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ANALYSIS OF HANGMAN GAME IMPLEMENTATION FOR HSK TEST PARTICIPANTS USING FLUTTER

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Abstrak

Bahasa Mandarin adalah salah satu dari banyak bahasa di dunia. Ini adalah bahasa resmi utama Republik Rakyat Tiongkok, dan juga salah satu bahasa yang paling banyak digunakan. Pada tahun 2020, bahasa Mandarin adalah bahasa kedua yang paling banyak digunakan di dunia dengan 1,12 miliar penutur. Untuk memfasilitasi meningkatnya penggunaan bahasa Mandarin di lingkungan kerja, semakin banyak sekolah swasta yang mengajarkan bahasa Mandarin sebagai bahasa kedua. Maka dari itu, butuh sebuah standar untuk menilai keahlian berbahasa, yang mengarah pada pembuatan tes kecakapan bahasa Mandarin tertentu seperti Hanyu Shuiping Kaoshi (HSK). Untuk mendukung peserta tes HSK, penulis bermaksud untuk menyediakan media baru untuk membantu peserta tes memperluas kosakata mereka. Dengan bantuan Flutter dan Firebase Cloud Firestore, hasilnya adalah aplikasi mobile-learning, yang berfungsi sebagai game hangman. Hasil dari survei yang telah dilakukan menunjukkan bahwa orang-orang tertarik dengan aplikasi ini dan dipercayakan aplikasi ini bisa membantu penggunanya memperluas kosa kata bahasa Mandarin.
Kata Kunci: *Cloud Firestore, Flutter, HSK, Mandarin*

Abstract

Mandarin Chinese, or more commonly known as Modern Chinese, is one of the worlds' many languages. It is the main official language of the People's Republic of China, and it is also one of the most anticipated languages across the world. In year 2020, the Mandarin language is the second most spoken language in the world at 1.12 billion speakers.To facilitate the growing use of Mandarin in workplace, more and more private schools are teaching Mandarin as a second language. This leads to a need to assess the expertise of the speakers, which leads to the creation of certain Chinese proficiency test such as Hanyu Shuiping Kaoshi (HSK). To support HSK test takers, the author intends to provide a new kind of media to help the test takers expand their vocabulary. With the help of Flutter and Firebase Cloud Firestore, the result is an e-learning mobile application, served as a hangman game. Survey results shows people are interested in the application and believed that it can help the players expand their vocabularies.
KeyWords : *Cloud Firestore, Flutter, HSK, Mandarin*

I. Research Background

Mandarin Chinese, or more commonly known as Modern Chinese, is one of the worlds' many languages. It is the main official language of the People's Republic of China, and it is also one of the most antic- ipated languages across the world. In year 2020, the Mandarin language is the second most spoken language in the world at 1.12 billion speakers [1]. As the Chinese began to expand its foreign policies and open their borders in trading, gradually the international jobs market required employees who could speak Mandarin professionally. This leads to a need to assess the expertise of the speakers, which leads to the creation of certain Chinese proficiency test such as Hanyu Shuiping Kaoshi (HSK), Business Chinese Test (BCT) and Youth Chinese Test (YCT). Among those three, HSK has the largest test takers count and therefore attracts the most research [2]. Hanyu Shuiping Kaoshi (汉语水平考试), translated as Chinese Language Proficiency Test, is one of the Chinese language proficiency tests. HSK aims to assess non-natives proficiency in Chinese. The HSK Exam consist of 6 levels, level 1 and 2 are considered to be beginner levels, while 3 and four is intermediate, and 5 and 6 as advanced levels. In all levels, listening and reading skills are evaluated, while writing skills are only assessed from level 3 onwards. Lengths of exams may vary according to levels, ranging around 40-130 minutes, with final scores varying from 200-300 points [3].

The advancement of technology allows much more approach to learning new knowledges. In particular, the barriers of language learning become weaker. Learning a new language is not restricted by physical interaction anymore, and can be done individually and even together. It can be done via self-learning website, video calls, and even mobile games. Mobile games are believed to be practical in terms of availability, individuality, and ability to adapt the users' specific needs [4]. One of the games that support language learning is Hangman. Hangman originated as a children's game. The game can be played by two or more people, one player thinks of a word, and write it as a series of dashes. Other players then guess a letter each, if the letter is contained in the word, then it's marked on top of the dashes, if it's wrong, the player adds one element of a hanged man stick figure as a tally mark. If the tally is complete, the guesser loses, on the contrary, if the guesser manages to guess the correct word without completing the tally, they would win [5]. Hangman can facilitate to learn foreign languages by helping the expand the languages vocabulary. Hangman can pique the learners' interest serve as an interesting media to learn new languages. As a video game, it is easier to attract the learners' attention compared to traditional learning media such as

books. Hangman will provide a group of targeted vocabularies for students to learn, and they will find it challenging to find the answer, building a fun atmosphere for studying [6].

