Design of Interactive Media for Japanese M-Learning Based on Android Using UML and Waterfall Model

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Abstract

The development of open-source technology has created many innovations created by developers in creating Android-based applications. One of them is creating interactive media M-Learning Japanese language learning based on Android. Japanese M-Learning is made to facilitate students in the learning process and provide interactive convenience in improving Japanese language skills. M-Learning is made using the Android programming language with UML (Unified Modeling Language) design analysis tools and the waterfall model. The initial analysis uses the Usecase model to determine the actors involved in the system, and the flow of actor activities using the Activity and Sequence models and several other supporting models. The User Interface is made to describe the system being built and the Flowchart is designed to see the scheme running on the Japanese M-Learning interactive media system. The results of the analysis were carried out by taking satisfaction data from 30 student respondents, 81% stated that this Interactive Media was Good.

Keywords: M-Learning, Japanese, UML, Waterfall, Android

I. Introduction

The increasingly developing technology and information currently has a great influence on daily life for all groups [1]. Especially in the development of smartphone technology. The use of various smartphones makes smartphones a primary need in communicating and obtaining information [2]. The development of smartphone devices that are increasingly high and relatively cheaper is the main factor in the use of smartphones in society. The Digital Marketing Research Institute Emarketer in 2018 estimated that active smartphone users in Indonesia reached more than 100 million people. With that number, Indonesia will become the country with the fourth largest active smartphone users in the world after China, India, and America [3]. In the field of education, utilizing Android smartphones has become a major part in supporting the needs and effectiveness of the teaching and learning process. The many innovations made in developing various educational applications make the learning process easy [4]. The many learning models that are built to answer the shortcomings of previous learning [5].

One of them is the interest of students who want to learn Japanese, the expensive cost factor and educational places that are not all available make this a challenge in itself in the learning process of this interest. Efforts need to be made, namely creating an interactive learning media in basic Japanese language learning based on use via Android smartphones [6]. So that with the existence of this interactive Japanese language learning media, it can facilitate and help students interested in learning and increasing their knowledge in Japanese. With the development that is already based on Android, this learning media will greatly facilitate students interested in learning Japanese without being hindered by space and time. The development of this interactive media cannot be separated from the planning tools and programming languages used. in the analysis and design process, the UML (Unified Modeling Language) diagram model will be used, and the Android programming language uses Eclipse.

Mobile learning is a new phenomenon with the effectiveness of countless tools in terms of education and high-quality learning process. Smartphone is not just a phone but a device that can educate you at your will and at a time that is conveniently available to the user. Mobile technology or smartphones in the digital era used in educational purposes are the core function of the spirit and development of mobile learning and referred to as ubiquitous learning [7]. M-learning in educational environment has brought several opportunities for learners and educators as indicated by the scope of M-learning that can be accessed anywhere only through android smartphones. M-learning helps learners in the learning process, join social media, find answers to their questions, enable team collaboration, facilitate knowledge sharing, and thus, improve their learning outcomes. Several research studies are interested in developing M-learning applications in various contexts for different purposes with this interest driven by the availability of open-source development, accessibility of mobile infrastructure, mobile devices, low cost, learner motivation [8].

UML (Unified Modeling Language) is one of the object-oriented modeling for designing and developing software or applications. UML modeling provides a standard for writing a blueprint system, which includes business concepts, writing classes in specific programming languages, components needed in a software system and database schema [9],[10]. UML is a very reliable model and is widely used by software/system developers because it is object-oriented [11]. This is because UML modeling provides a visual modeling language that allows system developers to create visuals in a standard form, easy to understand and equipped with an effective mechanism for sharing and communicating designs with others [12]. The basic concept of UML Abstraction consists of three parts, namely structural classification, dynamic behavior, and model management and can be the main concepts as a reference when creating diagrams and views as categories of the diagram. UML consists of many models such as Usecase diagrams, Activity diagrams, Sequence diagrams, Class diagrams, Statechart diagrams, Collaboration diagrams, Component diagrams, and Deployment diagrams [13]. Android is an operating system software used on mobile smartphone and tablet devices.

The operating system is illustrated as a bridge between the device and its user, so that users can interact with their devices and run applications available on the device [14]. The use of Android applications in the teaching and learning process is very important for both students and teachers. One of the functions of Android applications for learning is the creation of applications related to student lessons where there are learning materials and a collection of practice questions that can be worked on by students. One of the Android applications that can be developed for learning is the emodule application or learning module. Android-based multimedia used in learning media makes learning more interesting than conventional information in the form of text by displaying animations, both audio and visual so that knowledge of historical information becomes more interesting [15]. The number of software/application developers in previous related studies such as research conducted by Chandra et al. 2016, entitled "Designing a Mobile Learning Test of English for International Communication (TOEIC) Simulator Application on Android-Based Smartphones" where this study aims to create an Android-based learning with a focus on learning and TOEIC Simulation tests [16]. Furthermore, research conducted by Aisyiyah et al. 2019, entitled "Mobile Learning-Based Learning Media for Momentum and Impulse Material to Improve Students' Critical Thinking Skills", this research was to create an Android learning application related to Momentum and Impulse Physics [17].

Furthermore, research conducted by Ibnu and Wasis 2020, "Development of Mobile Learning-Based Learning Media for Physical Fitness Activities of Class X Vocational High School Students" this research produces android-based learning media for physical fitness learning containers for class X Vocational High School students [18]. Then previous research that utilized UML tools in the information system design process conducted by Fifin and Vina 2019, "Utilization of UML (Unified Modeling Language) in Designing Customer-To-Customer Type E-Commerce Information Systems" research conducted utilizing UML tools as a system design model.

