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SCHOOL CO-CURRICULAR PERFORMANCE SYSTEM: A WEB-BASED APPROACH TO STREAMLINING CO-CURRICULAR MANAGEMENT IN SCHOOLS

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ABSTRACT

Managing co-curricular activities is essential for fostering students' holistic development, yet conventional approaches that rely on paper-based records and spreadsheets are often inefficient and error-prone. This study presents the design and development of a web-based School Co-Curricular Performance System to digitise and automate the management of student participation, teacher assignments, and performance tracking. Developed using PHP, MySQL, and HTML/CSS, the system adopts an Agile methodology to support iterative improvements based on user feedback. Core features include student and teacher record management, event scheduling, performance report generation, and role-based authentication. Field testing was conducted with teachers at SMK Bukit Kayu Hitam to evaluate usability and functionality. The results demonstrated improved data retrieval, system responsiveness, and record consistency. The findings support the system's effectiveness in reducing administrative workload and enhancing the accuracy and efficiency of co-curricular data management. This study is significant because it offers a practical, scalable digital solution for Malaysian schools to improve the efficiency, accuracy, and transparency of co-curricular management through centralised, role-based data management. Future enhancements will include mobile access, advanced security features, and intelligent recommendation capabilities.

Keywords: Co-Curricular Management, Web System, Educational Technology, Agile Methodology, Student Performance Tracking

INTRODUCTION

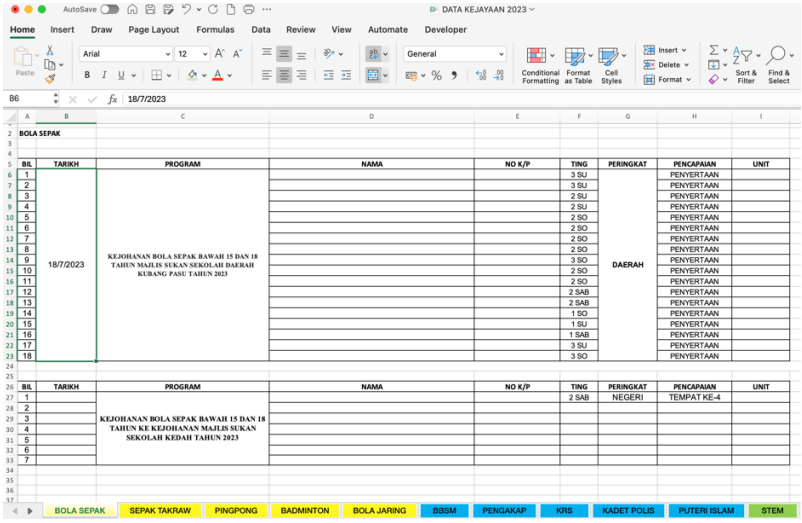
Co-curricular activities play an essential role in supporting students' holistic growth by cultivating social skills, leadership qualities, discipline, and teamwork. With the increasing integration of digital technologies in education, AI-driven and automated systems have become central to improving learning and administrative efficiency across institutions (Wang et al., 2024). These activities are designed to complement academic learning and help students develop well-rounded competencies crucial to success in life and future careers. In Malaysian secondary schools, students are required to participate in three main types of co-curricular activities: Sukan Sports and Games, Academic Societies, and Clubs or Uniformed Units. Active involvement in these areas contributes to students' overall development and is a significant component of their co-curricular assessment.

Students earn merit points when they participate in school-, district-, state-, or national-level activities. These accumulated points reflect their level of engagement and activity throughout their schooling years. At the end of secondary school, this performance record plays a critical role in shaping student profiles for higher education admission and scholarship opportunities. The responsibility for recording students' participation and achievements rests with the teachers, who must manage this data accurately and consistently throughout the academic session.

