

Development of Course Booking System (Front-end & Back-end) Based on Mobile Application to Help Tutoring Elementary and Junior High School in Indonesia

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ABSTRACT

Tutoring is informal education to help students who have problems outside of school. Especially elementary and junior high school students. Students are helped to adjust to their learning situation to develop efficiently according to their abilities. In Indonesia, many students still do not understand the learning material delivered at school, so they must deepen the material outside of school learning. Especially since the COVID-19 pandemic hit, the effectiveness of learning activities has decreased because the learning process is carried out online, so learning is less interactive. From these problems, the user-centered design method is used as the front-end design and the back-end design applies the waterfall method. user-centered design has several stages, namely understanding the context of use, specifying user requirements, designing solutions, and evaluating against requirements. Meanwhile, the stages used in the waterfall method are identification of needs, application development, and application testing. The results of using the user-centered design and waterfall methods can be implemented in the EduAlecta application to connect students with teachers outside of school hours by ordering tutoring and increasing teacher income. The EduAlecta application system has the advantage of applying GPS which can determine the learning location they want, and students can arrange the tutoring they ordered.

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1. INTRODUCTION

Based on the information reported in the Katadata news on March 24, 2020, it was written that during the COVID-19 pandemic, online tutoring platform users increased. Like Quipper tutoring, which has opened 20,000 online classes within a week after suspending school activities. There were 8,683 teachers from 4,492 schools joining Quipper. Based on this data, it was concluded that Quipper had a 30-fold increase compared to the previous week [1]. In Indonesia, many students do not understand the learning material delivered at school, so they must deepen the material outside of school time. Especially since the COVID-19 pandemic hit, the effectiveness of learning activities has decreased because the learning process is carried out online which results in less interactive learning [2]. Based

on a survey that parents of students choose an offline learning system with a survey result of 81% and consider the offline learning system to be effective with a survey score of 82%, then learning is more effective with an offline learning system and parents consider online education to be less effective [3].

Tutoring is an informal education to help students who have problems outside of school [4]. Students are helped to adjust to their learning situation so that they can develop efficiently according to their abilities [5]. Various institutions offer additional materials and fees outside of class hours, as well as detailed materials taught in schools to be able to achieve optimal learning outcomes [6]. In tutoring, there are four important things including learning strategies, learning consultation, problem-solving, and learning evaluation [7].

Based on the problems described above, the EduAlecta application which is engaged in digital-based education was created. The EduAlecta application can help teachers increase their income and connect with students who need tutoring outside of school hours. The system from EduAlecta application has the advantage of implementing a GPS so that students can determine the location of the study they want and students can also arrange the tutoring they need. Android applications that are made can be run on various devices that use the Android operating system, including smartphones [8]. The rapid development of android technology cannot be separated from the role of AOSP (Android Open Source Project) which is responsible for the development of the android operating system and is managed directly by Google [9].

This application uses the Global Positioning System (GPS) developed by the US Department of Defense which is used to determine positioning and navigation with satellites. Signals in the form of microwaves are sent by the navigation system to earth. Then microwaves will be received by receivers on the earth's surface to combine information including time and location from GPS satellites [10].

Mobile devices have characteristics including Central Processing Unit, limited Graphical Processor Unit, small layer, diverse work environment, and unreliable network connections [11]. The EduAlecta application is built using Flutter which is mobile-based and open source. Flutter can produce an attractive UI and is a Google technology [12]. In addition, this application is designed using PHP which is a programming language that is generally widely used in the industrial world because it is fast and compiled [13]. In addition, its performance is very good in concurrent programming or concurrent computations that are executed at the same time.

2. METHOD

The application design includes front-end and back-end using user-centered design and waterfall methods which are described in the following explanation:

2.1. Front-end Development

The method used in the design of the front-end is a user-centered design for an interactive system development approach that prioritizes the value of benefits in making the system. User-centered design is also known as the process of designing interfaces for user convenience, user characteristics, environment, tasks and workflows in the design. User-centered design is iterative [14]. The stages of user-centered design include understand context of use, specify user requirements, design solutions, and evaluation against requirements [15].

