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Design Of A Mobile App-Based Student Scout Extracurricular Activity Monitoring Application Using Geotagging (Case Study At A Junior High School In Bandung)

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Abstract

Teachers have a responsibility to monitor students, particularly given the constraints in supervising them during extracurricular activities such as scouting. This research aims to develop a mobile application to track student engagement in scouting activities, employing a descriptive-qualitative methodology through data collection via observation, interviews, and literature reviews. The application is built on the AppSheet online platform and integrates with Google Drive as a database, using spreadsheets for data management.

The research findings demonstrate that a student monitoring application is crucial for individual and institutional requirements. For future development, the application must be designed for simplicity to ensure accessibility for all users, with data presented in a manner that is comprehensible to educators.

Keywords : *Applicaton, Attendance, Monitoring*

INTRODUCTION

The swift progression of technology and information is increasingly apparent; as human needs expand, the technology created to fulfill those informational requirements must also evolve. This advancement has profoundly affected human existence, impacting practically all facets of activity, particularly in the acquisition and retrieval of knowledge. Moreover, the advancement of smartphone technology is integral to everyday life, enabling activities such as reading news, viewing material, studying, and managing businesses.

Scouting is a component of the compulsory curriculum for student education; yet, it frequently remains theoretical, with instructional hours ranging from 1 to 2 class periods—1 class session is equivalent to 30 minutes. Consequently, scouting education often lasts about 2 class periods or 1 hour. Consequently, institutions sometimes offer supplementary practical instruction for scouting activities on Saturdays following school hours.

Students may use this circumstance to evade school, claiming attendance at scouting classes while in truth being absent. Observations and interviews indicate that a student monitoring application is crucial for both individual and institutional requirements. Educators frequently lack the capacity to monitor all pupils simultaneously, underscoring the need for a mobile application that can track multiple children simultaneously.

Basic Concepts of Information Systems

"Information Systems are methodologies for the collection, entry, processing, and storage of data, while overseeing and disseminating information in a manner that facilitates an organization in attaining its defined objectives. (Tolle, H., Brata, K. C., Maryanto, S., & Athaya, 2023)

Smartphone

Smartphones are devices that incorporate internet functionality alongside features such as

a calendar, planner, contact list, calculator, and note-taking application. (Rexline, S. J., & Nazrin, 2024)

Mobile Apps

"Mobile applications are software programs that facilitate mobility through devices such as Personal Digital Assistants (PDAs), mobile phones, or smartphones." (Insani, R. W. S., & Alkadri, 2022)

Geotagging

Geotagging is the technique of attaching geographic metadata to diverse media, including geotagged images, videos, webpages, SMS messages, QR codes, and RSS feeds, and is a form of geospatial metadata. This data generally comprises latitude and longitude coordinates and may also include altitude, bearing, distance, accuracy metrics, and location names. (Nugraha, B. S., Cahyono, A. B., & Darminto, 2022; Sari, I. R., Amalia, F., & Brata, 2020)

Application

An application is a software program designed to perform certain functions on computers, laptops, or smartphones. (Rahma, B., & Putri, 2024)

Database

A database is an assemblage of integrated data systematically arranged to facilitate rapid manipulation, retrieval, and searching. This framework is essential for efficient data administration. Google Drive is a cloud-based storage solution that is readily accessible with a Google account. Launched by Google on April 24, 2012, it provides intuitive functionalities for data storage across multiple formats. Moreover, spreadsheets are integral to data processing because they organize information in rows and columns, facilitating efficient display, manipulation, and storage. Collectively, these solutions optimize data administration and improve user experience in information handling.

JavaScript Programming Language

JavaScript is a dynamic scripting language used to add interactivity to static HTML sites. This is accomplished by placing JavaScript code blocks at multiple locations across the web page. This adaptability enables developers to augment user engagement and craft more dynamic web experiences. (Kurnia, N., Hananto, A. L., Tukino, T., & Hilabi, 2025)

System Development Tools

AppSheet is a web-based application development platform that enables the straightforward development and distribution of mobile and web applications from cloud data sources, such as spreadsheets and databases, without coding expertise. (Singh, G., Chadha, R., Bawa, G., Chauhan, H., & Prakash, 2023)

Moreover, Draw.id is a platform designed specifically for creating diagrams online. All functionalities on this site are accessible via a web browser. Draw.io is used to create use case diagrams, activity diagrams, sequence diagrams, class diagrams, and interface designs. (Umarjati, A., & Wibowo, 2020)

Collectively, these tools streamline the development and visualization processes in application design, augmenting productivity while reducing the necessity for technical proficiency.

