Android-based REST API Integration for Counseling Services

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ABSTRACT
Education has a crucial role as a means for humans to develop their potential through learning. Education aims to create the next generation of a competent and qualified nation that can take advantage of existing advances. However, problems arise due to the lack of interaction between students and teachers in terms of submitting complaints or their aspirations regarding schools. This research aims to explore Android-based REST API integration for guidance and counseling services in schools. To create a satisfactory application, the system was tested using the White box method and REST API testing using Postman. Hopefully, this research can be a recommendation for educational institutions to utilize technology to improve the quality of guidance and counseling services at school.

General Terms
Android, Kotlin, REST API, Postman.

Keywords
School, Counseling Services, Mobile Application, REST API.

1. INTRODUCTION
Education is a means or bridge for humans to develop their potential through learning. As we know, in the 1945 Constitution of the Republic of Indonesia, article 31, paragraph 1tates that: "every citizen has the right to education" [1]. So, it is clear that education is the right of every individual to get it. With the existence of education, it is hoped that it can give birth to the next generation of the nation with smart and quality people, which means a generation that can make the best use of existing progress. To support this, each school must provide suitable facilities for its students. In addition, the importance of moral education schools provide, such as guidance and counseling services. These services are an integral part of comprehensive educational efforts [2]. Considering the development of information technology and the increasing trend of using mobile devices, technology integration in counseling services is becoming increasingly important. In this context, using Android-based applications and using the Representational State Transfer Application Programming Interface (REST API) effectively improve the accessibility and efficiency of guidance and counseling services in the educational environment [3]. The problem that occurs is that many students are afraid to submit complaints and complaints about events that occur at school. Besides that, students also want to express their aspirations for their school's progress.

Android technology advances have changed how people interact with information and services. School students, teachers, and counselors increasingly use mobile devices with the Android operating system [4]. This creates an opportunity to integrate guidance and counseling services into the Android platform, which can facilitate more accessible and more immediate access to valuable counseling resources. The app can significantly assist in complementing and participating in

various activities [5]. In addition, using REST API as the underlying technology to communicate between Android apps and counseling resources can increase the flexibility and interoperability of the system. REST API enables secure and efficient data exchange between Android apps and counseling servers, thus allowing counselors and students to access the latest information, advice, and guidance anytime and anywhere [6].

To improve the effectiveness of guidance and counseling services in schools, this study aims to investigate the integration of Android-based REST API as a potential solution. REST API is an architectural tool that builds on web services and focuses on system resources such as data transmission and requests using http [7]. The system created consists of three components: Android application as the frontend, database system used for data storage and automation, and REST API that acts as the backend. By combining these technologies, we can create a more inclusive and supportive educational environment where students can more easily access counseling resources needed for personal, academic, and social development. This research aims to provide a more in-depth view of the benefits and challenges associated with implementing Android-based REST API integration in school guidance and counseling services. Thus, this research can provide guidance and recommendations for educational institutions to optimally utilize this technology to improve the quality of their guidance and counseling services.

2. RESEARCH METHOD
This application is built using the Kotlin programming language and MySQL as a database that stores application data on the server. REST API is required to manage access to data on the web and actions to the Android mobile application. REST API testing uses Postman. Postman features are simple, making API testing successful and quick[8]. The REST API model can be seen in Figure 1.
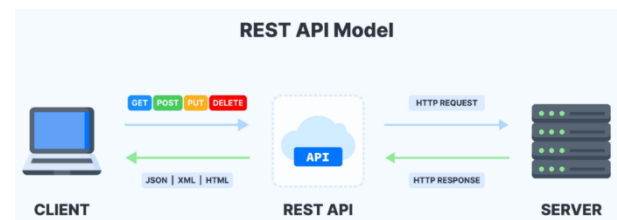