However, one government-endorsed system, PAJSK, is widely adopted in Malaysian schools but provides limited flexibility for real-time performance tracking and role-specific access (PAJSK, n.d.). Despite this, the management process is still conducted manually using printed forms, handwritten logs, or fragmented spreadsheet files. As schools continue to rely on spreadsheet-based methods for co-curricular tracking, they risk accumulating errors that compromise reporting and evaluation. Figure 1 illustrates a typical manual spreadsheet used in Malaysian schools for tracking co-curricular achievement. Each sport or activity is managed on a separate worksheet, and teachers must manually enter student names, identification numbers, performance levels, and participation details. These sheets are not standardised, lack real-time validation, and are highly susceptible to errors, duplication, and formatting inconsistencies.

Figure 1

Example of Manual Spreadsheet-Based Co-Curricular Achievement Tracking in a Malaysian Secondary School



Prior research has shown that different data entry methods lead to varying degrees of error, with visual checking producing significantly more inaccuracies than double-entry techniques (Barchard & Pace, 2011). These conventional methods are not only time-consuming but also prone to human error, including data duplication, misrecording, and information loss. Teachers often face difficulties in retrieving historical participation records, assigning students and teachers to appropriate clubs, and producing accurate performance summaries. Additionally, the manual assignment of teachers to clubs can lead to miscommunication, inconsistent recordkeeping, and delays in decision-making.

One of the most pressing challenges is generating timely and accurate co-curricular reports. These reports are essential for tracking student involvement, identifying top performers, and supporting school-level recognition or award ceremonies. Some commercial solutions, such as GoSchooler (GoSchooler, 2021) and Curriculus (GR Tech, n.d.), provide digital tools for managing student activities. However, these often focus on general school management rather than role-based co-curricular performance tracking. Without an integrated digital system, administrative staff must manually consolidate data from multiple sources, increasing the risk of inaccuracy, inefficiency, and data security concerns. Digital systems have been shown to improve the efficiency and accessibility of educational management processes, particularly through mobile applications designed for school operations (Abildinova et al., 2016).

To address these limitations, this study proposes developing a web-based School Co-Curricular Performance System. The system is designed to automate the end-to-end process of student record management, teacher assignments, event tracking, and report generation. By integrating a structured database system with secure role-based access, it offers a centralised and scalable solution that reduces administrative burden, improves data accuracy, and enhances decision-making. The system is accessible to teachers, secretaries, and extracurricular senior assistants through dedicated dashboards tailored to their roles. While technology can streamline educational processes, it is not a replacement for educators, but a tool to support them more effectively (GoSchooler, 2021). The system was designed and piloted specifically for SMK Bukit Kayu Hitam, a secondary school in Kedah, Malaysia, to address the challenges its teachers and administrative staff face in efficiently managing co-curricular records.

This paper outlines the system's design, development methodology, and real-world implementation. It also presents usability evaluation results based on feedback from school staff, demonstrating the system's positive impact on administrative workflows and highlighting opportunities for future enhancements such as mobile app development, AI-powered recommendations, and stronger data protection mechanisms.

RELATED WORK

The management of co-curricular activities in schools has traditionally relied on manual processes and simple digital tools such as spreadsheets and paper-based documentation. These methods are susceptible to data loss, input errors, and inefficiencies in tracking and reporting. Inaccurate student records, misplaced data, and difficulty retrieving historical information are common issues that hinder administrators and educators from making timely, data-driven decisions (Barchard & Pace, 2011).

Several systems have emerged to address these challenges, each offering various features with differing levels of functionality and automation. For example, the Sistem Pengurusan Kokurikulum (Men & Ren) in Malaysia provides a centralised platform for managing co-curricular performance. However, its reliance on manual input and lack of advanced features limit its effectiveness (PAJSK, n.d.). Similarly, GoSchooler,

a cloud-based school management system, offers general student activity tracking but lacks tailored tools for detailed co-curricular reporting and teacher-specific assignments (GoSchooler, 2021). Another example is Curriculus by GR Tech, which supports club and student management but is not fully customizable to varying administrative roles in Malaysian schools. Additionally, Microsoft Excel-based tools such as "Data Kejayaan" are widely used due to their accessibility, yet they lack integration, security, and automation capabilities (GR Tech, n.d.).