Unified Modeling Language (UML)

A Use Case illustrates the system's functionality from the user's perspective, detailing how users interact with the system to achieve specific objectives. A Class Diagram represents the class architecture of a system and is among the most prevalent diagram types, depicting the relationships and attributes of various classes. An Activity Diagram illustrates the workflow or sequence of activities within a system, business process, or software interface, demonstrating the execution of tasks. Finally, the Sequence Diagram depicts the interactions among objects in a system sequentially, emphasizing their communication and functionality over time. Collectively, these diagrams are crucial for understanding system capabilities and architectures, helping developers craft efficient, successful software solutions.

The creation of this mobile application will facilitate access for users at any time and from any location, provided they have an internet connection. This application will use geotagging to track students' positions via smartphone navigation, serving as a repository for students' grades and involvement in scouting activities. It will also encompass papers relevant to scouting objectives, such as competition levels and jamborees. This feature seeks to improve monitoring and involvement in the student scouting experience.

METHOD

The employed research method is descriptive quantitative research, which elucidates and delineates variables in their natural state without intervention or manipulation. This research is substantiated by quantitative data that accurately represents the current condition. (Ramaddhan, I., Tolle, H., & Fanani, 2021)

The development methodology employed is Object-Oriented Analysis and Design (OOAD). Object-Oriented Analysis and Design (OOAD) is a methodology that evaluates requirements through the lens of classes and objects inside the defined problem domain. This approach steers software architecture towards the manipulation of objects within the system or its subsystems. The system design process employs UML tools and includes database design using Activity Diagrams, Use Cases, and Entity Relationship Diagrams (ERDs).

RESULTS AND DISCUSSION

The findings are as follows, derived from interviews with students, parents, educators, and mentors:

Table 1. Interview

Question	Results
Student-1	Twenty-four adolescents who engage in scouting activities consistently bring their iPhones to the events.
Student-2	Five of the 24 students have either skipped or missed scouting events at least once.
Parent-1	Twenty of the 24 parents of the students require this tracking application to verify their children's honesty and determine their last known locations.
Parent-2	Eighteen of the twenty-four parents desire a documented history or outcomes of scouting activities to address their children's requirements when applying to vocational or secondary schools.

Question	Results
Supervisor-1	The mentors require a database to record activities, grades, and personal information for kids involved in scouting, in support of comprehensive scouting objectives, including inter-school interactions.
Supervisor-2	Mentors need tools to enhance supervision of kids engaged in scouting activities.

Design

A use case refers to a particular task, such as system login, data creation, or data deletion. In this sense, an actor is a human entity capable of interacting with the system to execute specific tasks. This information system's use case diagram features three actors: mentors, students, and parents. The administrator can add, modify, and remove users in the data management process. The following is a detailed account of the monitoring application and how users will engage with the system.

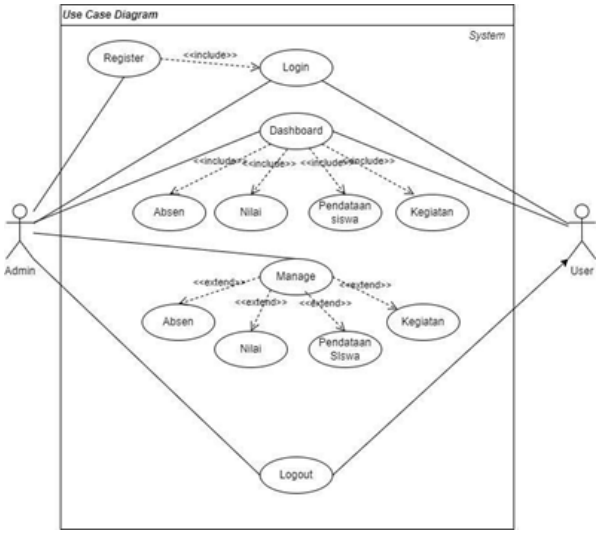

Figure 1. Use Case Diagram

After creating the Use Case Diagram, a scenario diagram was produced. Table 2 illustrates the scenario diagram for the Login use case. This scenario outlines the login procedures, specifying the interactions between the actors and the system to access their accounts, along with the anticipated results at each phase.

