualize completion rates and follow up on incomplete surveys if necessary.

Upon survey submission, the score calculation module is triggered automatically. This component of the system maps student responses into numeric scores based on the Pomel scale, ensuring standardized evaluation across all participants. The scores are grouped and categorized per domain and then saved in the database. This automation minimizes manual computation errors and accelerates result processing.

In the analysis phase, the AI system is activated. The data retrieval module collects the calculated scores, filters them by academic term and teacher, and prepares the datasets for analysis. The data is then sent to the AI analysis module, where it is processed using machine learning techniques and OpenAI's API. The system identifies trends in student feedback, detects areas needing improvement, and generates summaries based on historical performance.

The AI-generated recommendations are then passed to the recommendation module, which formulates practical suggestions tailored to each teacher's performance profile. These suggestions can include attending specific workshops, mentoring opportunities, or self-guided improvement resources. The results and recommendations are presented in a graphical user interface using Python's Tkinter framework, allowing administrators to browse the data interactively.

In the dashboard reporting module, administrators can access various charts—such as bar graphs for score comparisons across departments, line graphs to track improvements over time, and pie charts for distribution of rating levels. Each visualization comes with textual explanations to help users interpret the results. Filtering tools are available for sorting by teacher, department, category, or semester. This empowers administrators to make informed decisions regarding teacher evaluations and development programs.

Regarding system usage, the system is intended to be used twice per academic year—at the end of each semester. This schedule aligns with institutional policies for faculty evaluation. The data from each cycle is backed up and archived after each term to maintain records and ensure compliance with institutional and legal requirements.

To maintain system integrity, policies are enforced covering user responsibilities, secure access, and data protection. Administrators are tasked with conducting periodic audits, ensuring user permissions are updated as needed, and that all stored information is accurate and secure. Teachers can only view their own performance data through a read-only interface that summarizes their scores and recommendations.

4. EXTERNAL INTERFACE REQUIREMENTS

The Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations features a user-friendly and intuitive interface designed to accommodate various users, including students, teachers, and administrators from the Guidance and Human Resource (HR) departments. The system is developed using a combination of PHP, HTML, CSS, JavaScript, Bootstrap, Microsoft Visual Basic .NET, and Python, enabling both web-based and desktop-based operations. It consists of three main components. The Student Survey System, developed using PHP and hosted via XAMPP, allows students to complete surveys in a structured and accessible manner. The Administrator System, created using Microsoft Visual Basic .NET, enables authorized personnel to manage teacher information, survey results, and reporting tasks. Meanwhile, the AI Analysis System, developed in Python using Tkinter and the OpenAI API, processes survey data and provides AI-generated

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recommendations. To ensure functionality without internet access, all possible API results are pre-generated and stored locally. Each technology used in the system was selected based on its strengths. PHP was ideal for dynamic web interfaces, Microsoft Visual Basic .NET provided strong Windows-based data management capabilities, and Python offered advanced data analysis and AI integration using libraries such as Pandas.

Figures 3 and 4 present the login interfaces for both teachers and students. For students, the login requires a section and password, while for teachers, it requires a username and password. These login pages serve as the entry point to the system, ensuring that access is limited to authorized users based on their roles.