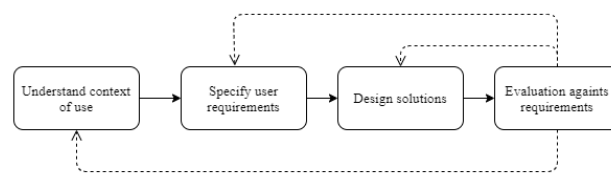


Figure 1. User-centered design method.

2.1.1. Understand context of use

At this stage, questionnaires were filled out via google form with 100 primary school students and 102 teachers as respondents. Furthermore, interviews were conducted with elementary students, parents, and teachers. After that, make observations to determine the character of elementary school students and teachers when conducting tutoring.

Pilihlah diantara 2 cara pembelajaran berikut yang lebih nyaman dalam kegiatan belajar anda?
51 jawaban

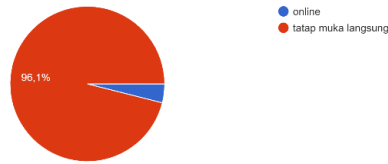


Figure 2. A comfortable learning survey for elementary school students who have never taken tutoring

Based on a survey through a questionnaire, it was found that among 51 respondents of elementary school students who had never attended tutoring, 96.1% of them felt more comfortable doing face-to-face learning activities.

Pilihlah diantara 2 cara pembelajaran berikut yang lebih nyaman dalam kegiatan belajar anda?
49 jawaban

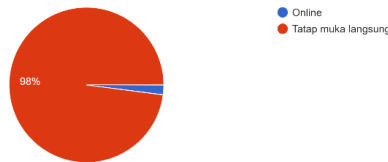


Figure 3. A comfortable learning survey for elementary school students who have attended tutoring

Meanwhile, for elementary school students who have attended tutoring, 98% of 49 respondents feel more comfortable doing face-to-face learning activities.

Bimbingan belajar mana yang lebih anda sukai?
52 jawaban

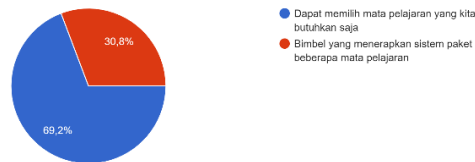


Figure 4. Survey of tutoring favors by students

Researchers also conducted a survey of 52 elementary school students, the results showed that there were 69.2% of respondents preferred subjects according to their needs compared to the package system.

Apakah anda kesulitan dalam menemukan guru bimbel yang sesuai dengan kebutuhan anda?
52 jawaban

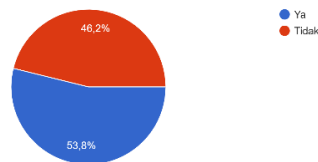


Figure 5. Student survey has difficulty finding tutors

Elementary students find it difficult to find teachers according to their needs. This is in line with the survey conducted, with the results that 53.8% of the 52 student respondents had difficulty finding a teacher according to their needs.

Apakah anda tertarik bergabung sebagai pengajar pada aplikasi pemesanan bimbingan melalui aplikasi berbasis GPS?
162 jawaban

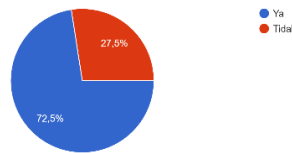


Figure 6. Survey of the level of teacher interest in joining as a teacher

To find out the level of interest of the target market towards the system and how the application works. It was found that 72.5% of the 100 teacher respondents were interested in joining as a teacher in the EduAlecta application.

Apakah anda tertarik mengikuti les tatap muka yang gurunya dapat di pesan secara online?
100 jawaban

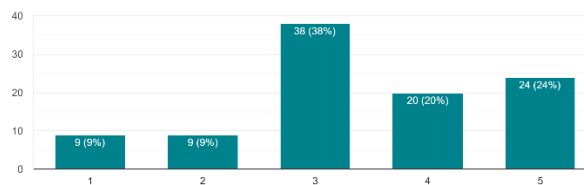


Figure 7. Survey of student engagement level following face-to-face tutoring

Based on the diagram on a scale of one (very disinterested) to five (very interested) most students want to take face-to-face tutoring which can be ordered online

2.1.2. Specify user requirements

Based on the results of an online survey that has been filled out by elementary/junior high school students and teachers who will use the EduAlecta application, it can be concluded that some of the needs to solve existing problems are face-to-face tutoring with online. order, students can choose private or group lessons, students can choose private lessons, students can choose lessons based on the required subjects only, students can determine the length of study, students can order lessons based on predetermined locations, attractive color displays and icons on the application. The results of interviews and observations that have been made with elementary school students and teachers obtained user persona. Sourced on problems obtained from questionnaires, interviews, and observations. Researchers provide a solution by creating a GPS-based tutoring application.