Table 2. Login Diagram Scenario

Login Diagram Scenario	
Objective	Log in and enter the application.
Description	This system allows actors to access applications.
Actor	Supervisors, students, and parents
Initial Conditions	Open the login page.
Final Condition	If the command is correct, it will go to the main application page

Following the scenario design for the login use case, additional scenario diagrams may be developed for use cases such as Attendance, Grades, Activities, and Student Data Management.

Table 3. Absence Diagram Scenario

Absence Diagram Scenario	
Objective	Bagian dimana siswa melakukan absen.
Description	A menu for student attendance. The application will request several data items, such as ID number, name, class, location, and photo.
Actor	Supervisors, students, and parents
Initial Conditions	Open the attendance page.
Final Condition	If the absence is successful, the page returns to the initial menu, but if the absence fails, the page returns to the absence menu.

Table 3 elucidates the scenario diagram for the Attendance use case. This scenario outlines the procedures for attendance, specifying how the mentor records student attendance, the interactions required to enter attendance data, and the anticipated outcomes at each phase. It emphasizes the method by which pupils are recorded as present or absent, ensuring clarity and efficiency in precise record-keeping.

Table 4. Value Diagram Scenario

Value Diagram Scenario	
Objective	Contains information about student activity grades.
Description	Menu for listing the grades of students who have taken attendance and carried out scouting activities.
Actor	Supervisors, students, and parents
Initial Conditions	Open the activity value page.
Final Condition	Displays the value.

Table 4 explains how the diagram scenario of the Value use case.

Table 5. Activity Diagram Scenario

Activity Diagram Scenario	
Objective	Contains information about learning activities.
Description	Menu of activities to be carried out.
Actor	Supervisors, students, and parents
Initial Conditions	Open the activity page.
Final Condition	Showing activities.

Table 5 explains how the scenario diagram of the Activity use case.

Table 6. Student Data Collection Diagram Scenario

Student Data Collection Diagram Scenario	
Objective	Contains personal data information for students who participate in scouting activities.
Description	Student data collection menu

Student Data Collection Diagram Scenario	
Actor	Supervisors, students, and parents
Initial Conditions	Open the student data collection page.
Final Condition	Displays student personal data.

Table 6 explains how the scenario diagram of the Student Data Collection use case.

Activity Diagram

This activity diagram depicts the workflow of the menu system in the sales information application. This figure outlines the sequence of operations the user performs, including navigating through diverse menu options, selecting products, processing orders, and maintaining sales statistics. It accurately illustrates user interaction with the program, facilitating a seamless, coherent progression through the sales process. This graphic depiction facilitates understanding of the application's overall functionality and user interface.

Registration Activity Diagram

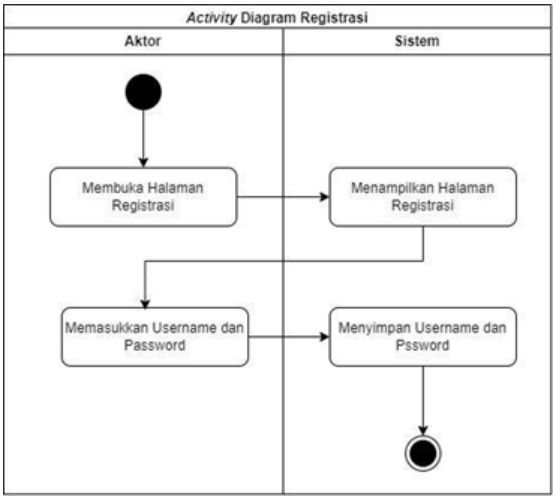

Figure 2. Registration Activity Diagram

The Activity Diagram for Registration depicts the process when a user seeks to register. It outlines the procedures involved, including entering personal information, validating data, submitting the registration form, and receiving confirmation. Each activity is depicted in sequence, emphasizing decision points and possible outcomes, ensuring users understand the registration process clearly. This diagram functions as a reference for developers and users, highlighting the essential interactions within the application during the registration process.