Figure 3. *Student login*

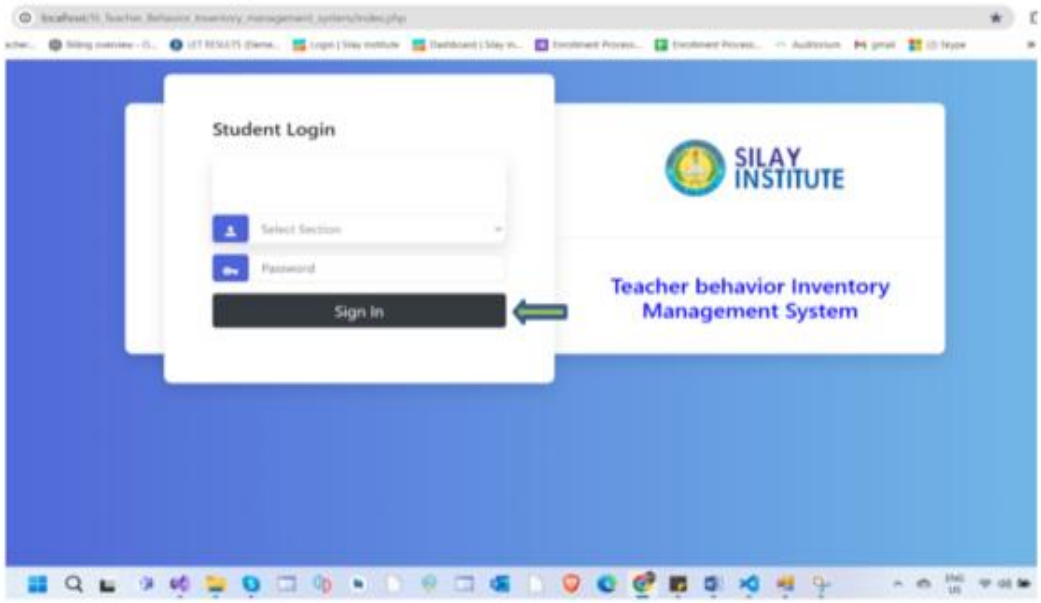

Figure 4. *Teacher login*

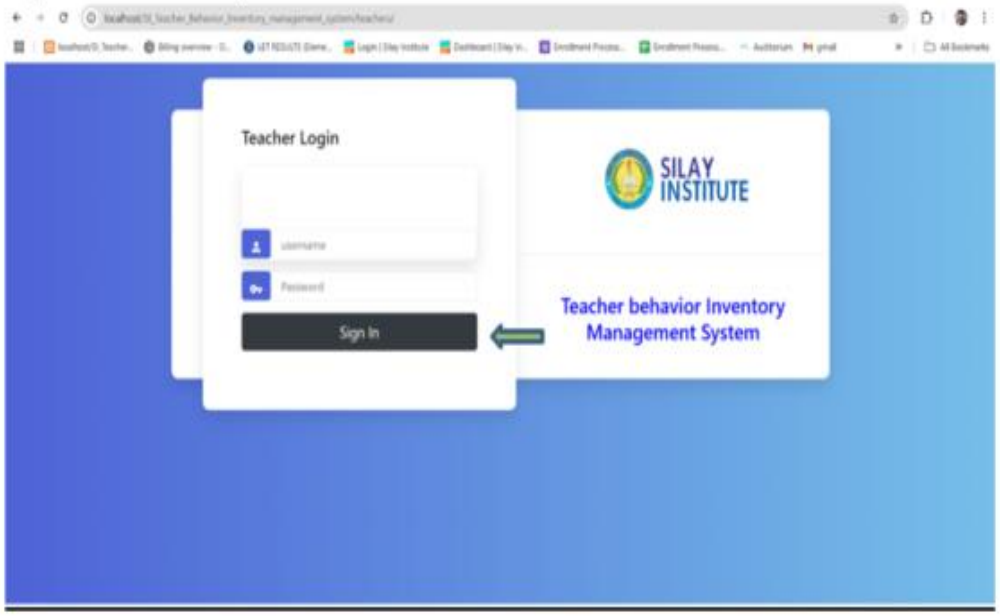

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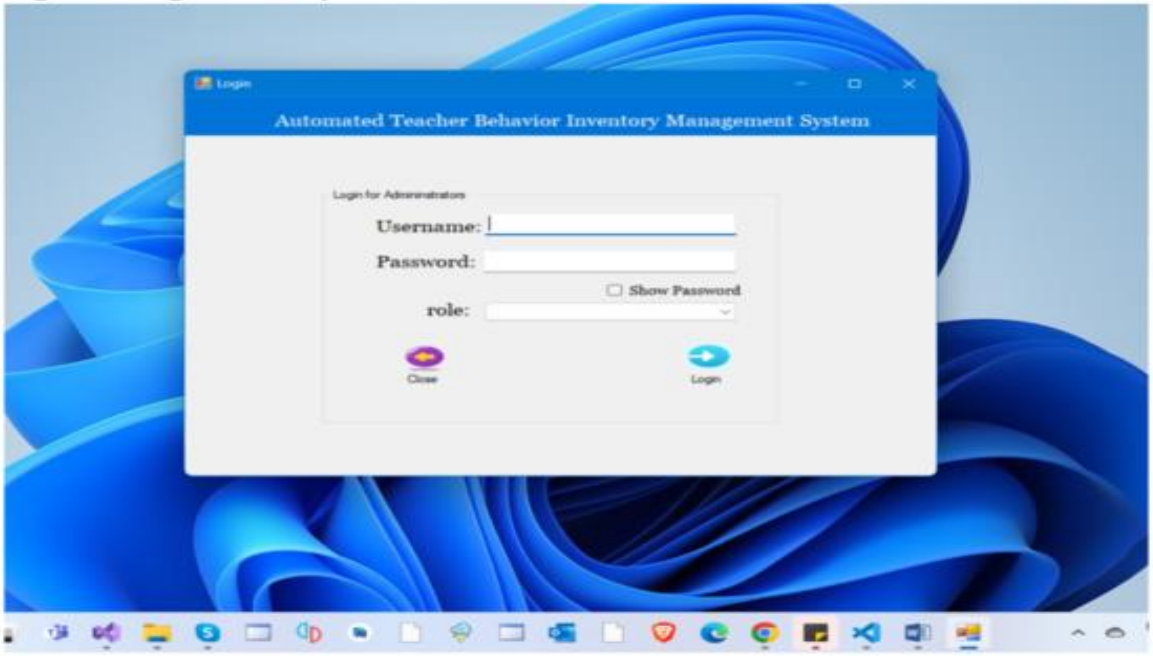
Figure 5 shows the login window for administrators, specifically for users from the Guidance and Human Resource (HR) departments. This login requires a valid username and password, providing a secure gateway for authorized personnel to access administrative features such as managing survey results, teacher profiles, and system reports.

