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Design And Construction of Web And Mobile Based Applications For Extracurricular Management (Case Study: MAN 2 Kulon Progo)

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ABSTRACT

MAN 2 Kulon Progo is one of the madrasahs in Kulon Progo that has various extracurricular activities. In the 2023/2024 academic year, MAN 2 Kulon Progo has 24 extracurricular activities. The large number of extracurricular activities certainly attracts students' attention, but the large number of extracurricular activities makes it difficult for the school to record student data, manage extracurricular activities, and there is a risk of errors in data recording. Based on these problems, a web and mobile-based extracurricular management application was built. The purpose of this study is to build an extracurricular management application that can be used by students to register for extracurricular activities and get information about extracurricular activities, extracurricular supervisors can easily manage student data, and extracurricular teachers can manage extracurricular activities more easily.

Keywords: *Extracurricular, Madrasah, Teacher, Student, Application.*

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INTRODUCTION

Education is an organized system and has a fairly broad function, namely everything related to physical development, health, skills, thoughts, feelings, will, social, and even matters of faith. This shows that schools as official educational institutions have a fairly high burden in carrying out these educational tasks. Moreover, with the very rapid changes today, which greatly affect the mindset and behavior of students, especially those who are still developing in a transition period and searching for their identity (Sukatin et al., 2023). Schools are social systems and require directed and coordinated guidance during the educational process. Therefore, it is expected that students can achieve academic and non-academic goals through extracurricular activities (Hartina & Siahaan, 2024).

Extracurricular activities are educational activities held outside of school hours. These activities aim to help develop students according to their needs, potential,

talents, and interests through activities guided by supervising teachers or education personnel who have the ability and authority in their fields. Extracurricular activities are held periodically and programmed. The extracurricular development program for students in schools aims to support institutional goals in an effort to form a complete Indonesian person based on Pancasila (Rachmat Subarkah et al., 2023). Character formation is a person's life values that have a good impact on their environment through the way they behave in everyday life in the midst of society. Individuals who have good values in themselves and are able to apply them are called people of character (Fitriani, 2022).

The rapid development of technology in the current global era cannot be separated from its influence on the world of education. Global demands require the world of education to constantly adapt to technological developments in an effort to improve the quality of education (Nurillahwaty, n.d.). In facing the digital era and globalization, education needs to continue to adapt to technological developments. Appropriate and intelligent technology integration is expected to not only improve the quality of learning but also reduce the gap in access to education. By utilizing technology wisely, education in Indonesia will experience significant acceleration, creating a generation that is more skilled, knowledgeable, and ready to compete in the global world (Trenggono Hidayatullah et al., 2023).

MAN 2 Kulon Progo is a madrasah that has 24 extracurricular activities, namely Qiro'ah, Social Studies and Humanities Research Extracurricular, Athletics, Chess, Choir, Rugby, Broadcasting, Scouts, Tonti, Badminton, Table Tennis, Calligraphy, Volleyball, Music, PMR, Dance, Cinematography, Tahfidz, Hadroh, Science Research Extracurricular, Basketball, Pencak Silat, Kempo, and Men's Futsal. The large number of extracurricular activities will certainly make it difficult for the school to manage student data, extracurricular management will be less than optimal, student attendance recording will be less than optimal, and there will be a lack of coordination between extracurricular supervisors and extracurricular teachers. In addition, information that has not been properly documented regarding extracurricular achievements, so a system is needed that can properly document extracurricular achievements and competitions (Amellia Insani & Fatmawati, 2023).

With the development of technology, a web and mobile-based extracurricular management application was built for extracurricular management at MAN 2 Kulon Progo. A website is a collection of publicly accessible and interconnected web pages that share a single domain name. Websites can be created and managed by individuals, groups, businesses, or organizations to serve a variety of purposes. Together, all publicly accessible websites form the World Wide Web. Although sometimes called "web pages," this definition is not quite right, because a website consists of several web pages (Riski et al., 2021). An application is a series of activities or commands carried out by a computer. Based on this understanding, it can be concluded that application design is a computer program model that is created using certain techniques and principles in order to process and perform specific tasks (Agusti, n.d.).