Login Activity Diagram

Upon completing the registration, users will advance to the login phase. Figure 3 illustrates the login procedure. This figure outlines the required procedures, including credential entry, information validation, and system access. It emphasizes the interactions and decisions required, ensuring consumers are seamlessly

directed through the login process. This image is crucial for comprehending user interaction with the program throughout the authentication process.

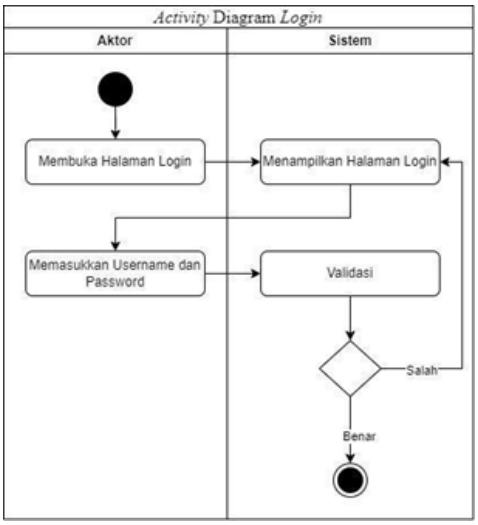

Figure 3. Login Activity Diagram

Absentee Activity Diagram

Figure 4 depicts the Activity Diagram for Attendance, outlining the procedure when a user executes the attendance process. It delineates the procedures, including selecting the date, verifying the student roster, recording attendance (present or absent), and submitting the attendance log. Every action is depicted in order, emphasizing critical decision points and results. This diagram elucidates user interaction with the program throughout the attendance process, ensuring clarity and speed in documenting student engagement.

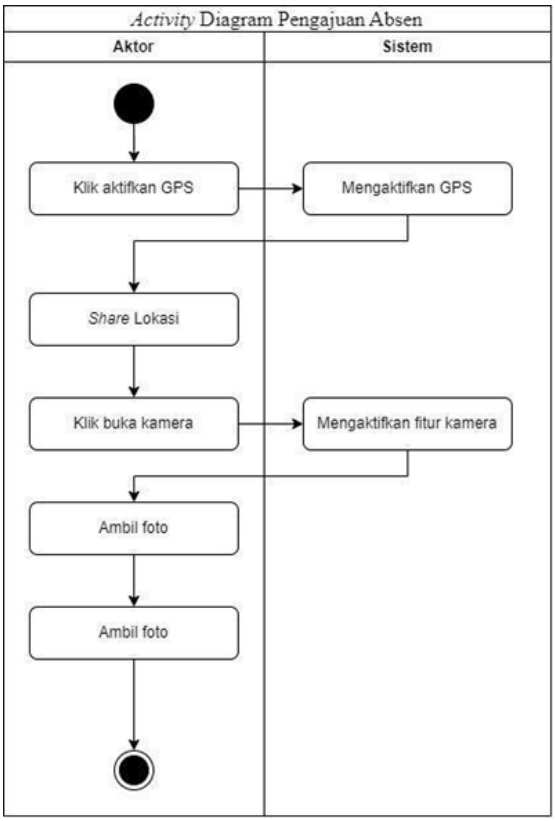

Figure 4. Absentee Activity Diagram

Value Activity Diagram

Figure 5 illustrates the Activity Diagram for Grades, showing the process for displaying grades when selecting the activity date. The figure outlines the stages, including selecting the specific date, obtaining the relevant grades, and displaying the results to the user. Each operation is shown in sequence, highlighting critical decision points and user interactions with the system. This visualization clarifies the procedure for accessing and reviewing grades for specific actions.