Then research by Suendri 2018, "Implementation of UML (Unified Modeling Language) Diagrams in Designing Lecturer Remuneration Information Systems with Oracle Database (Case Study: UIN North Sumatra Medan)" the design carried out used UML diagrams in the design model. Based on the many previous related studies, the design of this Japanese language M-Learning interactive media needs to be created. By utilizing the design tools, namely UML and the research model using the waterfall discipline to focus on working on each stage systematically. The following is UML consisting of 13 types of diagrams grouped into 3 categories [19]. The division of categories and types of diagrams can be seen in the following Figure.
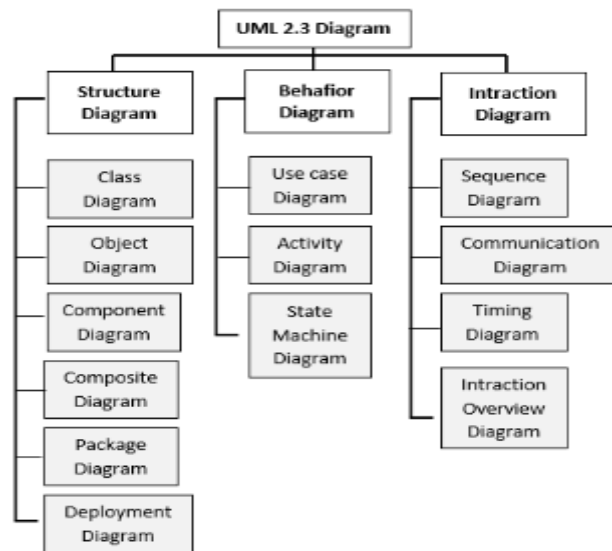
Figure 1. UML diagram

Figure 1 shows various diagrams that can be used to help design the system. In this study, several diagrams were used, such as Usecase Diagrams used to determine the actors and the overall system description, Activity Diagrams used to show the activities that actors can do in the system, Sequence diagrams show detailed and more detailed descriptions of each actor's movement, Class diagrams are used to determine interrelated classes and also as a concept of the database. Then several other designs such as the design of the system interface that will be created and several flowchart designs to show the sequence from beginning to end. Each stage in this study uses the waterfall discipline so that it can be more focused on each part of the design. So that with the innovation and development of the interactive media application of Japanese M-Learning, it can provide convenience for enthusiasts to increase their basic skills easily.

II. Methods

The research method used is using the computer science discipline SDLC (System Development Life Cycle) or can be interpreted as a system development life cycle. In general, SLDC has four stages, namely: Planning, Analysis, Implementation, and Maintenance [20]. These stages can be more detailed by utilizing a model from SDLC. This study uses an implementation model, namely waterfall, which is often referred to as the Linear Sequential Model [21]. The waterfall model will start from the planning stage, then collect data from research case studies, and carry out the process of modeling the analysis results using UML, and carry out the design using UML, then enter development or coding, and the last stage is testing and implementation [22].
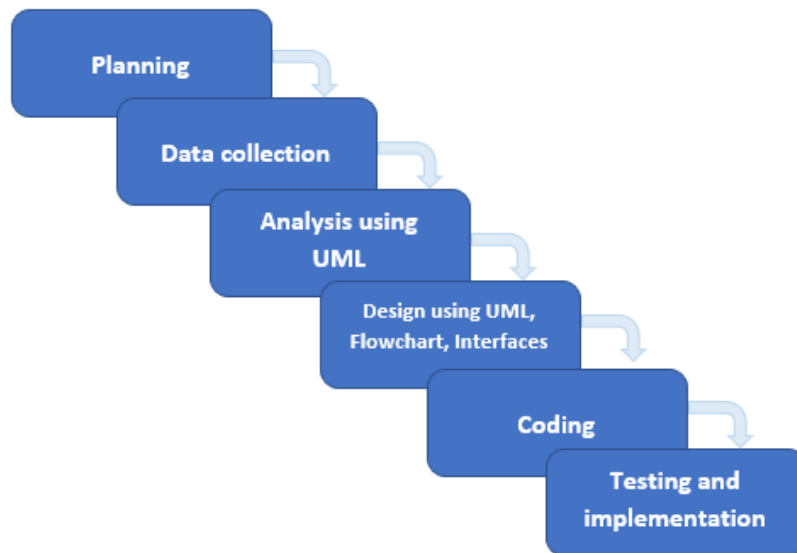
Figure 2. Research Framework

III. Results and Discussions

A. Analysis

Analysis is done by utilizing several UML models by producing an analysis design that will be made. The following is the definition of actors in the mobile learning application.

Table 1. Definition of Actor

No	Actor	Description
1	*User*	The user is the main actor in this mobile learning application. Because this mobile learning application is offline, the user is the only actor involved in this system.
2	Admin	Admin is an actor who acts as an operator in the mobile learning application. It is called an operator because the admin is an actor who inputs data into this application so that it can become an application that is ready to be used by the user.