Fig. 1 REST API model

2.1 System Development
The system creation stage is divided into three different components: the Android application at the front end, the database system used for data storage and automation, and the REST API, which acts as the backend. The design of this application system is made using a Data Flow Diagram (DFD). After that, the physical design includes the design of the

physical design of Database Management System (DBMS), which this system uses MySQL as a DBMS. Data Flow Diagram is a logical model of data or processes made to describe where the data comes from. Here, the data exits the system, where the data, the interaction between the stored data, and the processes imposed on the data [9]. The privacy analysis in the DFD supports the most common privacy mechanism of information flow or access control[10]. Meanwhile, a Database Management System is software that manages and executes database queries. DBMS software is used to manage databases effectively and efficiently, from the initial creation of the database to the operations applied to it, such as input editing, deleting, creating reports, and so on[11]. Relational DBMS presents data in the form of interconnected tables. Tables are where information is stored, relationships reflect interactions between data, and attributes define the characteristics of each entity [12]. However, to understand the complexity of the structure, a visual representation is needed that can provide a comprehensive overview. This is where the Entity-Relationship Diagram (ERD) enters a key role. ERD not only provides a visual view of entities, relationships, and attributes, buat also helps the development team to communicate more effectively [13].

1. Context Diagrams
The context diagram models the input and output flow of the application as a whole and describes all elements or scope that can provide an overview of the system.

Fig. 2 Context Diagrams

2. Level Diagrams
The level diagram is a relationship and all functions in the application. In this application, two sub-systems are run by users, namely students and admins.
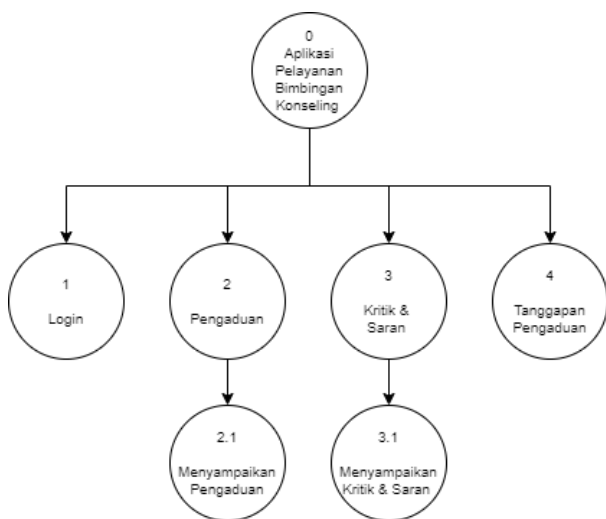

Fig. 3 Level Diagrams

3. Level 1 Data Flow Diagrams
Data Flow Diagram Level 1 describes the entire process that occurs in the application, where students can submit complaints, criticisms, and suggestions, and the admin can respond to these complaints.
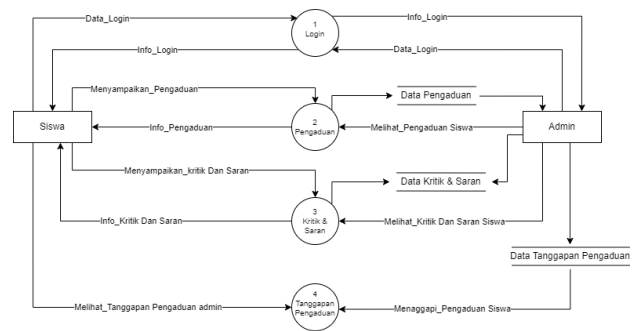

Fig. 4 Level 1 Data Flow Diagrams

4. Level 2 Data Flow Diagrams
Data Flow Diagram Level 2 process 1 illustrates how students can submit complaints to the admin, where the admin can see the complaint.
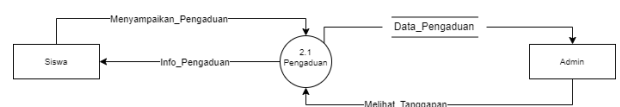