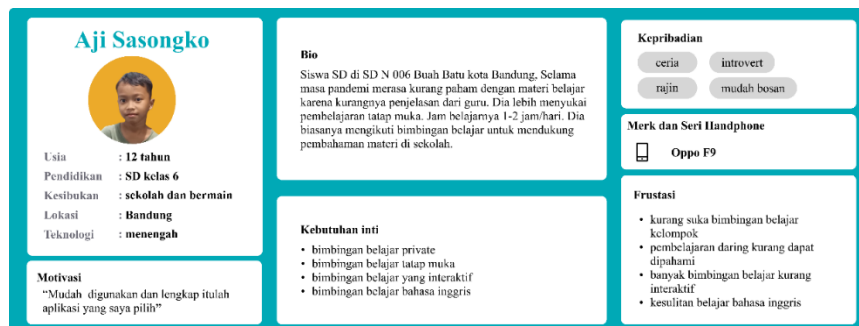


Figure 8. Student user persona.

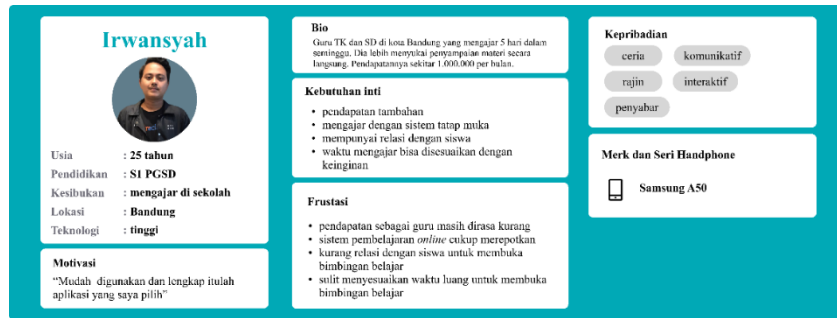


Figure 9. Teacher user persona.

2.1.3. Design solution

Based on the analysis of user needs, a system design was carried out for both users using the flowchart in Figure 10 and Figure 11. The design based on the flowchart will be implemented into a mobile application using the Flutter programming language. In the flowchart diagram of the student's user, students register or login to the application. Then students can choose the closest teacher or subject according to their needs, determine the location of study, schedule, or direct bookings, determine the duration of the study, and the payment system. In addition, students can also contact teachers via chat or calls on the EduAlecta application. Furthermore, while waiting for the teacher's arrival, students can also see the tracking of the teacher's travel location. After the teacher arrives at the student's location, scan the teacher's barcode to start the timer. Then the total bill payment is displayed, and the student makes a transaction. If the student makes a non-cash transaction, the student will first top up the balance and at the time of the transaction, there is no need to make another payment because the balance has been deducted when placing an order. However, if students choose cash transactions, students can make teacher orders without having to top up the balance and still make payments at the time of the transaction. Followed by giving ratings and reviews to teachers.

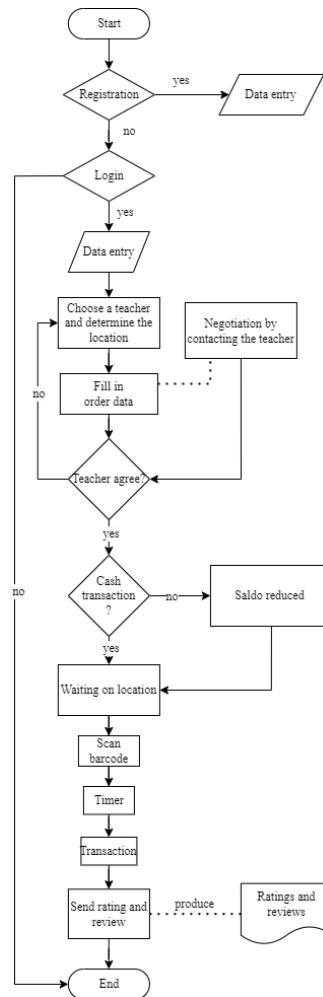


Figure 10. Student user flowchart.