The following is the Usecase plan that was formed.
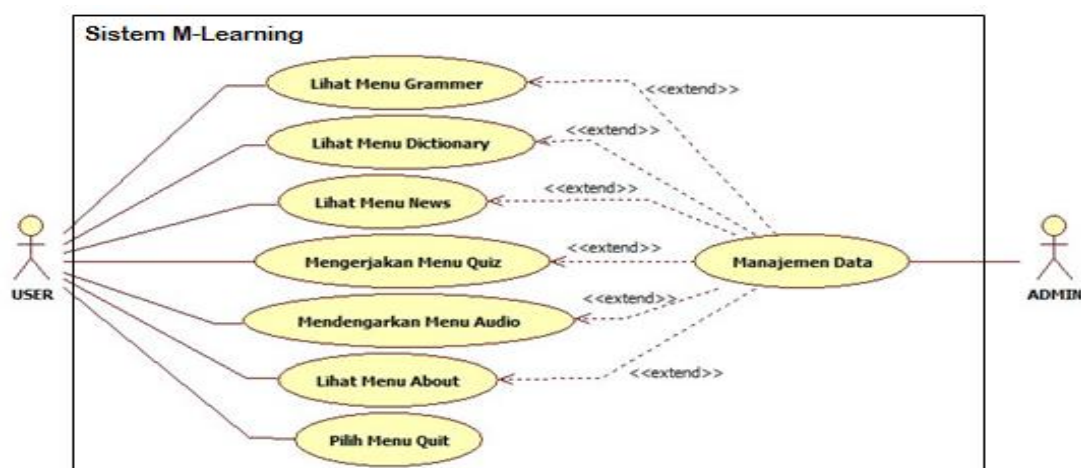
Figure 3. Usecase Diagram

Activity diagrams describe how activities occur in the system to be designed. Activity diagrams are the same as flowcharts that describe the processes that occur between actors and systems. Admin and user activity diagrams are the steps of activities carried out by each actor in the application. The following are the admin and user activity diagrams.
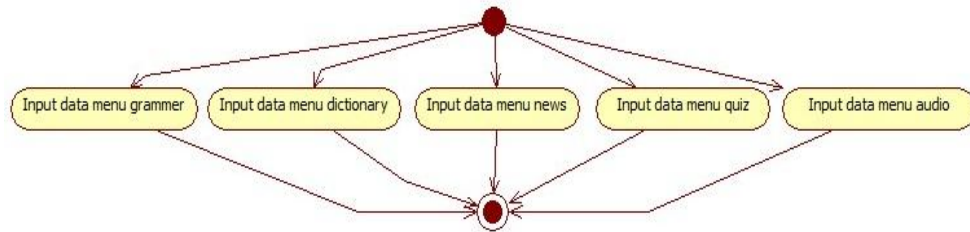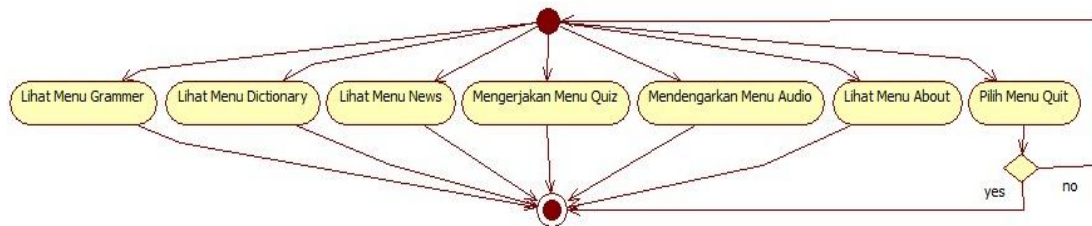
Figure 4. Admin Activity Diagram

Figure 5. Activity Diagram User

Sequence Diagrams are commonly used to describe scenarios or series of steps taken in response to an event to produce a specific output. Data management sequence diagrams describe the activities carried out by the admin when inputting application data.
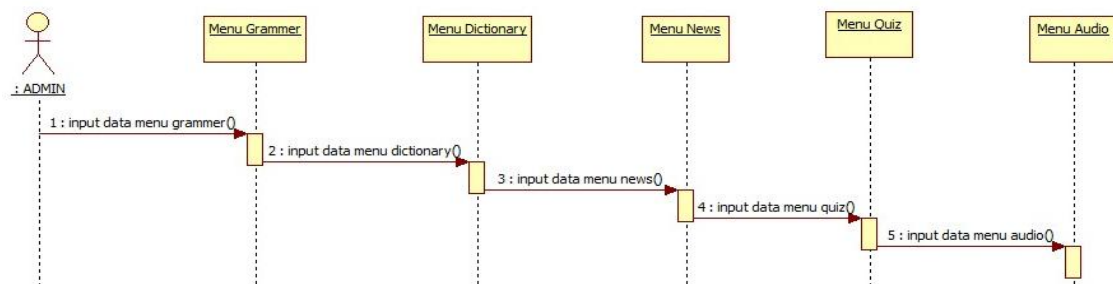

Figure 6. Data Management Sequence Diagram

The Indonesian tab menu sequence diagram illustrates the activities performed by the user after entering the main menu by selecting the Indonesian tab. In this menu, the user can search for Japanese words that are not understood.
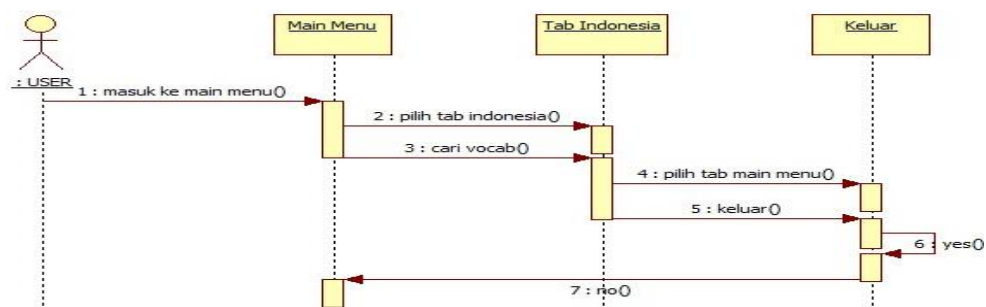