The development of education in schools in managing student data that participate in extracurricular organizational activity registration is still recorded manually. One solution to minimize the management of extracurricular registration information and student data to be faster, more precise, and accurate is to create a web-based application (Maulana et al., n.d.). With this application, it is expected to make it easier for students to register for extracurricular activities, attendance, and view information about extracurricular activities. In addition, extracurricular guidance teachers and extracurricular field teachers will find it easier to manage student data.

METHOD

The method used in this study is the SDLC (System Development Life Cycle) method with the Waterfall approach. The Waterfall method is a structured system development method, where each stage is carried out in stages and should not be continued until the previous stage is complete. This method has several advantages, including making the system design process easier because these stages must be carried out in stages until completed, so that the research process is not interrupted (Fachri & Rizal, 2024).

"Waterfall is the simplest SDLC model. This model is only suitable for software development with specifications that do not change". The waterfall method process is that the work on a system is carried out sequentially. The resulting system will be of good quality, because its implementation is gradual so that it does not focus on certain stages (Hidayat et al., 2022). The essence of the waterfall method is the work on a system that is carried out sequentially because it is completed one stage at a time, namely it is necessary to wait for the end of the previous stage (Pratiwi et al., 2023).

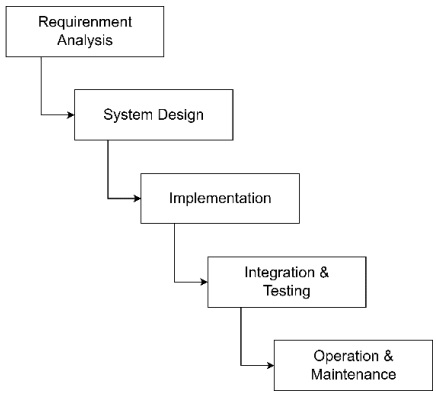

Figure 1. Waterfall Method

The following are the stages of the waterfall method.

1. *Requirements Analysis*

The Requirement Analysis stage is the process of collecting data related to the system to be built. In this study, data collection was carried out using interview methods, literature studies, and observations. In this stage, the author will collect information that can be used for application development. In this phase, the author conducts an in-depth analysis of the phases of the system that are running so that the author can see the needs of the ongoing processes (Rifanda| et al., 2023).

2. *System Design*

The System Design stage focuses on the development of data structures, software architecture, user interface design, and external and internal functions. This stage is carried out before the coding stage. This stage will be the foundation for creating code for the application. Software design is a process of several stages in designing software programs, including data structures, software architecture, interface representations, and coding procedures. This stage translates software requirements from the requirements analysis stage to design representations so that they can be implemented into programs at the next stage. At this stage, the results of the existing software design are documented (Kahfi et al., 2023).

3. *Implementation*

The Implementation stage involves coding or implementing a previously designed system design. The program code is developed based on the design that has been prepared (Duma & Pusvita, 2023). This stage is the stage of changing the software design into program code, according to what has been previously designed (Putra et al., 2022). After the design is complete, the implementation stage begins where developers begin writing code according to the design that has been made. This process involves building software that meets previously determined specifications (Registration et al., n.d.).

4. *Integration & Testing*

At the Integration & Testing stage, the modules that have been created will be merged. After the integration process is complete, the next stage is the testing stage. The testing stage aims to determine whether the system is running well or not. With the testing stage, it will be known whether there are errors or bugs in the program. Design Validation or Testing is a test of the results of the program coding that has been produced from the design stage. There are two purposes of testing. From the system development side, it must be guaranteed that the program code created is free from syntax and logic errors. From the user's side, the resulting program must be able to solve existing problems, and the new system must be easy to run and understand (Mahardika et al., 2023).

5. *Operation & Maintenance*

Operation & maintenance stage involves direct testing by application users. If there are errors, bugs, or deficiencies in the application, they will be analyzed for the maintenance process.

Data Source

The data sources in this study are primary data sources and secondary data sources. The following is an explanation of primary data sources and secondary data sources. Primary data sources are data sources obtained directly from respondents or researchers themselves. In this method, the primary data source comes from interviews. Data collection through interviews was carried out by interviewing Farida Rahmawati, S. Pd., M.Pd. as the deputy head of student affairs and alumni of MAN 2 Kulon Progo, namely Ibnu Rozardy Yuwono. This method also collects extracurricular data sourced from the MAN 2 Kulon Progo archives. The method used is by conducting direct interviews with related parties. Activities carried out during the study include collecting and recording data directly (Olindo & Syaripudin, 2022). Secondary data sources are obtained from various sources such as literature studies, theses, the internet and scientific journals related to extracurricular management applications.
Here is the interview with Farida Rahmawati, S.Pd., M.Pd.