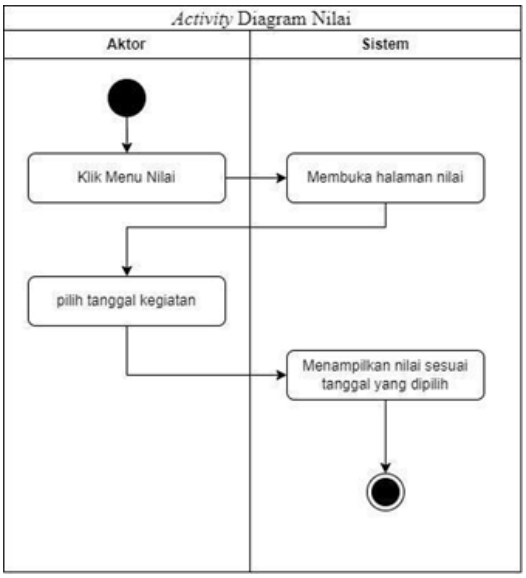

Figure 5. Activity Value Diagram

Student Data Collection Activity Diagram

Figure 7 depicts the Activity Diagram for Student Data Management. It delineates the procedure for presenting student data contained in the system. The graphic outlines the procedures involved, including accessing the student database, filtering data by specific criteria, and presenting the results to the user. Every action is clearly illustrated, emphasizing essential processes and interactions, thereby facilitating users' understanding of how to access and manage student information within the program.

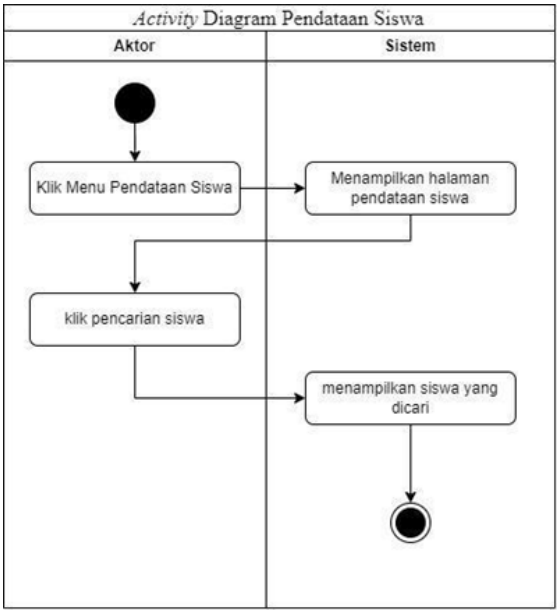

Figure 7. Student Data Collection Activity Diagram

Activity Diagram Activities

Figure 8 depicts the Activity Diagram for Activities, detailing the many activities conducted. The figure outlines the sequence of actions, including retrieving the list of activities, selecting specific events, and examining details of completed tasks. Every action is systematically depicted, highlighting interactions and decision points, so that users can understand how to navigate the records of activities and their results within the system.

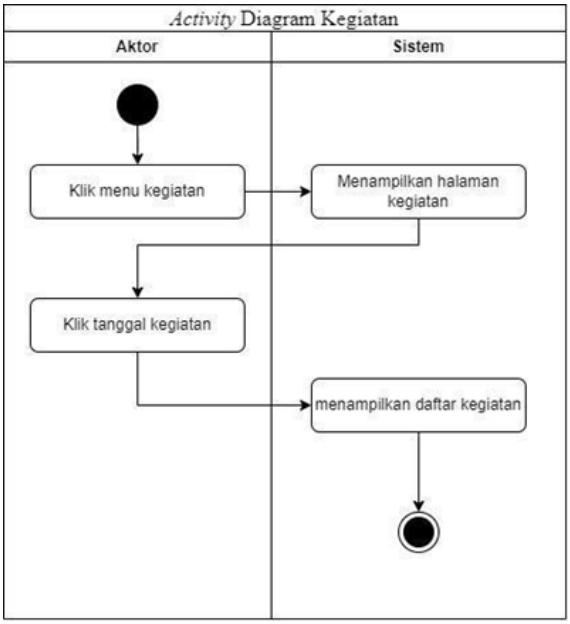

Figure 8. Activity Diagram

Sequence Diagram

A sequence diagram is used to illustrate and clarify the relationships within a system. It also presents the messages or commands transmitted, along with their execution durations.

Figure 9. Sequence Diagram Register.

Figure 9 depicts the Register Sequence Diagram, detailing user interactions throughout the registration process. Subsequently, the user may authenticate their access.