Fig. 5 Data Flow Diagram Level 2 Process 1

5. Data Flow Diagram Level 2 Process 2
Data Flow Diagram Level 2 process 2 describes the admin responding to student complaints, and students can see the response.
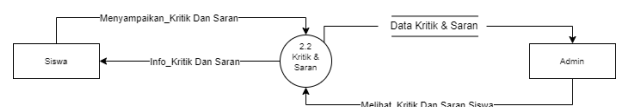

Fig. 6 Data Flow Diagram Level 2 Process 2

6. Data Flow Diagram Level 2 Process 3
Data Flow Diagram Level 2 process 3 describes how the admin responds to complaints to students, and they can see the response.

Fig. 7 Data Flow Diagram Level 2 Process 3

2.2 REST API Testing
There are several approaches to testing REST API-based applications, such as parameters, specifications, and expected requests, by testing the endpoint system and paying attention to several requirements. Postman is an option because users can testach requests using Hypertext Preprocessor (PHP) [14]. After the test, the next step is to verify whether the response is as expected, including data, format, and code status. They make a repost documenting the test result; if errors or failures occur, they can be prioritized for repair.

3. RESULT AND DISCUSSION
3.1 Assumption
Application users are counseling teachers and students who can operate smartphones. Students can submit complaints, criticisms, and suggestions, view history, and view complaint responses. Counseling teachers who get complaints from

students can reply, which will be displayed on the response page.

3.2 System Feature

Here are some features provided for counseling teachers and students. As explained earlier, these features are hoped to facilitate interaction between schools and their students. Some features can be seen in Table 1.

Table. 1 System Feature Application

No.	User	Description
1	Students	login, dashboard, complaint input, history, profile, criticism and suggestions, and complaint responses.
2	Teacher	login, dashboard, feedback input, history.

3.3 System Result

System development starts with creating an interface design, then a frontend, and then the last step is to create a backend consisting of compiling a REST API and database. The MySQL database structure consists of five tables that describe the data stored in the system. These tables consist of student data, complaint data, suggestion data, login data, and response data from complaints. The RESTful API design process in the counseling application uses the HTTP method, which consists of GET a POST operation. In designing GET and POST methods, the primary key of each table is used as the parameter. The whole design is done on a local server with the help of PhpMyAdmin. The list of endpoints and methods used in the application module can be seen in Table 2.

Table. 2 List of Counseling Services Endpoints

Method	Endpoint
getPengaduanByIdSiswa	api/pengaduan
addPengaduan	api/pengaduan/store
addSaran	api/saran/store
addLogin	api/login
getTanggapanByIdPengaduan	api/tanggapan/show

After several processes are carried out to create the system, the following result is from the counseling guidance service application.

3.3.1 Login View

This page will be displayed to users to log in for users who already have an account. To get account access rights, students can register themselves with the school.

Fig. 8 Login View

3.3.2 Dashboard View

The main page contains pages that users can access after login in. The complaint menu, history menu, and student profile will be displayed on this page.

Fig. 9 Dashboard View

3.3.3 Complaint Input View

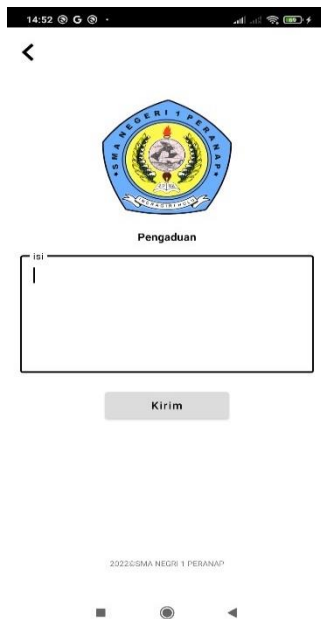This page contains a column for students who want to submit a complaint.