The OPTIMO system attempts to bridge this gap by offering modules for performance tracking and reporting across various co-curricular domains such as music, sports, cadets, drama, and outdoor programs (Optimo Systems, n.d.). Each module is tailored to the unique needs of its department, supporting features such as attendance tracking, equipment management, event scheduling, and communication with students and parents. However, many of these systems do not adequately support role-based access control, centralised event coordination, or live data synchronisation. Most also lack built-in usability evaluation mechanisms and flexible feedback systems that enable continuous improvement based on stakeholder input. While these platforms provide operational features, peer-reviewed studies remain limited in reporting role-based, real-time co-curricular performance tracking in an integrated design.

Recent academic evidence further supports the need for secure, centralised, and role-aware school information systems. Access control is consistently highlighted as a core security requirement in educational information systems, with recent studies discussing the use of role-based access control (RBAC) and access-control architectures to protect sensitive educational records and enforce role-specific privileges (Peng et al., 2022; Kabier et al., 2023). In school management contexts, recent system studies also emphasise that role-based design improves accountability and safer handling of administrative functions in web-based school platforms (Sabo et al., 2025).

In addition, recent work on education data systems highlights the importance of centralised data management for accurate reporting and decision-making. Education Management Information Systems (EMIS) research shows that centralised and robust data systems support monitoring, planning, and evidence-based improvement. In contrast, weaknesses in data structure and data availability can limit meaningful analysis and operational decision-making (Kaindaneh et al., 2024). Broader educational digital transformation literature also reinforces that effective digital systems can improve efficiency and administrative capability when aligned with real institutional needs (Haleem et al., 2022).

Therefore, despite the availability of various tools and platforms, a gap remains in the literature and practice for an integrated web-based co-curricular management system that combines (i) role-specific access control, (ii) centralised co-curricular records, and (iii) efficient participation tracking and reporting in a single platform aligned with real school workflows. This study addresses the gap by proposing and implementing a role-based School Co-Curricular Performance System, supported by a centralised database design and field testing in an operational secondary school setting.

METHODOLOGY

The development of the School Co-Curricular Performance System adopted the Agile methodology, chosen for its iterative nature and adaptability to evolving user needs. This section outlines the phases of the methodology used throughout the system development lifecycle: requirements gathering, design, development, testing, deployment, and review. It is depicted in Figure 2.

Figure 2

Agile Development Lifecycle (Ghimire & Charters, 2022)

The Agile development model was chosen to allow regular stakeholder feedback and flexible implementation, aligning with findings that Agile practices enhance communication and project outcomes (Klotins et al., 2021; Ghimire & Charters, 2022). Unlike the traditional Waterfall model, Agile enabled parallel development and iterative adjustments, particularly in response to input from teachers and administrative staff during school-based testing. Each phase produced incremental improvements, and modules were reviewed and revised after every sprint.

During the requirements-gathering phase, structured interviews were conducted with teachers who were actively involved in co-curricular supervision. These discussions highlighted recurring administrative difficulties, such as duplicate data entry, teacher misassignment, and inconsistent recordkeeping practices. In addition, paper-based forms and spreadsheet templates used by schools were reviewed to identify commonly recorded fields and frequent reporting issues. Insights from this phase guided the prioritisation of system features, including event creation, achievement tracking, and role-based user access control.

The design phase began with the creation of low-fidelity wireframes to visualise the system's navigation and layout. Users reviewed these prototypes to ensure intuitiveness before progressing to high-fidelity interactive mockups. A formal data model was constructed using an Entity-Relationship Diagram (ERD) to represent relationships among entities such as students, teachers, events, and co-curricular categories. Design considerations also included security features such as password protection, CSV data handling, and custom dashboards based on user roles.