Table 1. Interview With Farida Rahmawati, S.Pd., M.Pd.

No	Question	Answer
1	How many extracurricular activities are there at MAN 2 Kulon Progo?	MAN 2 Kulon Progo has 24 extracurricular activities.
2	Has MAN 2 Kulon Progo previously had an application for managing extracurricular activities?	No, MAN 2 Kulon Progo has not yet had an application for managing extracurricular activities.
3	How are extracurricular activities managed at MAN 2 Kulon Progo?	The management of extracurricular activities at MAN 2 Kulon Progo is still carried out manually. For example, when registering for extracurricular activities, students must fill out their personal information in a form provided by the extracurricular advisors. The data is then handed over to the extracurricular coordinator, who records it in Microsoft Excel.
4	Can each extracurricular supervising teacher only be a teacher for one extracurricular activity?	Yes, each extracurricular supervising teacher can only be a teacher for one extracurricular activity.
5	Is this extracurricular activity mandatory for all students, or is it just an option?	Extracurricular activities are mandatory for all 10th and 11th-grade students, but for 12th-grade students, participation in extracurricular activities is not required.

6	Are the extracurricular advisors teachers from MAN 2 Kulon Progo?	No, the majority of extracurricular advisors come from outside MAN 2 Kulon Progo.

From the interview, it can be concluded that the management of extracurricular activities at MAN 2 Kulon Progo still uses conventional methods, such as recording student data manually, which can lead to errors in data entry. Additionally, the large number of extracurricular activities makes it difficult for the extracurricular coordinator to track students participating in these activities. Therefore, MAN 2 Kulon Progo needs an extracurricular management application to manage extracurricular activities more effectively, in an organized manner, and more practically.
Here is the interview with Ibnu Rozardy Yuwono.

Table 2. Interview With Ibnu Rozardy Yuwono

No	Question	Answer
1	How many extracurricular activities are there at MAN 2 Kulon Progo?	MAN 2 Kulon Progo has 24 extracurricular activities.
2	What extracurricular activities do you participate in?	I participate in the extracurricular activities of scouting and choir.
3	Has there been an extracurricular application at MAN 2 Kulon Progo?	No, MAN 2 Kulon Progo does not yet have an extracurricular application.
4	In your opinion, does MAN 2 Kulon Progo need an extracurricular application?	Yes, MAN 2 Kulon Progo needs an extracurricular application so that students can easily register for extracurricular activities.

Based on the interview with Ibnu Rozardy Yuwono, it can be concluded that he participates in two extracurricular activities, MAN 2 Kulon Progo does not yet have an extracurricular application, and MAN 2 Kulon Progo needs an extracurricular application to make it easier for students to register for extracurricular activities.

Model Architecture

This stage is the stage of designing the system architecture that is created. In this extracurricular management application there are three users, namely students, extracurricular supervising teachers, and extracurricular field teachers. The mobile application can be used by students to register for extracurricular activities, while the website application is used by extracurricular supervising teachers to manage student data and extracurricular data.