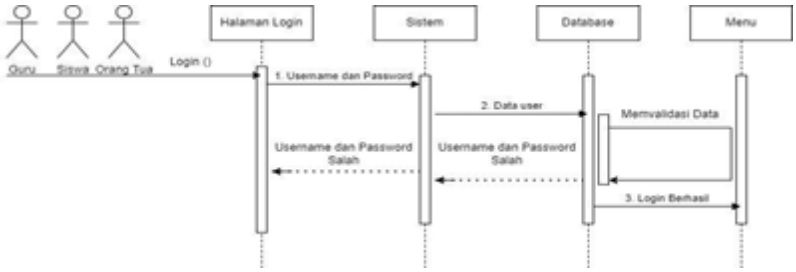

Figure 10. Login Sequence Diagram

Figure 10 illustrates the Login Sequence Diagram, detailing the interaction between the user and the system during the login process.

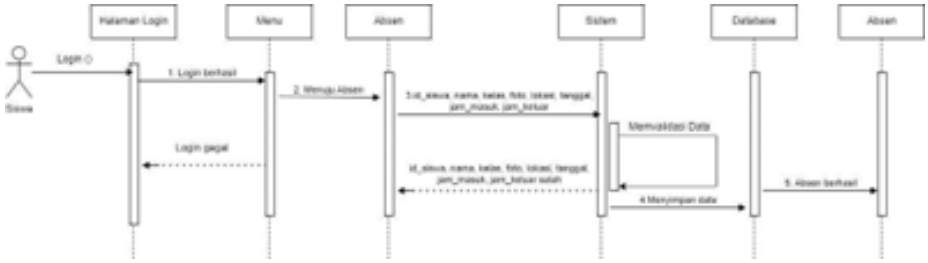

Figure 11. Absentee Sequence Diagram

Figure 11 illustrates the Absentee Sequence Diagram, detailing the interaction between the user and the system during the execution of the Absentee activity.

Figure 12. Sequence Diagram of Values.

Figure 12 illustrates a Value Sequence Diagram that delineates the interactions between the user and the system during the process of viewing Values.

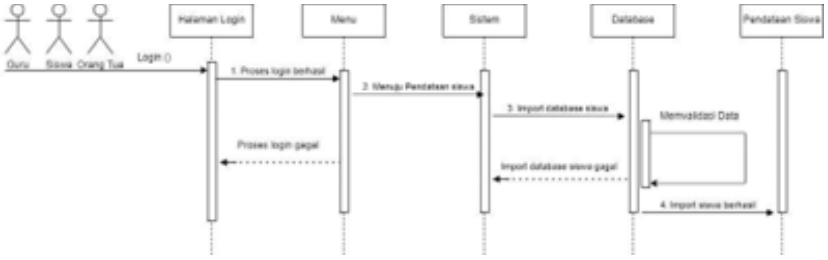

Figure 13. Student Data Collection Sequence Diagram

Figure 13 illustrates the Student Data Collection Sequence Diagram, detailing the interaction between the user and the system throughout the retrieval of registered student data.

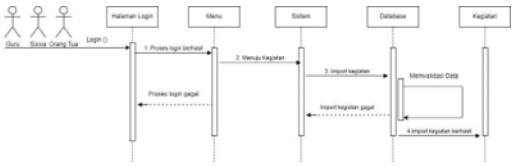

Figure 14. Activity Sequence Diagram

Figure 14 illustrates the Activity Sequence Diagram, detailing the interaction between the user and the system throughout the review of completed activities.

Class Diagram

The class diagram facilitates the visualization of a system's class hierarchy and is among the most commonly used diagram types. It illustrates the interconnections among classes and offers comprehensive descriptions of each class inside the system's design model. This visualization is essential for understanding component interactions and data organization, helping developers build an effective, unified system design

Figure 15. Class Diagram

The class diagram above shows the primary data structure and the interrelationships among the system's classes. It encompasses several essential classes, including Teacher, Attendance, Student Data Management, Student Activities, Grades, and Student. Every class possesses fundamental characteristics, such as an id and a name, as well as methods for performing activities such as insertion, updating, deletion, and data retrieval. This organization elucidates the data flow within the system and the interactions among various components.

Interface Implementation

During the implementation phase, the interface is developed according to the design

established in the preceding stage to enhance user comprehension of the system.