The system was developed using PHP for server-side operations, MySQL for database management, and HTML/CSS/JavaScript for frontend interfaces. The implementation followed a modular approach, with separate development of the login system, student and teacher management modules, event registration, and performance report generation. Each module was tested in isolation before full system integration. Data validation mechanisms were embedded throughout to ensure record accuracy and prevent inconsistencies.

Testing involved both technical validation and real-world field trials. Unit and integration testing were carried out during development, followed by hands-on testing at SMK Bukit Kayu Hitam, where seven teachers performed typical tasks such as adding events, managing participants, and generating reports. Feedback was collected using a structured Google Form accessed via QR code. This approach aligns with

established usability testing practices that emphasise user-centred evaluation and structured feedback collection to inform iterative design improvements (Bandi & Heeler, 2013). Positive responses were recorded regarding system speed and ease of use, while minor issues, such as delayed search results, were addressed before final deployment.

The system was deployed on a secure web server, configured to support encrypted data transactions and user authentication. Prior to the official rollout, training sessions were conducted to introduce staff to the system, accompanied by user manuals and troubleshooting guides. Technical support was provided during the initial adoption phase to ensure smooth onboarding and address emerging concerns.

Post-deployment, a review phase was conducted to evaluate user satisfaction and gather suggestions for system enhancement. Feedback from secretaries and co-curricular coordinators included requests for shortcut buttons, improved homepage layout, and advanced filtering options. These inputs were documented and prioritised for inclusion in future development cycles. The modular system architecture supports these enhancements and enables the future integration of mobile apps and AI-powered features to personalise student engagement further.

DESIGN AND DEVELOPMENT

This section outlines the architectural and functional design of the School Co-Curricular Performance System. The system was designed to support three main user roles—Accompanying Teachers, Secretaries, and Extracurricular Senior Assistants—each with clearly defined access rights and responsibilities. The system follows a role-based access control model to ensure that each user interacts only with the features relevant to their role.

4.1 Use Case Design and User Roles

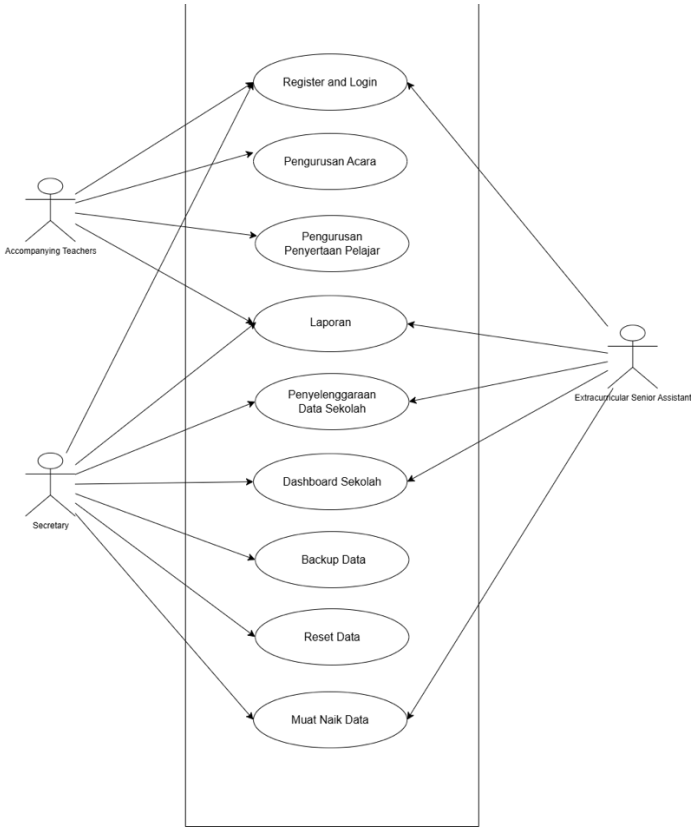
The system architecture was modelled using Unified Modelling Language (UML) use case diagrams to identify the core interactions between system users and features. The use case diagram (Figure 3) illustrates how different users engage with the platform based on their responsibilities.