Figure 5. *Login window for administrators*



Figures 6 and 7 present the student dashboard and the survey interface. The student dashboard offers a simple layout with access to begin the survey and the option to log out. To start, students must enter the appropriate teacher ID and subject ID. The survey itself, shown in Figure 7, uses a Likert scale for rating and includes fields for comments and suggestions, all organized under six specific domains. After completing the form and submitting their responses, the process is finished, and no further actions are required from the student.

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Figure 6. *Student dashboard*

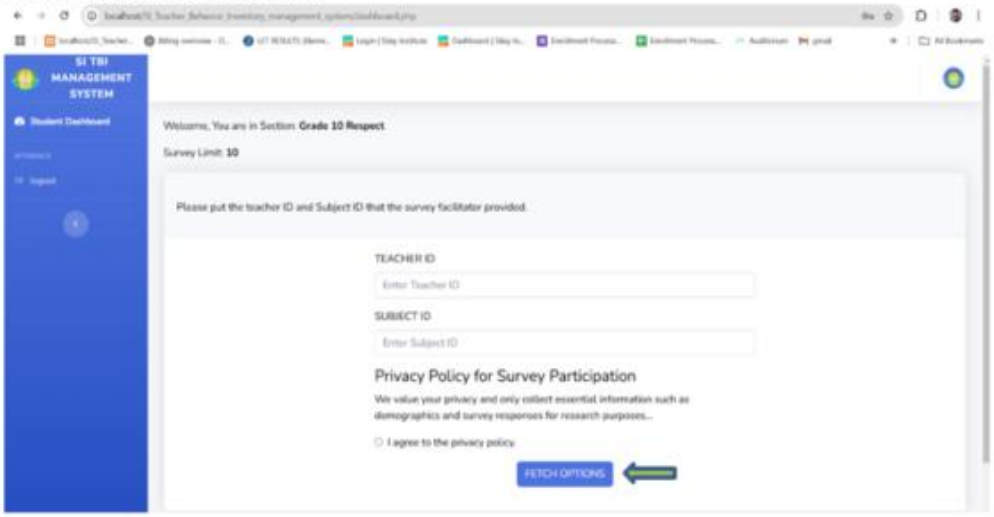
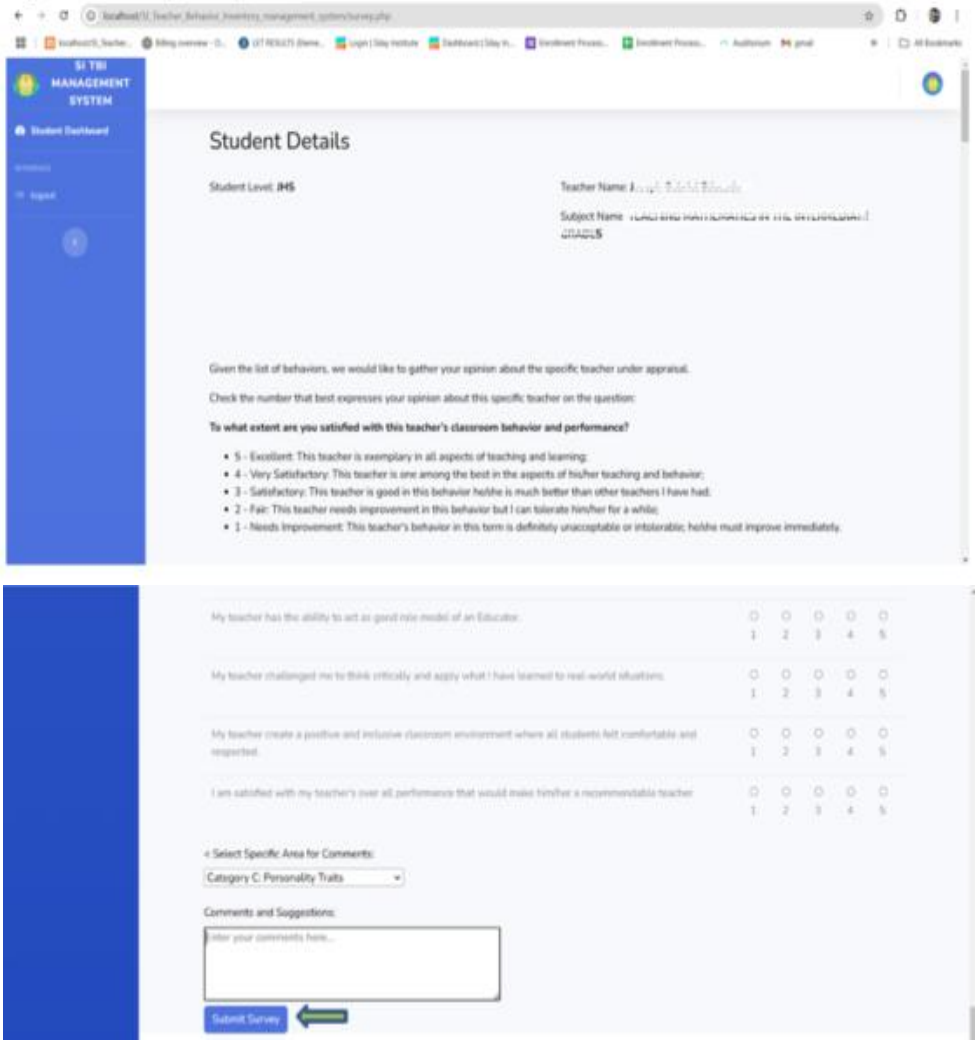