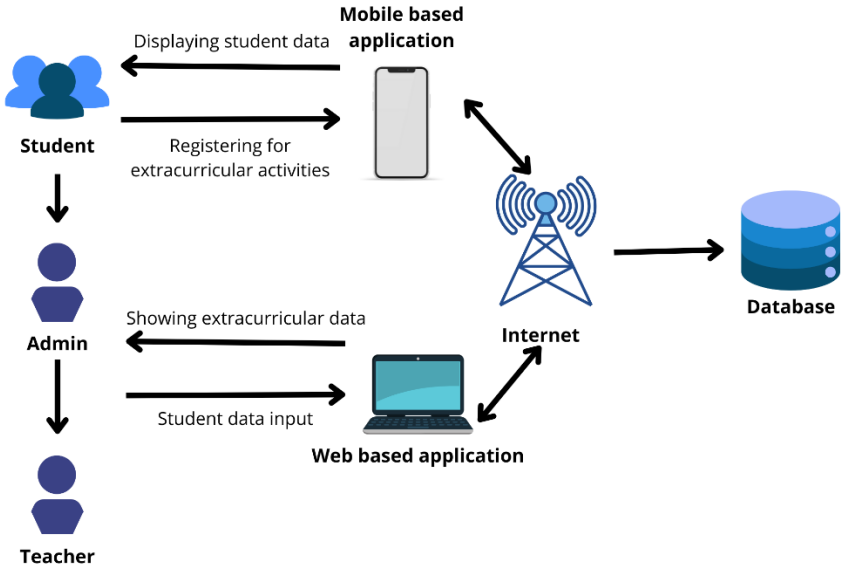

Figure 2. Model Architecture

Conceptual Design

The conceptual design of this research uses Entity Relationship Diagram (ERD), and Use Case Diagram.

1. Entity Relationship Diagram (ERD)

Entity Relationship Diagram (ERD) is a model used to compile a database to describe data and have a relationship with the database. Entity-Relationship is a method used for database modeling. This method is a conceptual scheme that explains the type of semantic data model of the system. Where the system used in Entity-Relationship is a relational database that has a top-down nature. The diagram used is a description of the Entity-Relationship model called the Entity-Relationship Diagram (ERD). An entity is an object that can be uniquely identified with a relationship, which connects one another. While attributes form the characteristics of each entity with a certain number of conventions (Pulungan et al., n.d.).

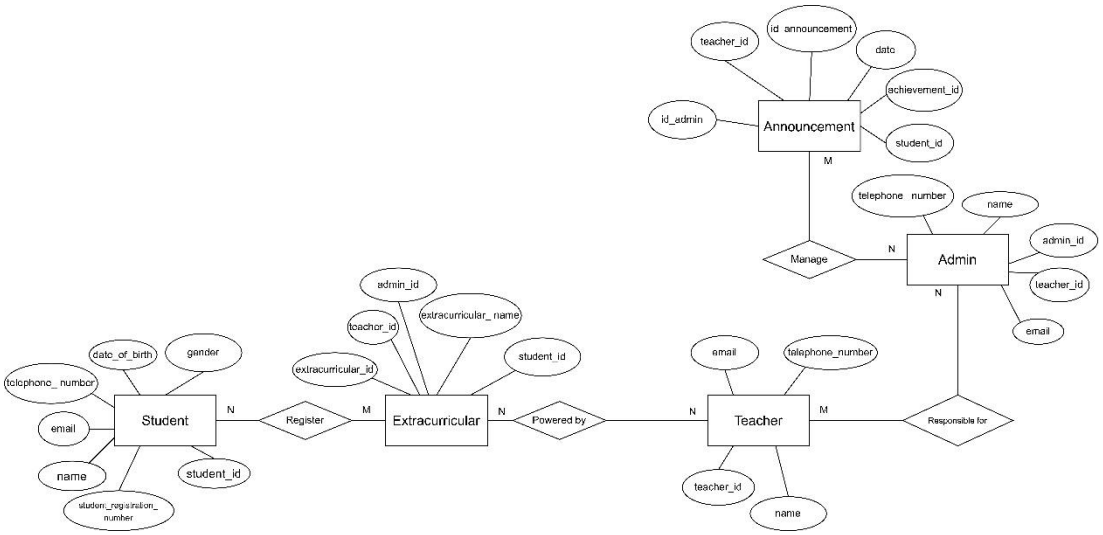

Figure 3. Entity Relationship Diagram (ERD)

2. Use Case Diagram

Use Case Diagram is a modeling used to design information systems. Use Case describes a correlation (relationship) between one or more roles with the information system to be designed (Hafsari et al., 2023). In this application there are three actors, namely admin, teacher, and student. Use Case Diagram is used to describe what the system should do.

A. Student Use Case Diagram

In the Student Use Case Diagram, students must first log in by entering their NIS (Student Identification Number) and password. If students have successfully logged in, they can use the extracurricular feature to register for extracurricular activities, view extracurricular schedules, view extracurricular cards, and attendance recaps. In addition, in the achievement menu, students can add achievements during extracurricular activities. There is an announcement menu that can be used to view announcements, student attendance, and accounts.