In the flowchart diagram of the teacher's user, the teacher logs in or registers in the application. Teachers can accept orders after activating the open order button. After that, teachers can receive notifications and choose student orders. Then, maps to the learning location. After arriving at the learning location, the teacher shows the barcode to be scanned by the students. The timer will automatically start as a sign of learning in progress when the timer stops indicating the learning process is complete. Followed by uploading proof of the meeting. Then, students will make transactions based on the payment system that has been selected. If students make a cash transaction, the teacher's balance will automatically be deducted by the system. Meanwhile, for non-cash transactions, the teacher's balance will automatically increase. Finally, teachers can see ratings and reviews.

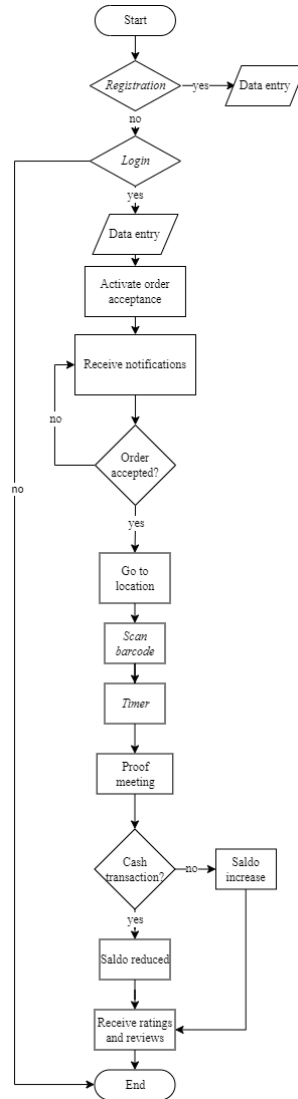


Figure 11. Flowchart of the teacher's user.

2.1.4. Evaluation against requirements

In the last stage, alpha testing and beta testing are performed on the application. Alpha testing using the black-box method aims to check the features available on the application. Then beta testing using the application directly by the user and filling out the Google Form. Based on these two tests, it is expected that the application is already running as its function. However, if the application is not running its function will be evaluated to correct the shortcomings of the application.

2.2. Back-end Development

Back-end uses the waterfall methodology, the process is carried out in stages and runs sequentially. The waterfall method used in this application consists of several stages including identification of needs, application development, and application testing [16]. The research methodology used in making an application for ordering GPS-based tutoring can be seen in the image below.

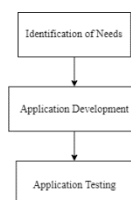


Figure 12. Research method.

2.2.1. Identification of Needs

This stage begins with conducting a literature study to find a problem, seeking relevant information, reviewing several basic theories, seeking theoretical foundations, and deepening knowledge related to the problem under study. And make comparisons with similar applications.

2.2.2. Application Development

The stage of making the application consists of the application design process and application creation. Application design makes flowcharts, application schemas, and database designs using MySQL. Next, create a UI/UX design and implement the UI design into the front-end using Flutter. Then the front-end will be integrated into the back-end using the PHP and Flutter programming languages.

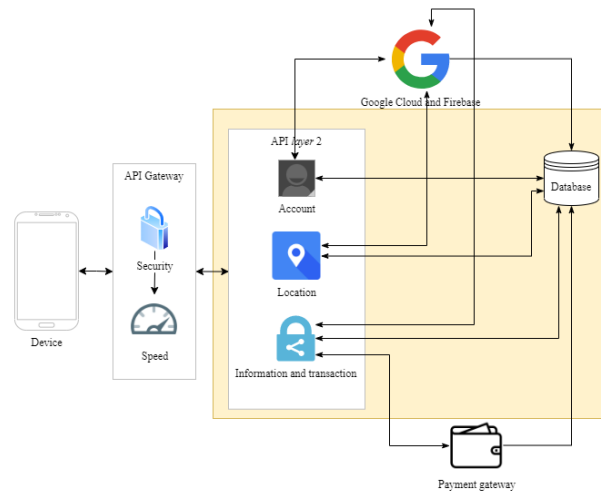


Figure 13. Schematic of the application.