Fig. 10 Complaint Input View

3.3.4 History View

On this page, students can see whether the complaint submitted has been responded to.
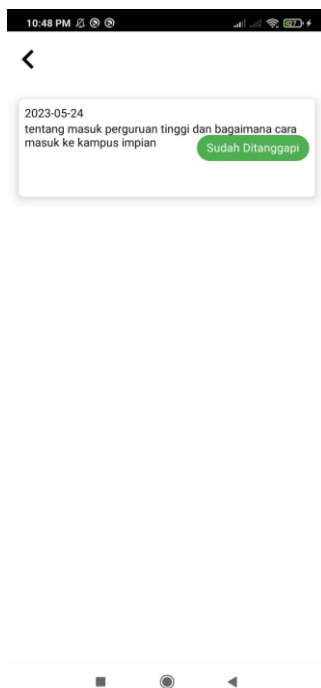

Fig. 11 History View

3.3.5 Criticism and Suggestion View

This page is a column for students to submit criticism and suggestions to the school. Hopefully, students will use this menu wisely to build a better school.

Fig. 12 Criticism and Suggestions View

3.3.6 Profile View

The profile page contains the identity of students who the school has registered. The data displayed are student identification number, name, address, gender, phone number, and email. In addition, there is a logout button to exit the account.

Fig. 13 Profile View

3.4 REST API Testing Result

Testing was carried out in the form of functional testing, using the white box testing method, to verify that the planned features

operate as desired. The RESTful API is tested in a local environment with the help of the Postman tool.

The following are the test results of one of the available features; from the results obtained, no errors occur in the system.

Table. 3 REST API Tesing Result

Test Components	Expected Realization	Showing Result	Note
Login Button	To show another page	The system displays the material page	Succeed
Complaint Input	Can write and send complaints	The system can send complaints written	Succeed
Complaint History	Can display response history	The system displays the history page	Succeed

The following are the results of testing the REST API using the Postman tool.
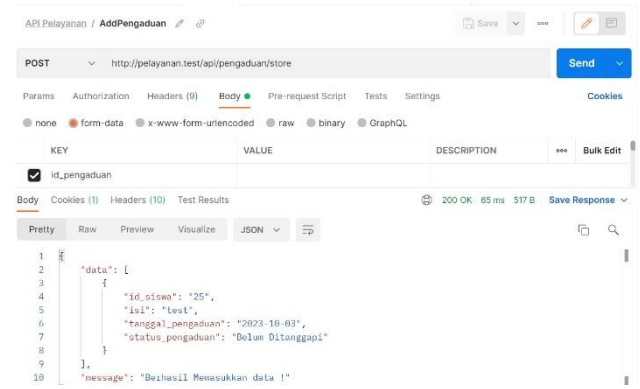
1. getPengaduanByIdSiswa

The results of the getPengaduanByIdSiswa test with the api/pengaduan endpoint in Postman show a 200-response code with an "OK" status, which indicates success in the request to display all complaint data. Figure 14 is a screenshot of the getPengaduanByIdSiswa test results.
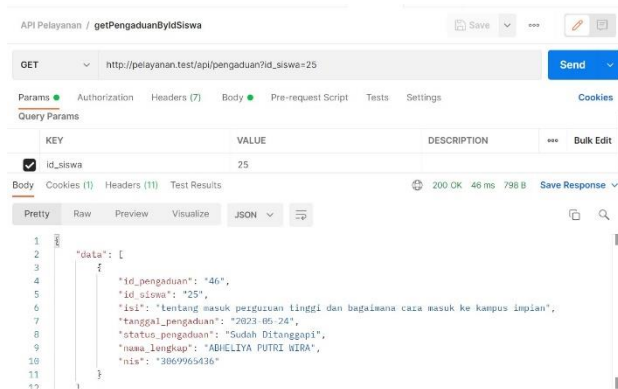
Fig. 14 getPengaduanByIdSiswa Test Results