- Accompanying Teacher: Responsible for creating events, registering student participation, assigning performance levels, and generating reports.
- Secretary: Manages club information, assigns teachers to clubs, handles bulk data uploads (student/teacher), and maintains system data.
- Extracurricular Senior Assistant: Oversees overall co-curricular activities, monitors teacher participation, generates school-wide performance dashboards, and validates student engagement levels.

Each role is associated with a dedicated homepage and a functional dashboard that aggregates tasks and streamlines access to frequently used features. This approach improves usability and reduces training time, especially for users with limited IT experience.

Figure 3

User of the System



4.2 Functional Requirements

The system includes several key features aligned with the operational needs of Malaysian schools. These functionalities were derived from stakeholder interviews and analysis of manual processes currently used in co-curricular reporting and planning. The main functional requirements are as follows:

- User Authentication: Role-based login to distinguish between teachers, secretaries, and administrators.
- Student and Teacher Management: Add, edit, and delete records, including names, IDs, roles, club affiliations, and achievement levels.
- Club and Category Management: Organise clubs under defined categories such as sports, uniformed units, academic, and non-academic societies.
- Event Creation and Participation Tracking: Teachers can register new events, assign students, and enter performance outcomes.
- Live Search and Filtering: Search student names, filter by category or achievement level, and retrieve records instantly.
- Report Generation: Export student performance reports and participation summaries in Excel format.
- Data Maintenance: Secretaries and senior assistants can upload CSV files for bulk data operations and reset or back up the database.

- Teacher Monitoring Dashboard: Provides administrators with insights into teacher engagement in co-curricular activities.
- Feedback Form: Allows users to provide input on system usability, which feeds into future design cycles.

These functional components were designed to align with school administrative workflows, reduce manual errors, and improve data accessibility across departments.

4.3 Non-Functional Requirements

In addition to core functionalities, the system adheres to several non-functional requirements to ensure optimal performance, security, and adaptability in diverse school environments:

- Performance: The system is designed to respond to user actions—such as searching and retrieving records—within 5 seconds. This responsiveness is maintained even under large data volumes involving hundreds of students, teachers, or events.

- Security: Security mechanisms include secure login protocols, password hashing (e.g., bcrypt), session management, and protection against common web-based threats such as cross-site scripting (XSS), SQL injection, and cross-site request forgery (CSRF).

- Compatibility: The system is compatible with all major browsers (Google Chrome, Mozilla Firefox, Microsoft Edge) and is responsive across desktops, laptops, tablets, and smartphones to ensure seamless access for diverse users.

- Scalability: The system architecture supports expansion. Schools can add new clubs, users, events, and categories without performance degradation. This ensures the system remains usable as the volume of co-curricular data increases over time.

4.4 Database Design

The database design for the School Co-Curricular Performance System was modelled using an Entity-Relationship Diagram (ERD) to represent the logical structure and interconnections among key entities. The ERD ensures data normalisation, integrity, and efficient querying, which are crucial for a web-based application handling large student and teacher datasets. Figure 4 shows the ERD of this system.

The primary entities include User, Student, Teacher, Club, Event, Participation, and Report. Each entity is uniquely identified by a primary key and linked to other entities through foreign key relationships. For example, the Participation table serves as a junction table linking students to events, allowing the system to track which students participated in which events and at what level (school, district, etc.).