Figure 13 shows the workflow of the system, when a user accesses the application, the application will connect to the API gateway which is a gateway that merges from API layer two including accounts, locations, information, and transactions stored on the server. For the account, authentication will be stored to Firebase and then saved to the main database as a backup when there is data loss. Locations will use Google Cloud features to process locations and convert them into transaction data that will be saved to the main database. Data containing transactions will be checked at the payment gateway service provider and then saved to the database. Meanwhile, additional information about accounts, history, and others will be stored directly in the database. Session storage will be carried out in the application device directly. Figure 14 shows the database design of the application system that was built.

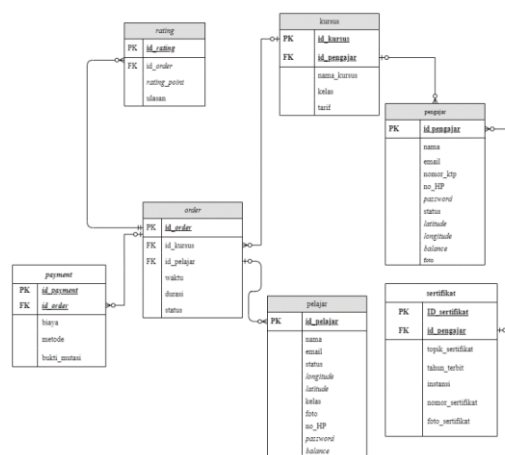


Figure 14. Application database design.

2.2.3. Application Testing

At the testing stage, alpha testing and beta testing are carried out along with front-end testing. Alpha testing uses the black-box method to find out the application has been running as it functions. Then beta testing using the

application directly by the user and filling out the Google Form. However, if the application does not run properly, an evaluation will be carried out to correct the shortcomings of the application.

3. RESULTS AND DISCUSSION

This section describes the research results which are presented in the form of the following figures and tables:

3.1 System to Application Implementation

Figure 15 displays debug student applications. On Figure 15a, users can search and select the required subjects and teachers. On this page there are also several important categories so that students can easily find teachers and subjects. Figure 15b displays the identity of the teacher, to make it easier for students to know the quality of the teacher they choose because they can see ratings, reviews, educational history, and awards. This page also displays some subjects that are covered by teachers that students can order. On Figure 15c, you can place a tutoring order at the desired time and date. To place an order there are several data that needs to be filled in, including making sure the learning location is correct, duration, type of tutoring, education level, class, number of students, students can input vouchers, and choose a payment system. On the travel tracking page (Figure 15d), students can monitor the teacher's journey, this page aims to make sure the teacher's journey is correct and students can also immediately prepare when the teacher has arrived at the location. On Figure 15e, students can scan the teacher's barcode when the teacher has arrived at the location. The purpose of the barcode scan feature ensures that students and teachers have met in person and started the learning timer. On Figure 15f, students can see the duration of learning according to what is ordered so that learning can be carried out in a timely manner. Students can also submit learning files on this page. After the teacher stops the timer will be displayed details of the payment that the student needs to pay to the teacher (Figure 15g). Payment can be made in cash and non-cash to the teacher. Once the teacher confirms the payment, a rating and review page will be displayed. This page aims to make it easier to consider other students who want to place the same teacher booking. On the home page users can open orders and see a list of incoming orders. The teacher's order list can accept or reject incoming orders. On the travel tracking page, teachers can monitor the journey from a predetermined location, this page aims to make sure the teacher's journey is correct and students can also immediately prepare when the teacher has arrived at the location. On this page the teacher can show the barcode contained in the application when it has arrived at the location. The purpose of the barcode scan feature ensures students and teachers have met in person and the learning timer will automatically start. On this page, teachers can see the duration of learning according to what is ordered so that learning can be carried out in a timely manner. Teachers can also submit learning files on this page. After uploading the proof of meeting, it will be displayed the details of the payment that needs to be paid by the student. Payment can be made in cash or non-cash to the teacher. After the teacher confirms the payment transaction, a page of the results of the rating and review provided by the student will be displayed.