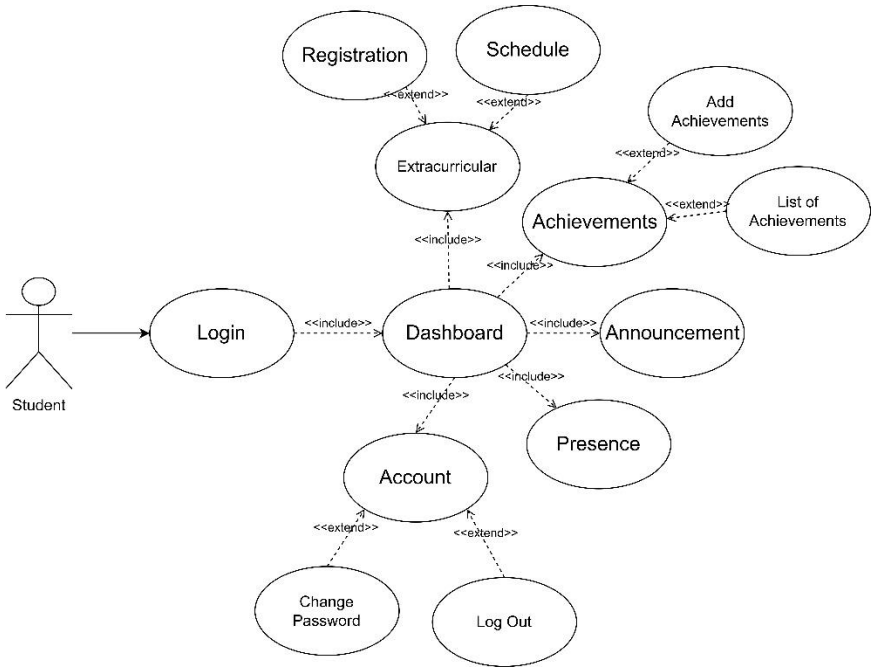

Figure 4. Student Use Case Diagram

B. Use Case Diagram Admin

In the Admin Use Case Diagram, admin here means the extracurricular teacher. Admin can access the application if they have logged in. The menus on the admin page are: Manage extracurricular which can be used to add extracurriculars, the Manage students menu which is used to add student data, Manage teachers which is used to add teacher data, Manage accounts which can be used to edit account data, and Manage announcements which is used to add announcements.

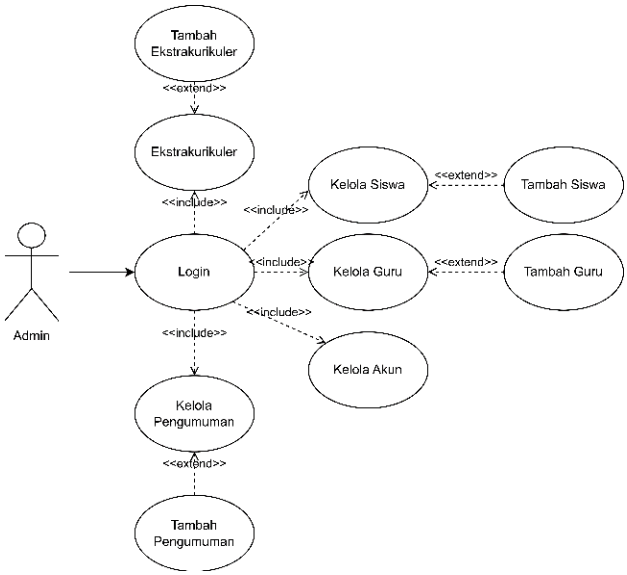

Figure 5. Use Case Diagram Admin

C. Use Case Diagram Teacher

In the Teacher Use Case Diagram, teachers who have logged in can access features in the application such as the extracurricular menu which can be used to recap attendance and start classes, and the attendance feature which can be used to create an attendance code that can be used by students to record attendance.