Figure 7. Sequence Diagram of the Indonesian Menu Tab

The Japanese tab menu sequence diagram illustrates the activities performed by the user after entering the main menu by selecting the Japanese tab. In this menu, the user can search for the meaning of Japanese words that are not understood.
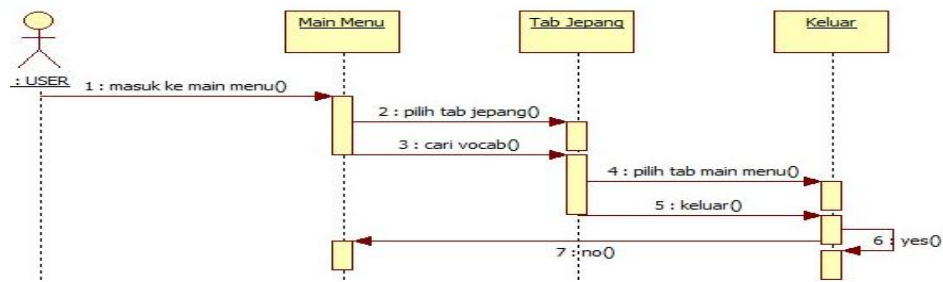
Figure 8. Japanese Tab Menu Sequence Diagram

The quiz menu sequence diagram illustrates the activities carried out by the user after entering the main menu by selecting the quiz menu. In this menu, the user can work on quizzes from previously available materials.
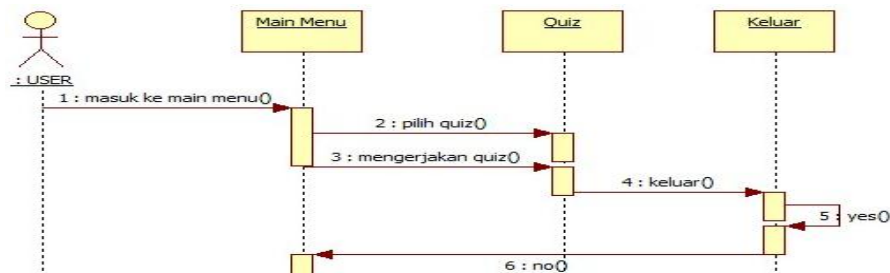

Figure 9. Sequence Diagram Tab Menu Quiz

The audio menu sequence diagram illustrates the activities performed by the user after entering the main menu by selecting the audio menu. In this menu, the user can listen to Japanese language learning recordings from Japanese NHK radio.

Figure 10. Audio Menu Tab Sequence Diagram

B. Design

At this design stage is a continuation of the analysis design results. Some are used to describe the results of the analysis made previously. Class Diagram describes a collection of object classes. In this class diagram will be explained about the classes contained in the M-Learning application. Through the class diagram, the author will design the M-Learning application by describing several classes that will be used in this M-Learning application.
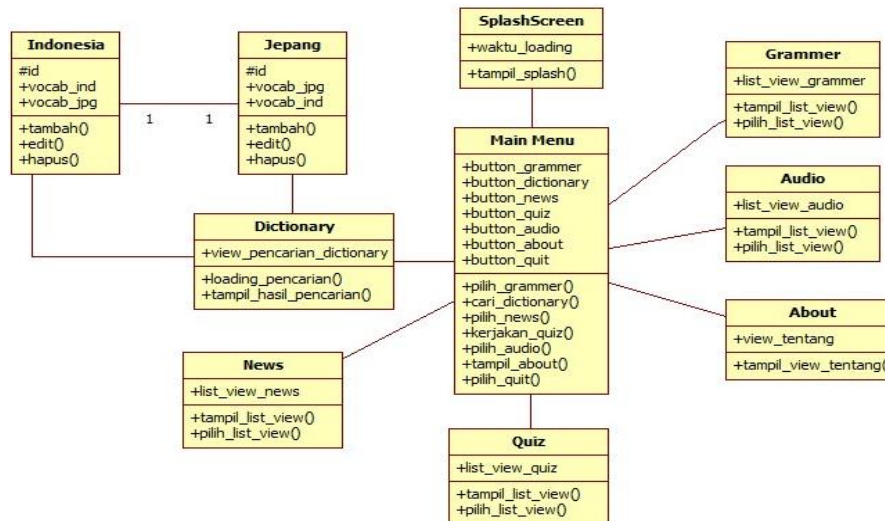
Figure 11. Class Diagram

Interface design is done to describe in general how the application output will look. Therefore, interface design can also be said to be a sketch of the application to be designed. Interface design helps in creating application designs; therefore, it is very necessary to create an interface design first before designing the application design.
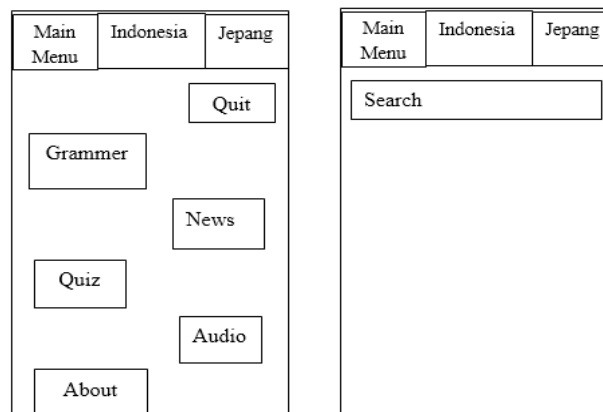