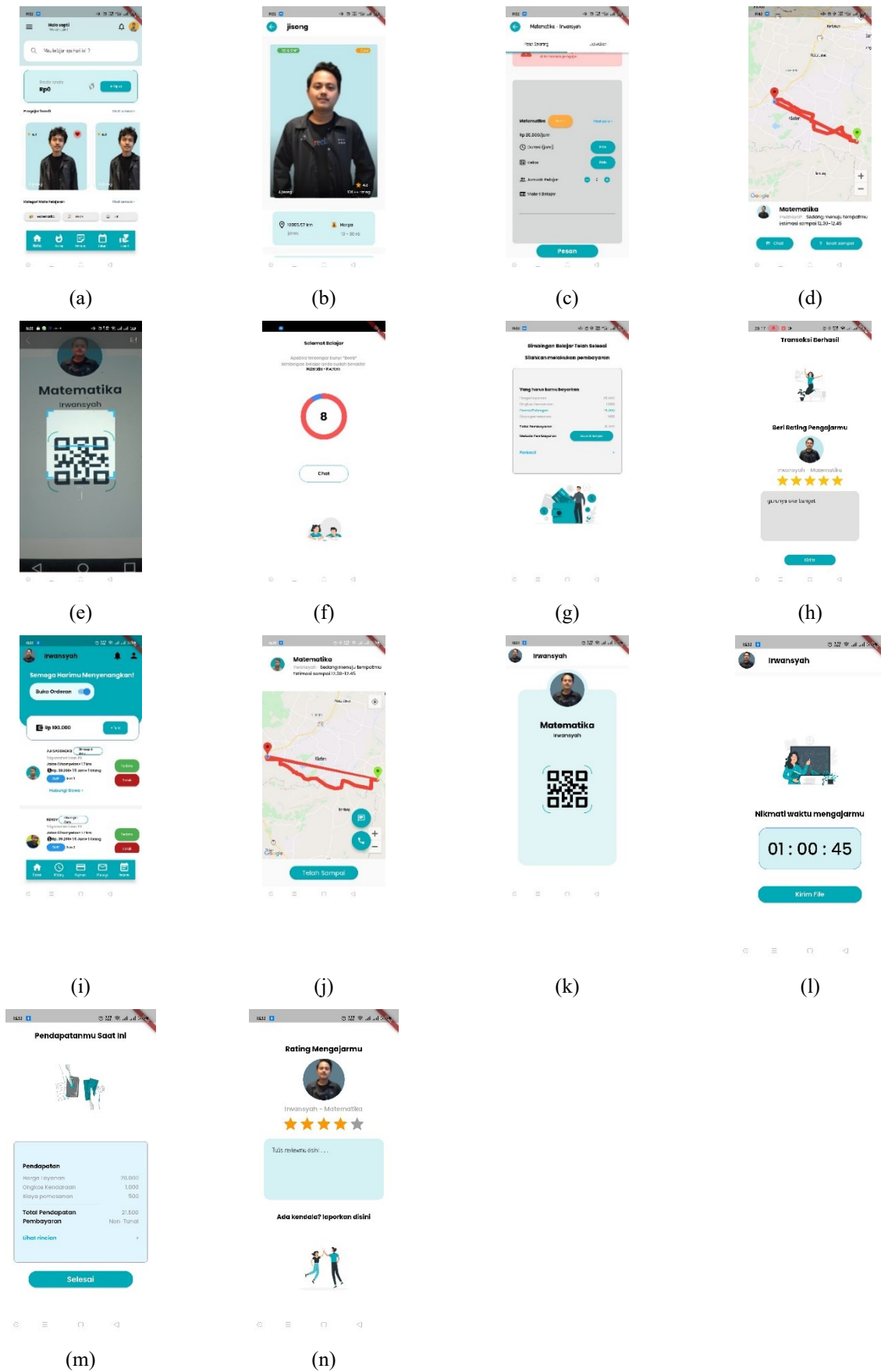


Figure 15. Application display

3.2 Application Testing

This test is carried out directly by the developer by determining the expected testing and realization activities. Student and teacher application testing is done simultaneously to ensure both apps are integrated. As well as checking the features of the application that runs according to its function. The results of alpha testing of student and teacher applications using black-box are represented in Table 1. Meanwhile, the beta test results were conducted on 15 student users and teacher users by filling out the Google Form in Figure 16 and Figure 17.