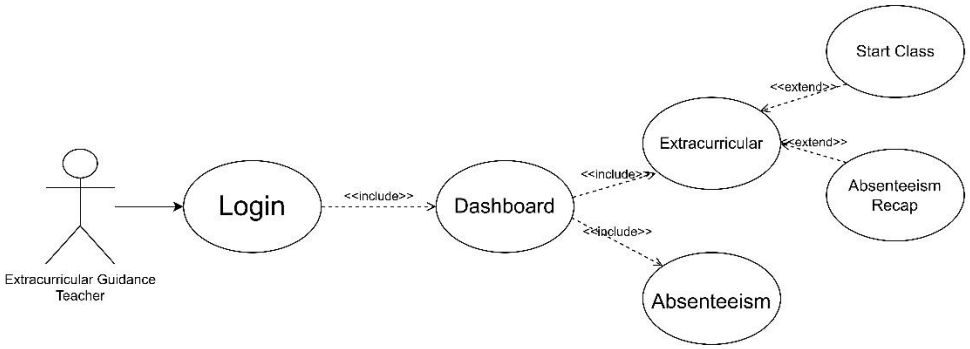

Figure 6. Use Case Diagram Teacher

FINDING AND DISCUSSION

The results of the research that has been conducted have produced web and mobile-based extracurricular management applications as follows.

1. Mobile Application For Students
   A. Home Page
      This page contains menus such as extracurricular activities, achievements, announcements, attendance and accounts.

Figure 7. Home Page

   B. Extracurricular Page
      On this page there are two main menus, namely extracurricular registration that can be used by students to register for extracurricular activities and the extracurricular schedule menu. On the extracurricular schedule menu, students can see what extracurricular activities they are participating in, extracurricular supervising teachers, extracurricular activity schedules, and student attendance recaps.

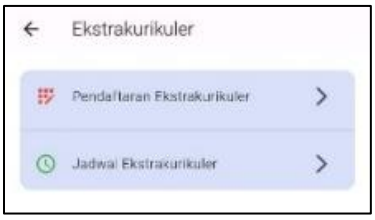

Figure 8. Extracurricular Page

   C. Achievement Page
      There are two main menus, namely Add Achievement, which students can use to add achievements in the extracurricular fields they are involved in, and List of Achievements, which students can use to see a summary of the achievements they have achieved.

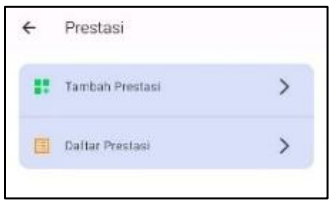

Figure 9. Achievement Page

D. Attendance Page

The attendance page can be used by students to take attendance using a QR Code or an attendance code shared by the extracurricular supervising teacher.

Figure 10. Attendance Page

2. Web Application For Admin

A. Manage Extracurricular Page

On this page, the admin can add new extracurricular activities, in addition, the admin can also edit and delete extracurricular activities that have been added. In addition to adding the name of the extracurricular activity, the admin can also add the name of the extracurricular supervisor, a description of the extracurricular activity and the schedule of the extracurricular activity.

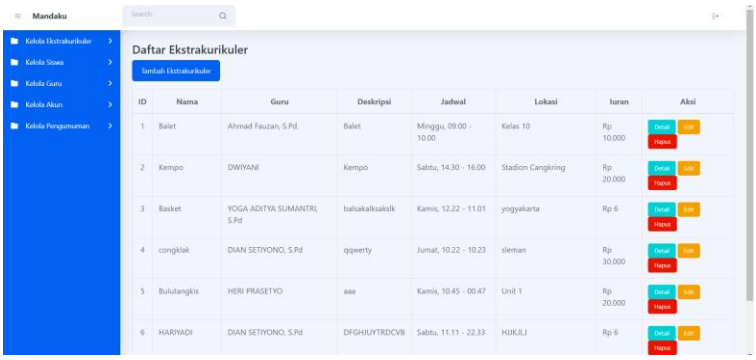

Figure 11. Manage Extracurricular Page

B. Manage Students Page

This page can be used to add student data such as full name, email, telephone number, and date of birth. In addition, the admin can also edit and delete student data that has been added.