Figure 12. Main Menu & Tab Interface Indonesia/Japan

C. System Structure and Flowchart

At this stage, it shows part of the system structure and a flowchart of the process flow of each program activity. The menu structure is a general form of an application design to make it easier for users to run the application so that when running the application, users do not have difficulty in selecting the desired menus. The following is the form of the M-Learning application interface menu structure.
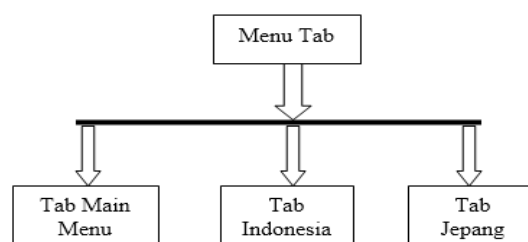

Figure 13. M-learning Application Structure

The Indonesian tab procedure is a procedure that occurs when the user selects the Indonesian tab in the application, while the Japanese tab procedure is a procedure that occurs when the user selects the Japanese tab in the application. The flowchart of the Indonesian and Japanese tab procedural process flow can be seen in the following image.
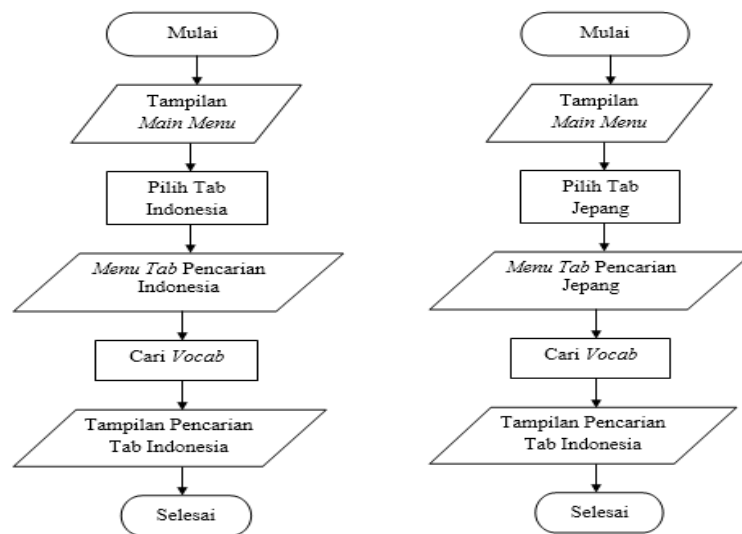

Figure 14. Flowchart of Indonesian Tab and Japanese Tab

The grammar menu procedure is a procedure that occurs when the user selects the grammar menu in the application and the quiz menu procedure is a procedure that occurs when the user selects the quiz menu in the application. The grammar menu and quiz menu procedures can be seen in the following image.
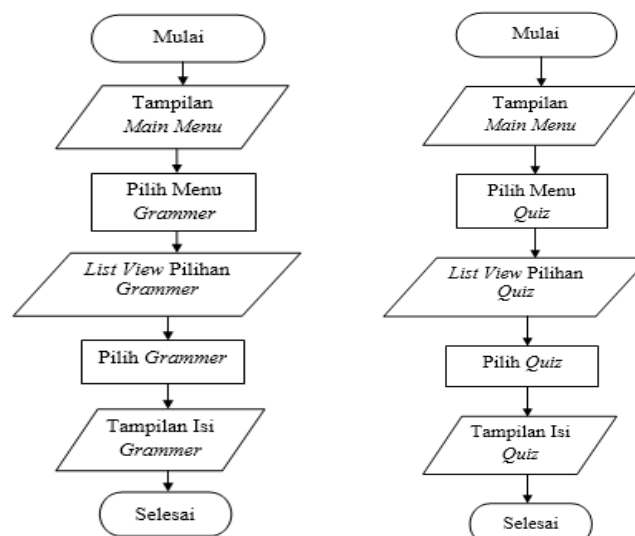

Figure 15. Flowchart of Grammar Tab and Quiz Tab

D. Implementation

System implementation is a stage of system development. In this stage, several activities take place sequentially, namely starting from implementing the implementation plan, carrying out implementation activities, and implementation follow-up. Mobile Learning application testing can be done on all smartphones that have Android OS. In this menu, users can select Japanese grammar materials that are available in the form of a list. This menu contains Japanese grammar materials that can be used to learn the order or structure of sentences in Japanese.
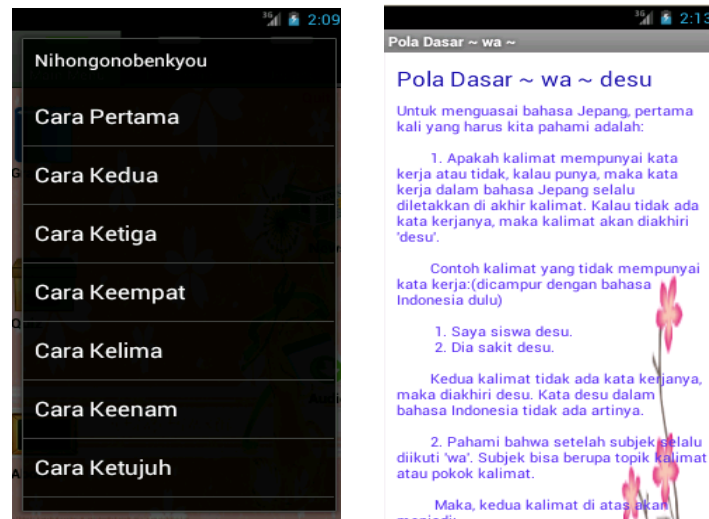
Figure 16. Gammar Menu Display

The Indonesian tab functions as a dictionary in searching for Japanese words translated into Indonesian. The Indonesian tab display is in the form of a searching column, so users must input the first letter of the word they want to search for. After the loading process is complete, a list of words from the letters previously input will appear.