Figure 7. *Survey Interface*



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Figures 8 and 9 showcase the teacher dashboard and the comparison of semester results. Figure 8 presents the teacher dashboard, which displays the subjects taught along with their TBI result scores. However, the teacher still requires the guidance department to interpret these scores and provide AI-driven recommendations. Figure 9 illustrates the comparison of semester results, using a line graph to track performance across six domains in the same subject taught. This visualization allows teachers to assess their performance over time in a clear and insightful manner.

Figure 8. *Teacher dashboard*

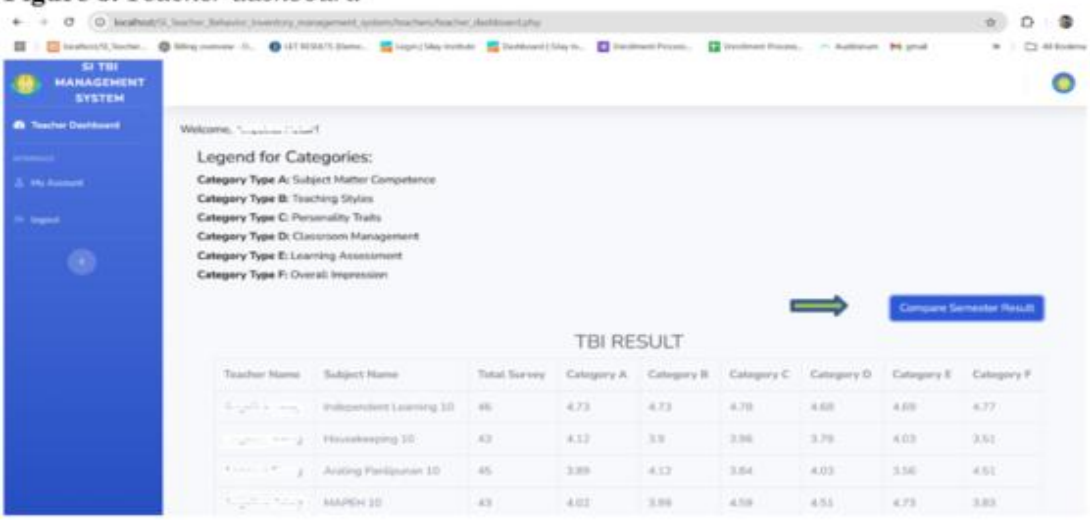

Figure 9. *Compare TBI result per semester*

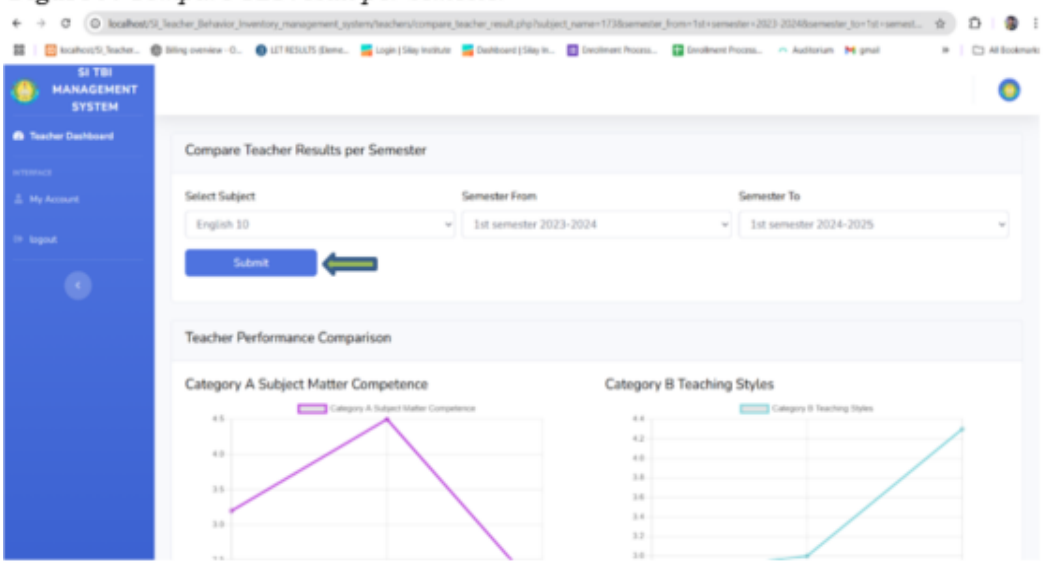

Figure 10 displays the dashboard for the Guidance department, where they can view the total number of teachers, subjects, and surveys. The dashboard includes buttons for managing teachers, subjects, questions, surveys, and generating reports, providing easy access to all administrative functions related to teacher evaluations and survey management.