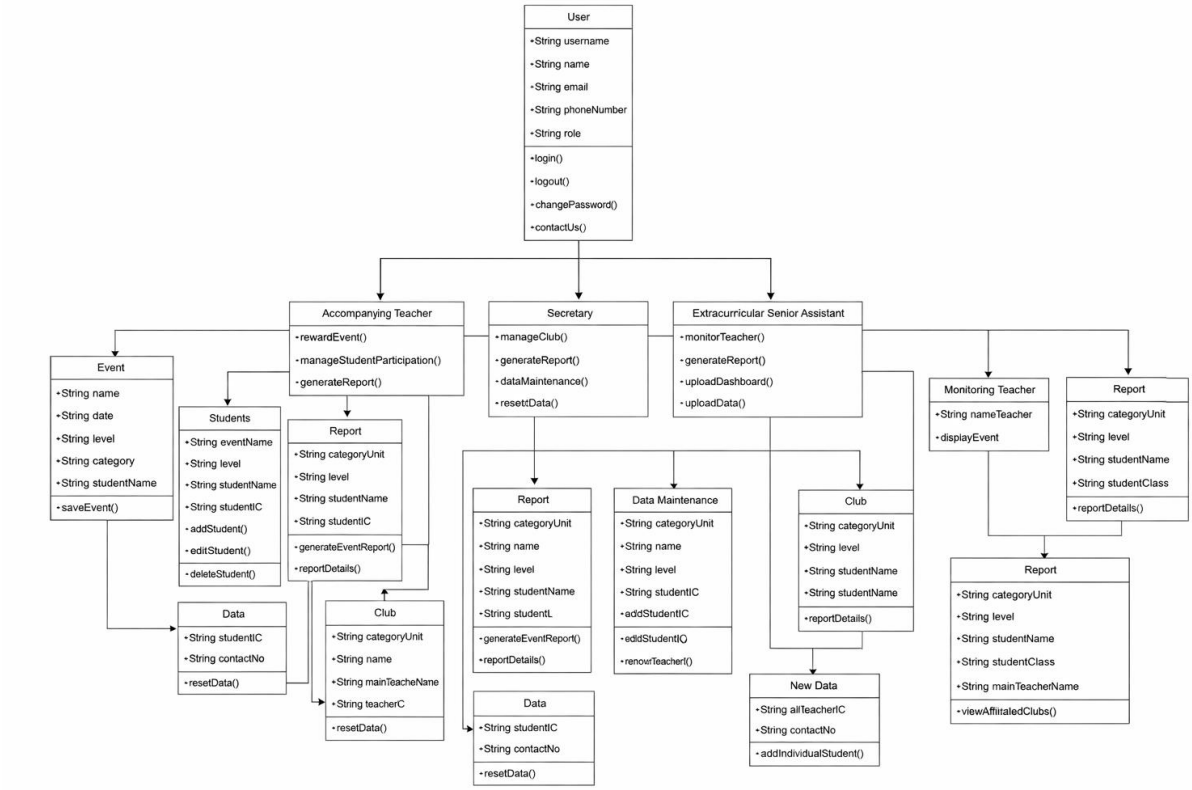
- The User entity includes attributes such as user_id, name, role, and login credentials, supporting role-based access control.
- The Student and Teacher entities capture demographic and assignment data relevant to co-curricular involvement.
- The Club entity holds information about club categories and teacher assignments.

- The Event entity records event metadata (e.g., name, date, location, level), while participation links these events to students.
- The Report entity supports export functionality and aggregates participation and performance data.

This ERD model enables efficient data retrieval for reports, reduces redundancy, and supports system scalability as more records and users are added over time.

Figure 4

Entity Relationship Diagram (ERD)



4.5 User Interface Design

The School Co-Curricular Performance System was developed with a strong emphasis on usability, accessibility, and responsiveness. The user interface was tailored to match the operational needs of different user roles—Accompanying Teacher, Secretary, and Extracurricular Senior Assistant—ensuring that each user could efficiently perform their respective tasks with minimal learning curve.
The system's interface was intentionally designed with dropdown menus, guided fields, and role-specific dashboards to reduce cognitive load and minimise data entry errors. Prior research highlights that interface design significantly influences both the accuracy and efficiency of user input, with well-structured interfaces improving performance and reducing workload (Wilbanks & Moss, 2021).