Figure 17. Indonesian Tab View

The Japanese tab functions as a dictionary in searching for Indonesian words translated into Japanese. The Japanese tab display is in the form of a searching column, so users must input the first letter of the word they want to search for. After the loading process is complete, a list of words from the letters previously input will appear.
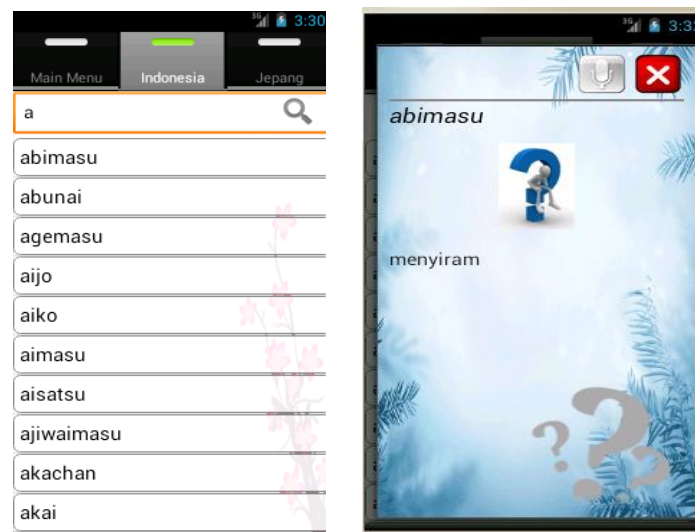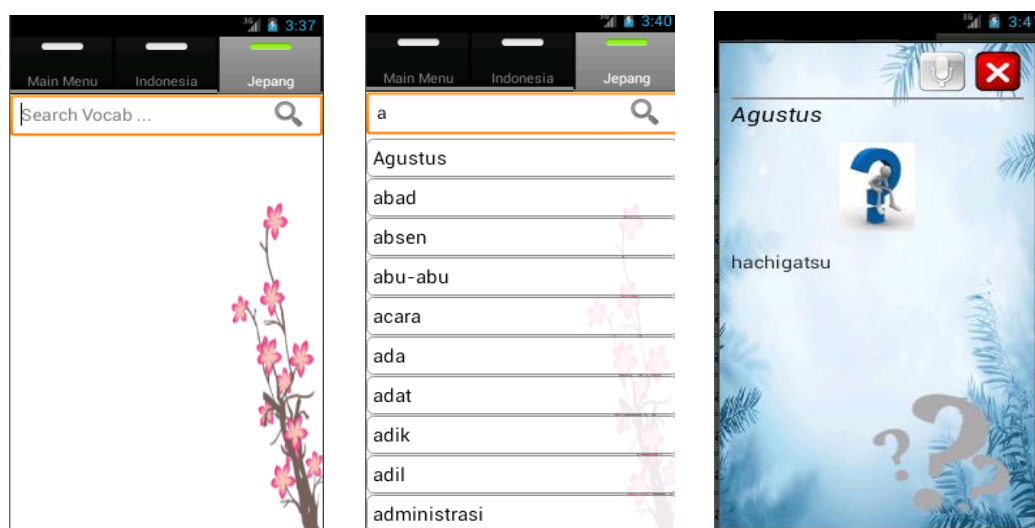
Figure 18. Japanese Tab View

In this menu, there are several NHK radio recordings that can be used as learning media in the form of sound. The display of this menu is in the form of a list of recordings, so that users can directly select which recording they want to listen to. In the detailed list display, there are three buttons that function to play audio, namely the play button (used to start audio), the pause button (used to stop audio temporarily) and the stop button (used if you want to end audio).
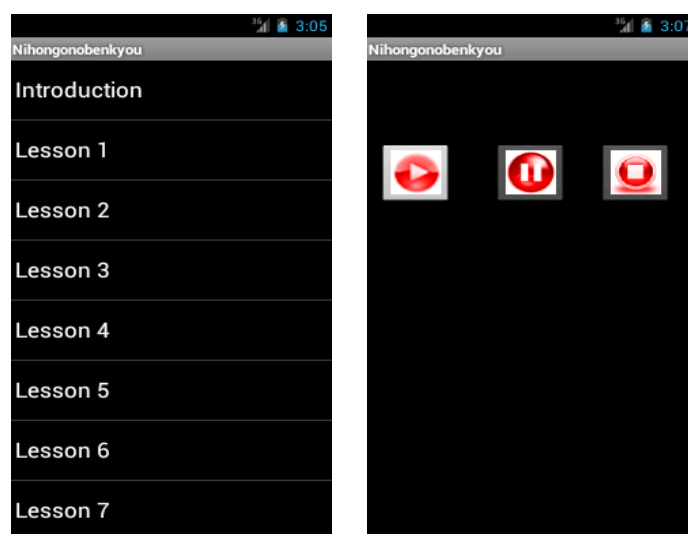

Figure 19. Audio List View

E. Test Analysis Results

The test results were conducted using a questionnaire distributed to 30 respondents after trying to use this interactive Japanese M-learning application. Where the contents of the questionnaire contain questions with three levels of answer choices, namely Bad, Enough, Good.