2. addPengaduan
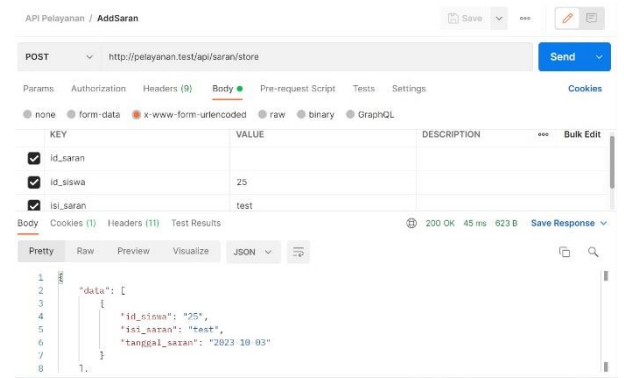
The results of the addPengaduan test with the api/pengaduan/store endpoint in Postman show a 200 response with an "OK" status, which indicates success in the request to enter complaint data. Figure 15 is a screenshot of the addPengaduan test results.
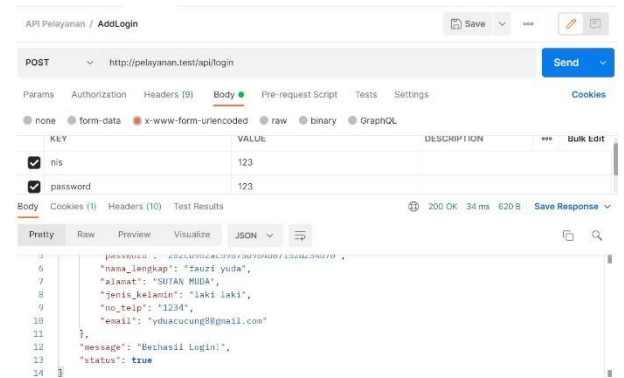

Fig. 15 addPengaduan Test Results

3. addSaran

The results of the addSaran test with the api/saran/store endpoint in Postman show a 200 response with an "OK" status, indicating success in the request to enter suggestion data. Figure 16 is a screenshot of the addSaran test results.

Fig. 16 addSaran Test Results

4. addLogin

The results of the addLogin test with the api/login endpoint in Postman show a 200 response with the status "OK," which indicates success in the request to log in to the system. Figure 17 is a screenshot of the addLogin test results.

Fig. 17 addLogin Test Results

5. getTanggapanByIdPengaduan

The results of the getTanggapanByIdPengaduan test with the api/tanggapan/show endpoint in Postman show a 200 response with an "OK" status, which indicates success in the request to

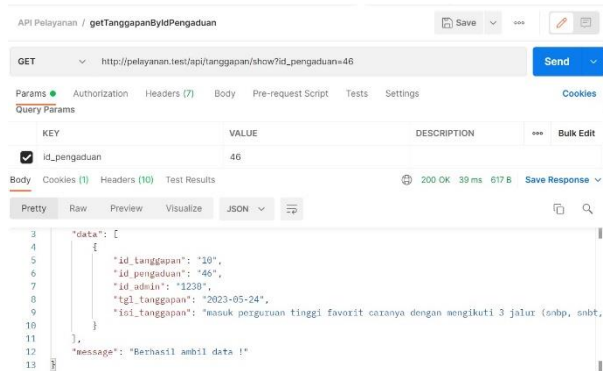display response data on the system. Figure 17 is a screenshot of the getTanggapanByIdPengaduan test results.

Fig. 18 getTanggapanByIdPengaduan Test Results

4. CONCLUSION

This research explores the integration of Android-based REST API with guidance and counseling services in schools. The problem that student experience because they are afraid to submit their compliments and aspirations to the school has been overcome with the features available on the application. This application was built with Kotlin and MySQL as a database. After successfully creating the system, testing was carried out using White box, then REST API testing using Postman.

The test results show that the system runs without errors, and REST API integration is expected to increase the accessibility and efficiency of counseling services in the educational environment. It is hoped that this system can be implemented in schools to improve interactions between students and counseling service providers and provide better improvement according to student needs.

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