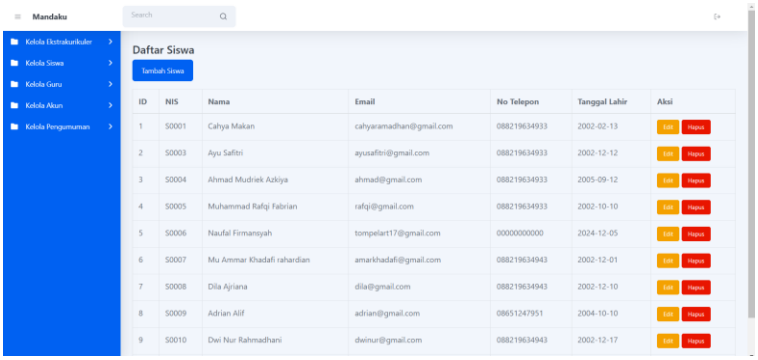

Figure 12. Manage Students Page

C. Manage Teacher Page

On the Manage Teacher page, the admin can add extracurricular teacher data, such as full name, email, and telephone number. In addition, the admin can edit and delete extracurricular teacher data.

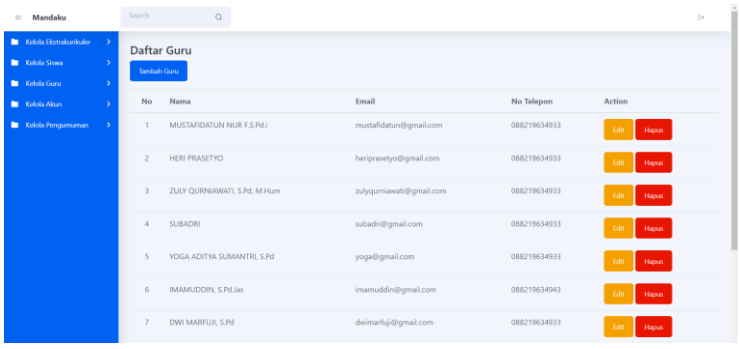

Figure 13. Manage Teacher Page

3. Web Application For Teachers

A. Class/Extracurricular Page

On this page there is a detailed menu of extracurricular activities available/supervised by the extracurricular supervising teacher. In addition, there is a start class menu that can be used to start class before doing an attendance recap and an attendance recap menu that is used to recap student attendance.

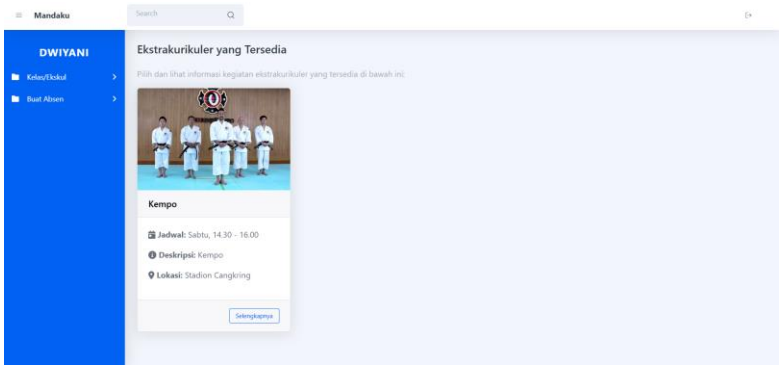

Figure 14. Class/Extracurricular Page

B. Create Absence Page

This page is used to create an absence code that can be used by students by utilizing a mobile-based application. Absences can only be done within the time specified by the extracurricular supervising teacher.

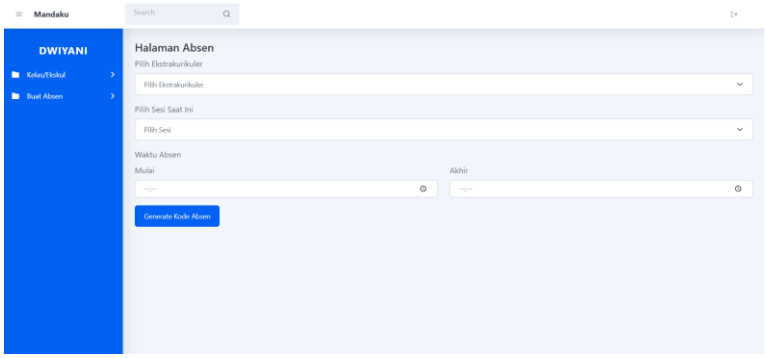

Figure 15. Create Absence Page

Testing

This study uses the application testing method, namely testing using the black box method. Software Testing or software testing is a process of executing a program or application that has been developed by a developer. Software testing itself is generally carried out to find obstacles such as bugs in software in order to ensure the quality of the software. Software testing is very important to do, because usually in every application creation there will be things that are missed, so testing a software application is very important to do (Fahrezi et al., n.d.).