Table 2. Assessment Questionnaire

No	Questions	Bad	Enough	Good
1	How do you rate this Android-based Japanese Language M-Learning Interactive Media?	0	3	27
2	How do you rate the ease of using this system?	0	2	28
3	How do you rate the visual appearance of this Japanese M-Learning?	1	9	20
4	How do you rate the features in this Japanese M-Learning?	0	8	22

5	How do you rate the speed or accuracy when this application runs?	0	5	25

Based on table 2 above, the results of the rating levels given by respondents are obtained. The results are calculated and presented to obtain the following results.
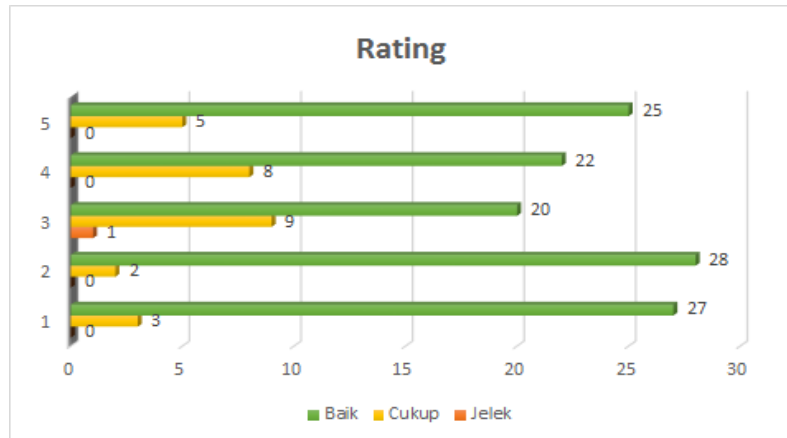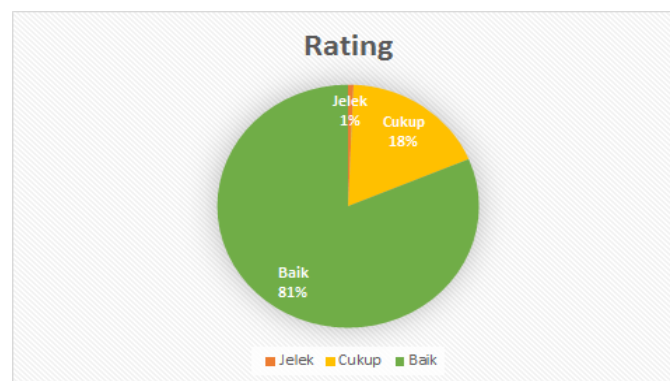

Figure 20. Assessment Results

Figure 21. User Feedback Presentation

From Figure 20, it can be seen that the level of satisfaction obtained from this interactive Japanese M-learning learning media. At the Good assessment level = 81%, the Enough level = 18%, while at the Bad level = 1%. Based on the assessment responses given by respondents, this application is worthy to be used and implemented for users who want to learn basic Japanese.

IV. Conclusions

The development of this Japanese language M-learning Interactive Media learning has a very positive impact on supporting and providing convenience for students or enthusiasts who want to learn Japanese. Difficult places to study and human resources, then with this created application can help and the process of developing knowledge in learning Japanese. Based on the results of the analysis, 81% were obtained with a good level of satisfaction so that the M-learning application is useful and provides convenience. So that with the existence of the Japanese language mobile learning application, it can be more efficient in time in searching and purchasing Japanese language books and can also save expenses because it maximizes the use of smartphones as one of the technological developments. In further developments, this M-learning application is still worth developing by adding new features so that this learning media is more complex and by developing more attractive and sweet interface displays so that this learning media can be implemented sustainably.

References

[1]   S. Adhi, K. Marhadini, I. Akhlis, and I. Sumpono, "Pengembangan Media Pembelajaran Berbasis Android pada Materi Gerak Parabola Untuk Siswa SMA," *UPEJ Unnes Phys. Educ. J.*, vol. 6, no. 3, pp. 38–43, 2017, doi: 10.15294/upej.v6i3.19315.

[2]   A. Voutama, I. Maulana, and N. Ade, "Interactive M-Learning Design Innovation using Android-Based Adobe Flash at WFH (Work From Home)," *Sci. J. Informatics*, vol. 8, no. 1, pp. 127–136, 2021, doi: 10.15294/sji.v8i1.27880.

[3]   Anita Adesti and Siti Nurkholimah, "Pengembangan Media Pembelajaran Berbasis Android Menggunakan Aplikasi Adobe Flash Cs 6 Pada Mata Pelajaran Sosiologi," *Edutainment*, vol. 8, no. 1, pp. 27–38, 2020, doi: 10.35438/e.v8i1.221.

[4]   A. Voutama, "Perancangan Aplikasi M-Discussion Berbasis Android Sebagai Wadah Diskusi Sekolah," *Syntax J. Inform.*, vol. 7, no. 2, pp. 116–124, 2018.

[5]   E. Novalia *et al.*, "Website Implementation with the Monte Carlo Method as a Media for Predicting Sales of Cashier Applications," vol. 2, no. 3, pp. 118–131, 2020.

[6]   A. Aditya and D. W. S. Susanto, "Rancang Bangun Aplikasi Media Pembelajaran Bagi Siswa Penyandang Tuna Rungu Berbasis Android," *Techno.Com*, vol. 20, no. 4, pp. 540–551, 2021, doi: 10.33633/tc.v20i4.5216.