Table 1. Alpha testing for user students and teachers.

Student				Teacher			
Testing Activity	Expected Realization	Test Results	Conclusion	Testing Activity	Expected Realization	Test Results	Conclusion
Registration as a student	Can go to the registration page	Open the registration page	Results run and accordingly	Register as a teacher	Can go to the registration page	Open the registration page	Results run and accordingly
Login as a Student	Can go to the login page	Open the login page	Results run and accordingly	Login as a teacher	Can go to the login page	Open the login page	Results run and accordingly
Looking for teachers or subjects	Can go to the home page	Go to the home page	Results run and accordingly	Turn on the open order button	Can open an order to receive an order	Activate the open order button to be able to accept orders	Results run and accordingly
View teacher profiles	Can go to the teacher profile page	Open the teacher profile page	Results run and accordingly	Select orders to receive	Can go to the order list page and receive it	There is a list of orders and teachers can choose which orders to receive	Results run and accordingly
Create an order	Can input the details of the desired order	Input the order that has been made	Results run and accordingly	Tracking student location	Can show student location tracking	Appear tracking student locations	Results run and accordingly
View teacher location tracking	Can show teacher location tracking	Perform teacher location tracking	Results run and accordingly	Showing the barcode to be scanned by students	Can display barcodes for scan	Barcodes can be scanned by students	Results run and accordingly
Scan the barcode	Can scan barcodes	Scan the barcode	Results run and accordingly	View timers	Timer can run according to the ordered duration	View the reserved duration timer	Results run and accordingly
View timers	Timer can run according to the ordered duration	View the reserved duration timer	Results run and accordingly	Upload proof of meeting	Can take photos of meetings and upload photos	Proof-of-meeting photos can be taken and uploaded	Results run and accordingly
View payment bills	Can see payment details as booked	Go to the payment details page	Results run and accordingly	View student payment bills	Can see payment details as booked	Go to the payment details page	Results run and accordingly
Provide ratings and reviews	Can provide ratings and reviews to teachers	Input ratings and reviews	Results run and accordingly	View ratings and reviews	Can receive ratings and reviews from students	Showing the results of ratings and reviews from students	Results run and accordingly

Apakah dengan adanya aplikasi EduAlecta dapat meningkatkan efektivitas kegiatan pembelajaran selama pandemi Covid-19?
15 responses

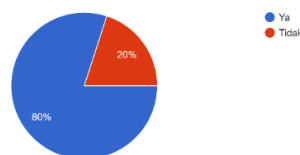


Figure 16. Student user effectiveness testing

Apakah dengan adanya aplikasi EduAlecta dapat meningkatkan efektivitas penyampaian materi selama pandemi Covid-19?
15 responses

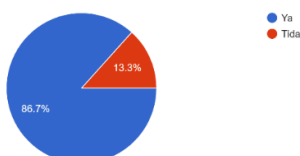


Figure 16. Teacher user effectiveness testing

Student users with a percentage of 80% of 15 people, feel that the EduAlecta application can increase the effectiveness of learning activities during the Covid-19 pandemic. Teacher users with a percentage of 86.7% of 15 people, feel that the EduAlecta application can increase the effectiveness of material delivery during the Covid-19 pandemic.

4. CONCLUSION

The study explains how to develop a mobile app to connect students with teachers outside of school hours by booking tutoring and increasing teacher income. Based on the test results obtained, it can be concluded that the tutoring feature in both applications runs as expected, the EduAlecta application can be used by students in ordering lessons by their needs to increase the effectiveness of learning activities during the Covid-19 pandemic, can be used by teachers in receiving tutoring orders and increasing the effectiveness of teachers in delivering learning materials during the Covid-19 pandemic, it can run at least on the android version, and the EduAlecta app must be connected to the internet when in use. Obstacles in making applications are ushered in finding the right respondents for the research and testing process. How to overcome this problem by increasing cooperation between schools and tutoring institutions. As well as complicated front-end and back-end integration. How to solve it with a simpler programming model. Suggestions for further research are the development of other application features, the appearance of a user interface that adapts the design to the time and expanding access to the iOS operating system.

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