1. Application for Students
   The following are the results of black box testing of the mobile-based application for students.

Table 3. Application for Students

Testing Scenario	Expected Result	Testing Result
The student logs in using NIS (Student Identification Number) and password	The system will input the NIS and password, and if successful, the student will be directed to the dashboard page	Successful
The student can register for extracurricular activities in the extracurricular registration menu	The system will direct the student to the extracurricular menu, then to the extracurricular registration menu	Successful
The student can view the extracurricular schedule, the extracurricular activities they are involved in, the extracurricular supervisor, and attendance recap in the extracurricular schedule menu	The system will direct the student to the extracurricular menu, then to the extracurricular schedule menu	Successful
The student can add achievements in the add achievement menu under the achievements menu	The system will direct the student to the achievements menu, then to the add achievement menu	Successful
The student can view a recap of achievements in the list of achievements menu under the achievements menu	The system will direct the student to the achievements menu, then to the list of achievements menu	Successful
The student can view announcements from the school regarding extracurricular activities	The system will direct the student to the announcements menu	Successful
The student can mark attendance using QR Code or attendance code in the attendance menu	The system will direct the student to the attendance menu	Successful
The student can change their password and log out using the account menu	The system will direct the student to the account menu	Successful

2. Application for Admin
   The following are the results of black box testing of the web-based application for teachers.

Table 4. Application for Admin

Testing Scenario	Expected Result	Testing Result
The admin logs in using email and password	The system will input the email and password, and if successful, the admin will be directed to the dashboard page	Successful
The admin can add, edit, and delete extracurricular data in the manage extracurricular menu	The system will direct the admin to the manage extracurricular page to add extracurricular data	Successful
The admin can add, edit, and delete student data in the manage students menu	The system will direct the admin to the manage students page to add student data	Successful
The admin can add, edit, and delete extracurricular teacher data in the manage teachers menu	The system will direct the admin to the manage teachers page to add teacher data	Successful
The admin can edit and delete registered account (user) data in the manage account menu	The system will direct the admin to the manage account page to edit the logged-in account	Successful
The admin can add, edit, and delete announcements in the manage announcements menu	The system will direct the admin to the manage announcements page to add an announcement	Successful
The admin can log out by selecting the logout menu	The system will direct the admin to the logout menu, and if successful, the admin can exit the application	Successful

3. Application for Teachers
   The following are the results of black box testing of the mobile-based application for students.

Table 5. Application for Teachers

Testing Scenario	Expected Result	Testing Result
The teacher logs in using email and password	The system will input the email and password, and if successful, the teacher will be directed to the dashboard page	Successful
The teacher can view the extracurriculars they supervise, the extracurricular description,	The system will direct the teacher to the class/extracurricular page	Successful

and the extracurricular schedule		
The teacher can select the "start class" menu to begin the ongoing class	The system will direct the teacher to the start class page	Successful
The teacher can select the "attendance recap" menu to recap student attendance	The system will direct the teacher to the attendance recap page	Successful
The teacher can see whether the students who registered for extracurriculars are confirmed or not	The system will direct the teacher to the class/extracurricular page	Successful
The teacher can create a presence code in the form of a QR Code or attendance code in the "create attendance" menu	The system will direct the teacher to the create attendance page	Successful
The teacher can log out by selecting the logout menu	The system will direct the teacher to the logout menu, and if successful, the teacher can exit the application	Successful

CONCLUSION

This research has succeeded in building a web and mobile-based extracurricular management application to facilitate extracurricular management, student data management, and teacher data management. This application has several main features, namely attendance, extracurricular registration, add achievements, manage teachers, manage students, and manage announcements.

The web and mobile-based extracurricular management application has functioned well based on the black box test results. Students can add the desired extracurricular, take attendance, add achievement certificates and see announcements about extracurricular activities. Extracurricular teachers can manage student data, extracurricular supervising teacher data, add announcements, and add new extracurricular activities. Meanwhile, extracurricular supervising teachers can easily recap student attendance, and create attendance codes in the form of QR Codes or student attendance links. With this application, it is hoped that it will make it easier for MAN 2 Kulon Progo to manage student data, extracurricular activities, and extracurricular supervising teacher data to be more efficient and organized.

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