Figure 10. *Administrator dashboard (Guidance department)*

Figure 11 shows the Generate Report window. When the administrator clicks the "Generate Report" button, the system displays all categorized survey results per teacher and subject. The results are organized according to the six domains, making it easier for the administrator to analyze teacher performance in each area.

Figure 11. *Generate Report window*

Figure 12 shows the interface after clicking the "Generate AI" button. The system sends the subject and the six domain scores to the OpenAI API for analysis. Once processed, the AI returns data-driven recommendations, which are displayed using a Tkinter interface. The guidance staff can review the suggestions and, if satisfied, save them as a PDF and to the database for the HR department to view. If the recommendations are not satisfactory, the guidance staff can simply click "Generate AI" again to receive a new set of recommendations.

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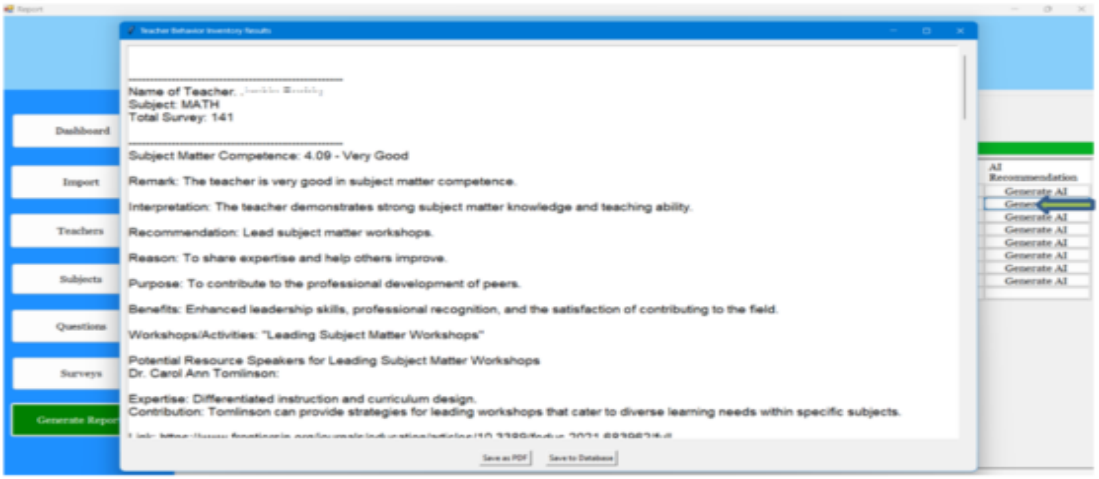
Figure 12. *Generate AI Recommendations*



5. OTHER NONFUNCTIONAL REQUIREMENTS

Performance Requirements. To evaluate the performance of the Automated Teacher Behavior Inventory Management System with AI-driven Recommendations, the proponent conducted a comprehensive assessment focusing on accessibility and usability across different interfaces. Feedback was gathered from 30 respondents, including teachers and students. Utilizing a five-point Pomel Scale, where 5 represented Excellent, and 1 represented Very Low, participants rated 15 key performance indicators related to system functionality and user experience. The findings, summarized in Table 1, provided insights into the system's effectiveness and highlighted areas for potential enhancement.

Table 1. *Summary Features and Attributes of Automated Teacher Behavior Inventory Management System with AI-driven Recommendations*

Product Features	**Software Quality Attributes**
User-Friendliness (Usability)	Operability, Training, and Communicativeness
Compatibility (Adaptable)	Operability and Consistency
Reliability (Reliability)	Accuracy, Consistency, and Simplicity
Interactivity (Human Engineering)	Simplicity and Communicativeness
Learning Reinforcement (Understandability)	Consistency, Conciseness, and Modularity
Dynamic Environment (Flexibility)	Operability, Expandability, and Modularity

Table 2 shows the mapping between the system's product features and corresponding software quality attributes, along with their computed mean scores and interpretations based on the evaluation results.

Table 2. *Mapping of Features and Relevant Measures*

Product Features	Software Quality Attributes	Mean	Interpretation
User-Friendliness (Usability)	Operability	4.43	Excellent
	Training	4.49	Good
	Communicativeness	4.72	Excellent
Compatibility (Adaptable)	Operability	4.52	Excellent
	Consistency	4.15	Good
Reliability (Reliability)	Accuracy	4.57	Excellent
	Consistency	4.70	Excellent
	Simplicity	4.85	Excellent
Interactivity (Human Engineering)	Simplicity	4.47	Excellent
	Communicativeness	4.98	Excellent
Learning Reinforcement (Understandability)	Consistency	4.40	Good
	Conciseness	4.41	Good
	Modularity	4.88	Excellent
Dynamic Environment (Flexibility)	Operability	4.34	Good
	Expandability	4.90	Excellent
	Modularity	4.82	Excellent

The study involved 30 respondents, composed of 20 students, two members of the guidance department, two from the IT department, three from the HR department, and three faculty members. The evaluation utilized a five-point Pomel scale to assess the performance of the Automated Teacher Behavior Inventory Management System with AI-driven Recommendations. Google Forms was used as the platform for survey distribution due to its accessibility and ease of integration with data analysis tools. Upon collection, the responses were tabulated and analyzed using the Pomel scale to evaluate each product feature in relation to its software quality attributes.