To support role-based interaction, each user is presented with a dedicated dashboard upon logging in. These interfaces are designed to be simple, intuitive, and accessible on a variety of devices, including desktops, laptops, and tablets. Prior research has shown that thoughtful interface design can significantly reduce

cognitive workload and improve the accuracy and efficiency of data entry (Wilbanks & Moss, 2021). Figures 4-6 illustrate the core interface designs.

The login interface is the system's primary security gateway (Figure 5). It requires users to authenticate using their assigned username and password before accessing any system module. This screen ensures that only authorised personnel, such as teachers, secretaries, and administrators, can access sensitive co-curricular records. The interface design emphasises simplicity and clarity, with a responsive layout and secure input validation to protect user credentials.

Figure 5

Login Interface

The secretary's homepage serves as a control panel for managing school-wide co-curricular operations (Figure 6). From this page, the secretary can perform tasks such as assigning teachers to clubs, uploading or resetting data, generating performance dashboards, and accessing student reports. The layout presents all critical functions through clearly labelled navigation buttons, supporting efficient access to each module.

Figure 6

Secretary Homepage

The Update Entries and Participations Page (Figure 7) is the core operational page for Accompanying Teachers. It allows them to add student participation records for events that they have created. Teachers select an event, then input student details such as name, identification number (IC), class, and achievement level (e.g., "Johan", "Naib Johan"). Once students are added, their names appear in the participation list ("Senarai Pelajar yang Menyertai"). A "Tambah Pelajar" button facilitates quick entry of multiple students, and a "Simpan" button is provided to store the final list. This feature ensures that students' co-curricular achievements are systematically and accurately recorded for future reporting.

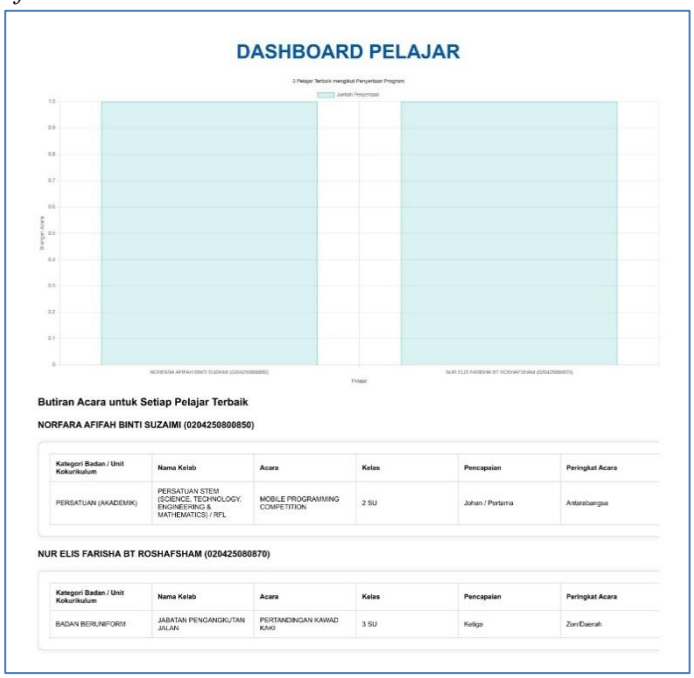
Figure 7

Update Entries and Participations Page

Figure 8 presents a visual summary of student participation throughout the year. The dashboard displays graphs and tables highlighting the most active students, categorised by event type and participation level. It allows teachers and administrators to identify top performers easily and supports planning for end-of-year award ceremonies or co-curricular recognition. The dashboard also includes an export function that allows users to download the information as a PDF, making it convenient for official documentation and school reports.

Figure 8

Student Dashboard Interface



ANALYSIS AND RESULTS

A comprehensive evaluation was conducted to assess the functionality, usability, and overall effectiveness of the School Co-Curricular Performance System: the assessment process combined field testing, user surveys, and performance analysis. Feedback was collected to validate system reliability, user satisfaction, and areas for future enhancement.