[7]   M. I. Qureshi, N. Khan, S. M. Ahmad Hassan Gillani, and H. Raza, "A systematic review of past decade of mobile learning: What we learned and where to go," *Int. J. Interact. Mob. Technol.*, vol. 14, no. 6, pp. 67–81, 2020, doi: 10.3991/IJIM.V14I06.13479.

[8]   M. Al-Emran, V. Mezhuyev, A. Kamaludin, and M. ALSinani, "Development of M-learning application based on knowledge management processes," *ACM Int. Conf. Proceeding Ser.*, pp. 248–253, 2018, doi: 10.1145/3185089.3185120.

[9]   F.- Sonata, "Pemanfaatan UML (Unified Modeling Language) Dalam Perancangan Sistem Informasi E-Commerce Jenis Customer-To-Customer," *J. Komunika J. Komunikasi, Media dan Inform.*, vol. 8, no. 1, p. 22, 2019, doi: 10.31504/komunika.v8i1.1832.

[10]   A. Rohmat, B. A. Dermawan, A. Voutama, and B. Gunadi, "Sistem Pakar Penentuan Jenis Budidaya Ikan Air Tawar Berdasarkan Lokasi dan Kualitas Air," *J. Teknol. dan Inf.*, vol. 11, no. 2, pp. 96–110, 2021, doi: 10.34010/jati.v11i2.3490.

[11]   B. Adhi Pamungkas, A. Voutama, and B. Nurina Sari, "Sistem Pakar Deteksi Dini Hiv/Aids Dengan Metode Forward Chaining Dan Certainty Factor Expert System of Hiv/Aids Early Detection With Forward Chaining and Certainty Factor Method," *J. Inf. Technol. Comput. Sci.*, vol. 4, no. 1, 2021.

[12]   A. Voutama and E. Novalia, "Perancangan Aplikasi M-Magazine Berbasis Android Sebagai Sarana Mading Sekolah Menengah Atas," *J. Tekno Kompak*, vol. 15, no. 1, p. 104, 2021, doi: 10.33365/jtk.v15i1.920.

[13]   Suendri, "Implementasi Diagram UML (Unified Modelling Language) Pada Perancangan Sistem Informasi Remunerasi Dosen Dengan Database Oracle (Studi Kasus: UIN Sumatera Utara Medan)," *J. Ilmu Komput. dan Inform.*, vol. 3, no. 1, pp. 1–9, 2018, [Online]. Available: http://jurnal.uinsu.ac.id/index.php/algoritma/article/download/3148/1871.

[14]   T. Wiranda and M. Adri, "Rancang Bangun Aplikasi Modul Pembelajaran Teknologi Wan Berbasis Android," *Voteteknika (Vocational Tek. Elektron. dan Inform.*, vol. 7, no. 4, p. 85, 2020, doi: 10.24036/voteteknika.v7i4.106472.

[15]   F. Tahel and E. Ginting, "Perancangan aplikasi media pembelajaran pengenalan pahlawan nasional untuk meningkatkan rasa nasionalis berbasis android," *Teknomatika*, vol. 09, no. 02, pp. 113–120, 2019.

[16]   Y. F. Chandra, N. Dwiyani, and Y. Huda, "Perancangan Aplikasi Mobile Learning Test of English for International Communication (Toeic) Simulation Pada Smartphone Berbasis Android," *Voteteknika (Vocational Tek. Elektron. dan Inform.*, vol. 5, no. 1, 2017, doi: 10.24036/voteteknika.v5i1.6167.

[17]   A. H. Ngurahrai, S. D. Farmaryanti, and N. Nurhidayati, "Media Pembelajaran Materi Momentum dan Impuls Berbasis Mobile learning untuk Meningkatkan Kemampuan Berpikir Kritis Siswa," *Berk. Ilm. Pendidik. Fis.*, vol. 7, no. 1, p. 62, 2019, doi: 10.20527/bipf.v7i1.5440.

[18]   I. A. Pamungkas and W. D. Dwiyogo, "Pengembangan Media Pembelajaran Berbasis Mobile Learning Untuk Aktifitas Kesegaran Jasmani Siswa kelas X Sekolah Menengah Kejuruhan,"

Sport Sci. Heal., vol. 2, no. 5, pp. 272–278, 2022, doi: 10.17977/um062v2i52020p272-278.

[19]   A. Voutama, "Sistem Antrian Cucian Mobil Berbasis Website Menggunakan Konsep CRM dan Penerapan UML," *Komputika   J. Sist. Komput.*, vol. 11, no. 1, pp. 102–111, 2022, doi: 10.34010/komputika.v11i1.4677.

[20]   A. T. J. Harjanta and B. A. Herlambang, "Rancang Bangun Game Edukasi Pemilihan Gubernur Jateng Berbasis Android Dengan Model ADDIE," *J. Transform.*, vol. 16, no. 1, p. 91, 2018, doi: 10.26623/transformatika.v16i1.894.

[21]   D. Zaliluddin and R. Rohmat, "Perancangan Sistem Informasi Penjualan Berbasis Web (Studi Kasus Pada Newbiestore)," *Infotech J.*, vol. 4, no. 1, p. 236615, 2018.

[22]   Agariadne Dwinggo Samala, Bayu Ramadhani Fajri, and Fadhli Ranuharja, "Desain dan implementasi media pembelajaran berbasis mobile learning menggunakan moodle mobile app," *J. Teknol. Inf. dan Pendidik.*, vol. 12, no. 2, pp. 13–20, 2019, [Online]. Available: http://tip.ppj.unp.ac.id.