User-Friendliness. The system was developed with a focus on user-friendliness, ensuring that users can intuitively navigate and operate its features. Survey results showed the following mean scores for the associated quality attributes: Operability (M = 4.43), Training (M = 4.49), and Communicativeness (M = 4.72). The overall mean score for this feature was 4.55, interpreted as "Excellent."

Compatibility. This feature highlights the system's ability to function across multiple platforms and devices. It scored 4.52 in Operability and 4.15 in Consistency. The combined average was 4.34, interpreted as "Good."

Reliability. Reliability refers to the system's performance stability under defined conditions. It received high scores across its quality attributes: Accuracy (M = 4.57), Consistency (M = 4.70), and Simplicity (M = 4.85), with an overall average of 4.71, rated as "Excellent."

Interactivity. This feature evaluates the system's capacity for user engagement and responsiveness. The results showed: Simplicity (M = 4.47) and Communicativeness (M = 4.98), yielding a mean of 4.73, interpreted as "Excellent."

Dynamic Environment. This refers to the system's ability to dynamically adjust its interface and navigation based on user actions and progress. The quality attribute scores were Operability (M = 4.34), Expandability (M = 4.90), and Modularity (M = 4.82). The resulting mean was 4.69, classified as "Excellent."

Safety and Security Requirements. The system's safety and security requirements were designed to protect user data, prevent unauthorized access, and ensure overall system integrity.

***Data Authorization*.** The system includes role-based access control, allowing only authorized users to perform sensitive tasks. Each user's access is limited according to their role within the institution. For example, only designated administrators have access to student survey data. Audit logs also track user actions for accountability.

Data Backup. The system integrates both manual and automatic backup mechanisms. A "Backup" button enables guidance personnel to download an SQL file of the database. Additionally, automated backups are scheduled twice daily: once at 8:00 AM and again at 5:00 PM. These backups are saved both locally and to a designated secondary station, ensuring data redundancy and recoverability.

Installation Directory. The system setup involves the installation of XAMPP (Apache, MySQL, and PHP) and requires PHP version 7.3. All files are organized under the htdocs directory of XAMPP, making deployment and maintenance streamlined and manageable.

Internet Access and Network Security. The system is confined to the institution's local area network to reduce external threats. It is accessible only through campus-based computers. Additional layers of protection include firewalls to filter unauthorized traffic and encryption protocols to secure data in storage and transmission.

Data Retention Policy. In compliance with Silay Institute's policies, all data is retained for five (5) years. After this period, data is securely deleted both from active databases and from backup copies. This ensures that outdated records are removed in a way that aligns with institutional and data privacy standards.

Software Quality Attributes and Metrics. This section presents the measures and criteria used to evaluate the system features of the Automated Teacher Behavior Inventory Management System with AI-driven Recommendations. Each feature corresponds to specific software quality attributes, which were carefully assessed to ensure clarity, reliability, and detectability from the users' perspective. The system was evaluated based on key attributes such as usability, performance, reliability, security, and maintainability. Respondents rated these attributes favorably, indicating that the system was easy to use, consistent in performance, secure from unauthorized access, and manageable for ongoing maintenance and updates. Metrics such as user satisfaction, task completion time, system uptime, and responsiveness were considered to validate the system's efficiency and effectiveness. Overall, the results affirmed that the system performed reliably and met quality standards across various operational conditions.

Data Analysis. After the data were collected, the proponent used frequency distribution to evaluate whether the objectives of the Automated Teacher Behavior Inventory Management System with AI-driven Recommendations were met. The survey responses were analyzed using statistical methods such as percentile rank and mean score to assess system quality attributes. Formula 1 was

applied to compute the percentile rank, which determined how each score compared relative to the rest of the dataset. Formula 2 was used to calculate the mean score for each attribute, providing an average measure of performance.

Formula 1. ***Percentile Rank***

$$\text{Percentile Rank of } x = \left(\frac{\text{No. of values below } x}{n} \right) \times 100$$

Formula 2. ***Mean***

$$\text{Mean} = \frac{\text{Sum of All the Scores}}{\text{Number of Scores}}$$

Table 3 below shows the software quality evaluation results based on key attributes such as Security, Modularity, Observability, and others. These criteria were assessed by users to determine the effectiveness, efficiency, and robustness of the system. Each attribute was rated using a Likert scale, and the results reflect the system's overall excellence in fulfilling user and technical expectations.