5.1 Field Testing

Field testing was conducted at SMK Bukit Kayu Hitam, involving 17 participants comprising teachers and administrative staff. Users interacted with the live system over a trial period, performing key tasks such as event creation, student assignment, data retrieval, and report generation. To ensure feedback diversity, participants included both experienced IT users and individuals with limited technical backgrounds. User feedback was collected via a structured Google Form accessed via a QR code. The evaluation form included both closed-ended questions (Likert scale) and open-ended sections for qualitative input.

5.2 Quantitative Results

Table 1 presents survey results indicating high levels of user satisfaction and system usability. Only minor issues were reported, such as occasional latency during data retrieval and limited interface aesthetics, which were noted for future improvement. No critical bugs or system crashes were encountered during testing. Regarding technical reliability, 58.8% of users reported encountering no system errors, while 29.4% experienced issues only rarely, indicating a high level of system stability across all roles.

Table 1

User Satisfaction and System Usability

Evaluation Metric	Positive Response (%)
Ease of Navigation	88.2% (Very Easy)
System Responsiveness	88.2% (Very Satisfied)
Intuitiveness of Interface	82.4% (Yes)
Ease of Registering Events/Clubs	94.1% (Very Easy)
Usefulness of Data Backup for the New Academic Year	82.4% (Very Useful)
Report Usefulness in Student Evaluation	100% (Yes)
Overall Satisfaction	88.2% (Very Satisfied)

5.3 Qualitative Feedback

Open-ended responses provided further insights, such as users praising the system for its simplicity, feature completeness, and intuitive structure. Suggestions included:

- Adding a button to return to the homepage on every page.
- Implementing document upload functionality.
- Improving UI design with clearer labels and colour consistency.
- Strengthening security through two-factor authentication.

Besides that, teachers appreciated the ability to generate Excel-based reports, monitor participation, and efficiently identify top-performing students—capabilities that were previously time-consuming or unavailable in manual systems.

CONCLUSION AND FUTURE WORK

This study presented the design, development, and evaluation of the School Co-Curricular Performance System, a web-based solution to modernise the management of student co-curricular activities in Malaysian schools. Developed using PHP, MySQL, and web technologies, and guided by the Agile methodology, the system successfully addresses key challenges in co-curricular administration, such as manual data entry, fragmented records, and inefficient reporting.

The system offers key functionalities including student and teacher data management, event creation, real-time performance tracking, and report generation. Field testing at a secondary school revealed high user satisfaction, with respondents citing improvements in data accuracy, administrative efficiency, and user-friendliness. More than 88% of users reported very positive experiences in system navigation, responsiveness, and task execution. Furthermore, built-in feedback mechanisms supported iterative improvements during development and positioned the system for future scalability.

Despite these achievements, the system has limitations, particularly in advanced analytics, scalability, and multi-device integration. To address these issues, several future enhancements are proposed:

- Mobile Application Development- To improve accessibility for users on the go, a mobile version of the system will be developed for Android and iOS platforms. This enhancement will enable real-time access to co-curricular information and event management from smartphones and tablets.
- Advanced Security Features- Future versions will incorporate additional layers of protection, including two-factor authentication, data encryption, and enhanced session management, to ensure data privacy and protect sensitive student and teacher information.
- AI-Powered Recommendation Engine- The system will integrate an artificial intelligence module capable of analysing students' historical participation, interests, and performance to provide personalised recommendations for co-curricular activities. This feature aims to promote student engagement and optimise participation by aligning it with individual strengths and preferences.

By addressing these future directions, the School Co-Curricular Performance System can evolve into a comprehensive platform that not only manages administrative processes efficiently but also enhances students' educational experience and educators' productivity. Overall, this study contributes a practical, role-based, and field-tested web system that can serve as a useful reference for the digital transformation of co-curricular management in Malaysian secondary schools.

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