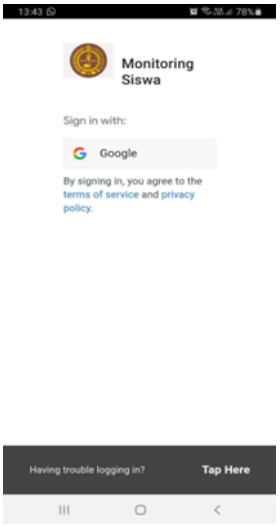

Figure 16. Login Page

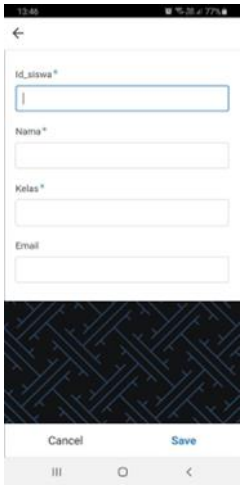

Figure 17. Registration Page

Figure 18. Absence Page 1

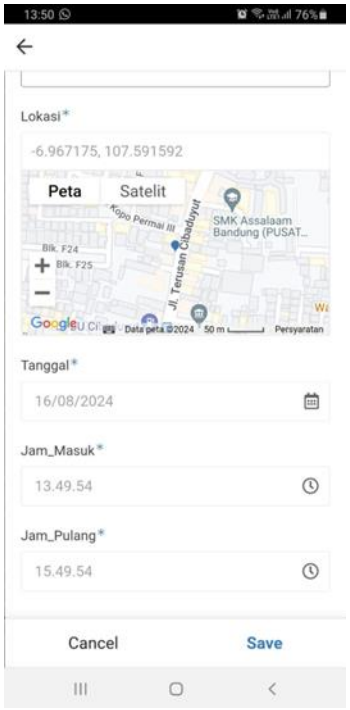

Figure 19. Absence Page 2

Figure 20. Values Page

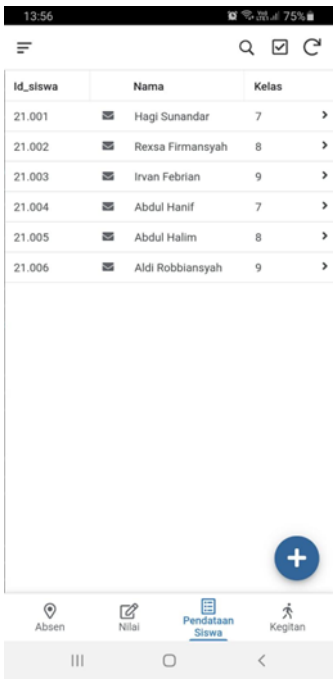

Figure 21. Student Data Collection Page

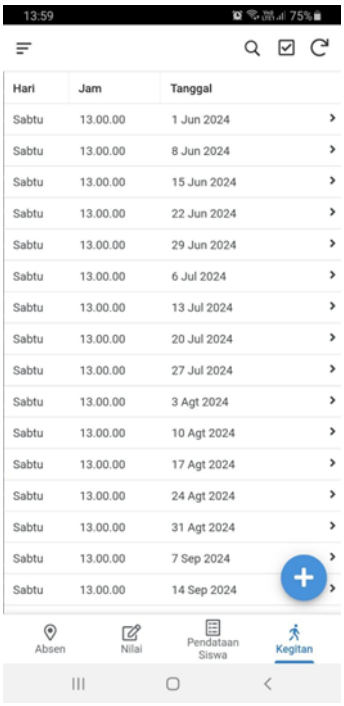

Figure 22. Activities Page

CONCLUSION

In the digital age, where data management is digitized, the implementation of information systems to oversee attendance, grades, and activities is a fundamental academic requirement for institutions and among institutions. This research has developed a monitoring program designed to track student activities, encompassing attendance, grades, and scouting participation. The results demonstrate that the application proficiently streamlines attendance tracking, grading, and student activity monitoring, hence improving data management. The implementation of this program facilitates monitoring by institutions and parents, hence reducing the potential for absenteeism. The development of the monitoring application streamlines oversight for institutions, educators, and parents, while also serving as a repository for attendance, grades, and student activities. Furthermore, the output reports are comprehensible and systematically organized, making them suitable for inter-institutional applications.

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