Table 3. *Results of Validation Testing of the System*

Software Quality Attributes	Mean	Interpretation
Security	4.87	Excellent
Modularity	4.90	Excellent
Observability	4.87	Excellent
Instrumentation	4.87	Excellent
Execution Efficiency	4.87	Excellent
Expandability	4.91	Excellent
Data Commonality	4.91	Excellent
Error Tolerance	4.89	Excellent
Decomposability	4.87	Excellent
Generality	4.89	Excellent
Traceability	4.87	Excellent
Audibility	4.91	Excellent
Software System Independence	4.91	Excellent
Completeness	4.91	Excellent
Conciseness	4.87	Excellent
Communication Commonality	4.89	Excellent
Error Correction	4.89	Excellent

Security. This software attribute ensures that the application protects user data and prevents unauthorized access. The system implements basic security protocols to safeguard user interactions. Based on the responses, it received a mean score of 4.87, which indicates it is "Excellent" in terms of maintaining data integrity and security.

Modularity. Modularity evaluates how well the system's components are divided into independent and manageable sections. Each major function—such as survey, computation, and AI

recommendation—is clearly separated. The system received a mean rating of 4.90, indicating "Excellent" modular design and organization.

Observability. This attribute refers to the system's ability to make internal states and behaviors visible during operation. With clear outputs and user feedback, the application scored 4.87, an "Excellent" rating in observability.

Instrumentation. This evaluates how well the system supports tracking and diagnostics for performance and issues. The system scored 4.87, showing an "Excellent" capability to support monitoring and analysis.

Execution Efficiency. This quality measures how quickly and effectively the system responds to user actions. The application runs smoothly with optimized response times, earning it a mean of 4.87, considered "Excellent."

Expandability. This refers to how easily the system can accommodate future features or changes. Designed with scalability in mind, the system received a score of 4.91, reflecting "Excellent" expandability.

Data Commonality. This attribute assesses how shared data is managed across system modules. The system scored 4.91, signifying "Excellent" performance in ensuring consistent data handling.

Error Tolerance. This measures the system's ability to handle input or process errors without crashing. With a mean score of 4.89, the system demonstrated "Excellent" tolerance and recovery behavior.

Decomposability. This evaluates how well the system functions can be broken into smaller, independent parts for maintenance and updates. The system scored 4.87, rated as "Excellent."

Traceability. This attribute pertains to the ability to trace processes and changes throughout the system. With clear logs and system behavior tracking, it achieved a score of 4.87, interpreted as "Excellent."

Audibility. This quality measures how well system actions can be reviewed and audited. The system received a mean of 4.91, signifying "Excellent" support for accountability and transparency.

Software System Independence. This refers to the system's ability to function regardless of the underlying software or hardware. Operating across standard platforms, it scored 4.91, an "Excellent" rating.

Completeness. This attribute reflects how fully the system delivers all expected features and functions. Addressing key modules like AI recommendations, reporting, and analytics, the system earned a score of 4.91, indicating "Excellent" completeness.

Conciseness. This assesses the simplicity and clarity of the system's structure and code. The system achieved a mean score of 4.87, demonstrating "Excellent" conciseness.

Communication Commonality. This pertains to the system's ability to communicate effectively with users across different modules. It scored 4.89, which is interpreted as "Excellent."

Error Correction. This attribute refers to how well the system can detect and correct issues. With a mean of 4.89, the system was rated "Excellent" in error-handling capabilities.

Testing Requirements. Testing was conducted to ensure the overall functionality, usability, and reliability of the Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations. Since no system is perfect, testing played a vital role in identifying defects and validating that the application met all intended requirements. The testing phase involved system-level evaluations, real user trials, and AI response analysis to refine the system and enhance its performance.

Unit Testing. Unit testing was performed to verify that individual components of the system—such as the survey form interface, scoring computation module, database interaction scripts, and AI-generated recommendations—functioned correctly in isolation. Each module was tested by the developer to ensure that input validation, score computation logic, and user interactions behaved as expected. This phase allowed the identification and correction of errors before modules were integrated into the full system.

Integration Testing. Integration testing was carried out after combining individual modules, such as the student survey input, teacher score processing, and the AI feedback generator. The testing aimed to ensure smooth communication between these interconnected parts. Tools like SQL logging, Python console testing, and form submission monitoring were used to trace data flow between the modules. This testing confirmed that the AI recommendations aligned with survey responses and that results were correctly logged and displayed on the dashboard.

6. PROJECT MANAGEMENT

Hardware Recommendations. The successful deployment of the Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations depends on reliable hardware to ensure smooth and uninterrupted operations. The hardware components were selected based on the system's performance requirements, such as handling AI-generated recommendations, supporting offline access, and maintaining secure data processes. The developer evaluated both the server-side (admin application) and client-side (survey interface) demands to identify the most suitable hardware setup. The selected specifications support the efficient running of the desktop-based analytics module and the web-based survey application. While the listed requirements represent the minimum configuration, the system remains scalable and open to hardware upgrades for future enhancements. The table 4 presents the recommended hardware setup for optimal system functionality:

Table 4. *Hardware Specification*

Computer Requirements: (Admin and Server)	
Processor	Intel Core i7 11th gen processor with a minimum of 3 GHz clock speed.
RAM/Memory	16 GB of RAM
Hard Drive	1TB SSD
Client Requirements: (Student)	
Processor	Intel Core i5 processor with a minimum of 2 GHz clock speed.
RAM/Memory	16 GB of RAM
Hard Drive	500 GB SSD

Actual Hardware Specification

Computer Requirements: (Admin and Server)	
Processor	Intel Core i7 12th gen processor with a minimum of 3 GHz clock speed.
RAM/Memory	32 GB of RAM
Hard Drive	2 TB SSD
Client Requirements: (Student)	
Processor	11th Gen Intel Core i5 processor with a minimum of 3 GHz clock speed.
RAM/Memory	16 GB of RAM
Hard Drive	1TB SSD

Software Recommendations. The developer has identified specific software necessary to support the system's functionality and overall operation. These recommended applications are intended to ensure proper performance during the implementation phase. The following list outlines the suggested software specifications to help ensure system compatibility.

Table 5. *Software Recommendations*

Computer Requirements: (Admin and Server)	
Operating System	Windows10 or higher
Web Server	Apache HTTP Server
Database Management System	MySQL Database
Programming Languages	PHP 7.3 or higher, Microsoft Visual Basic.NET, Python.
Python Libraries	Pandas
API	OpenAI API
Web Browser	Google, Mozilla Firefox, Microsoft Edge

Product Feasibility Assessment. After identifying the technical requirements and user needs, the proponent evaluated the feasibility of implementing the Automated Teacher Behavior Inventory Management System with AI Driven Recommendations. This feasibility assessment aimed to analyze the potential strengths and weaknesses of the system, as well as external factors such as risks, opportunities, and limitations. Conducting this evaluation is essential in supporting informed decisions regarding system development and deployment. The assessment further explores key criteria for determining product viability, including marketing strategy, organizational management, economic considerations, and development planning. To ensure the system meets the required technical standards

and provides meaningful benefits, at least three Information Technology specialists will review the proposed system in line with the guidelines set by the technical committee.

Time Management. The system administrator will oversee system activities while staff members manage the collection and processing of survey responses from students. This framework supports effective time management by promoting deliberate planning and time allocation for specific tasks, improving the overall efficiency, productivity, and functionality of the system.

Communication, Coordination, and Team Composition. As part of the development process, the proponent conducted interviews and observations involving students and staff. The data collected informed the design of the system's objectives and functions. The system was designed to streamline operations, making the process of evaluating teacher behavior more accessible and efficient for administrators, staff, and students alike.

Risk Management. There are three primary risks associated with the implementation of the Automated Teacher Behavior Inventory Management System with AI Driven Recommendations: data breaches and loss, technological risk, and operational risk. For data breaches and loss, unauthorized access to survey data, teacher evaluations, and AI generated recommendations could compromise confidentiality and violate data protection policies, leading to privacy issues and potential legal implications. In terms of technological risk, system integrity may be affected by hardware failures, software vulnerabilities, or compatibility issues between modules (PHP, VB.NET, and Python). These problems could result in system downtime, data corruption, or unauthorized access. With regard to operational risk, human errors such as incorrect data input, insufficient training, or failure to follow procedures may disrupt the system workflow and hinder accurate evaluations.

To mitigate these risks, several measures must be enforced. First, strict access control should be implemented to ensure that only authorized personnel, such as system administrators and HR staff, can access sensitive data and system functions. Second, regular backups should be scheduled every time the system is used to prevent data loss and ensure quick recovery in the event of system failure. Lastly, training and awareness programs must be conducted to educate all users on proper system usage, data handling procedures, and security practices. These measures will minimize risks and maintain the reliability, integrity, and security of the system.

Policy Development. Policies should be established to ensure the proper use, maintenance, and security of the Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations. A data retention policy must define the duration for storing survey data, analytics reports, and recommendations, along with guidelines for secure disposal to maintain data privacy. An incident response plan should also be developed to address potential system failures, data breaches, or AI-related errors, ensuring that appropriate steps are in place for timely resolution and minimal disruption. Furthermore, a training policy should be implemented to equip users—administrators, HR personnel, teachers, and IT staff—with the necessary knowledge on system usage, data handling, and AI-generated insights. These policies will support responsible system use, strengthen data protection, and promote effective decision-making based on accurate and secure information.

7. SUMMARY

The Automated Teacher Behavior Inventory Management System with AI-Driven Recommendations was developed to enhance teacher performance management at Silay Institute. The system collects evaluations across six categories: Subject Matter Competence, Teaching Styles, Personality Traits, Classroom Management, Learning Assessment, and Overall Impression. These evaluations are gathered through a web-based survey system and processed to generate detailed reports. AI-driven recommendations provide tailored suggestions for professional development, such as

workshops and training programs. A user-friendly dashboard enables administrators to manage and visualize data, streamlining the evaluation process and reducing administrative work while improving teaching quality.

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