Research done by Ying and friends [7] focused on developing a "Smart Word" app with survey and experimental methods. A research by Apriani [8], is trying to research how to create an educational application to learn Japanese. By referring to the ADDIE method, the application is developed with the help of Unity 3D and is written with the C# language. Research done by Muslimin and friends [9] aimed to make learning microeconomics more interesting by making an accessible mobile application. By basing the structural design on the ADDIE model, they crafted courses and training programs for microeconomics. Civicpedia, developed by Abdulkarim and friends [10], is an e-learning software for students. Developed with the Research and Development (R&D) method, it aims to improve student's literacy by providing medias on such as learning materials, dictionaries, quizzes, videos, and etc. A research done by Tanjung and friends [11], conducted in SMP Negeri 1 Padang Bolak, aims to find the effects of hangman's game with students' English vocabulary skills. Research done by Huynh [12] aiming to develop a flashcard mobile application with Flutter. From these studies, we will carry out the research, namely developing a e-learning application which manifests as a mobile hangman game for HSK test takers, with the goal of learning Chinese using hangman game with the ADDIE method, built with Flutter and Firebase Database as used by Huynh. The goal of writing this research was to create a functional educational Hangman game with HSK vocabularies using Flutter and to create a more exciting way of learning Mandarin Chinese with the help of gamification. This research benefits are to create a new medium for studying and preparing for HSK Exam, means of expanding Chinese vocabulary, and to expand authors' knowledge on application design.

II. METHOD

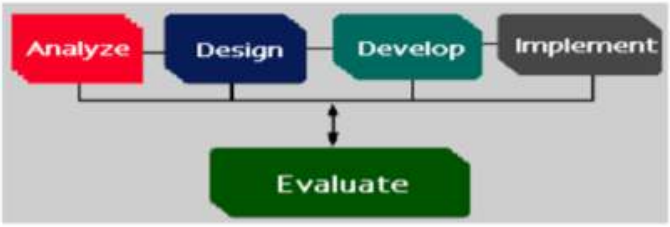


Figure. 1: Addie Instructional Design Phases [13]

To develop this project, we will be using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) Method as see on Figure 1. ADDIE is a set of scientific development model for teaching & learning systems and is a common curriculum implementation plan [14]. It is a common choice to use ADDIE Model, as its strength lies in helping instructional designers and teachers to create an efficient, and effective teaching design [13]. As per phases, firstly, we will analyze the objective in this research. This research's objective is to create a new learning method for HSK learners. The design stage includes designing the database structure, which consist of setting up tables and table relations. Next is designing the applications user interface, and also designing a level structure for the game, to establish a steady learning curve. Next is the development stage, this stage is where all the planning before will be executed in code format. With the development stage done, the project will be launched into beta. In beta, the author will make sure the application works as intended. In this stage, all the previous stages and results shall be evaluated, we will collect the pros and cons of each method, assessing their effectiveness for future development. The user's feedback will also be collected and evaluated here.

The gameplay flow is shown in Figure 2. When the user chooses their desired stage, the server will request the current stage question and choices and display them on the application. Here the user will try to choose the correct answer from the list of choices. If the correct answer is chosen, the game will end, and the server will mark the stage as finished, and the user can either quit or proceed to the next stage. Meanwhile, if the wrong answer is chosen, the tally mark will increase by 1, until it reaches 5 times. By the time the tally has reached 5, the game will be over, and the user can choose to retry or quit the game.

With the development stage done, the project will be tested for its functionality. The author plans to use Black box Testing, a software testing technique which focuses on the functional specifications of the software. Black box Testing allows software developers to create a set of input conditions which will train all the functional requirements of a program [15].

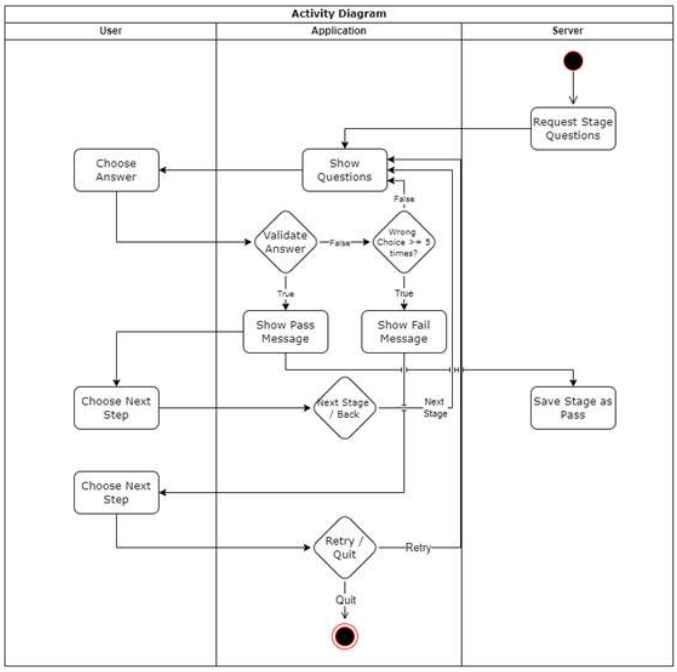
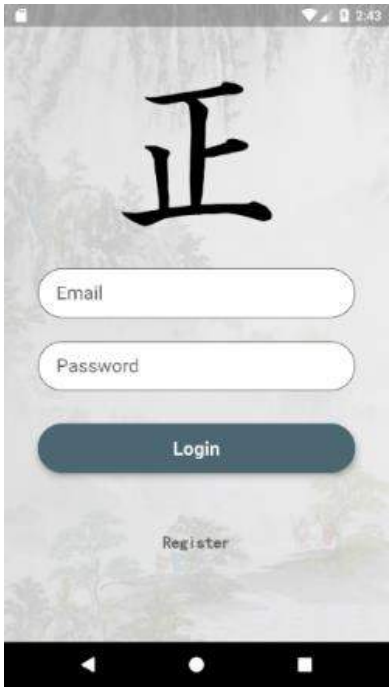


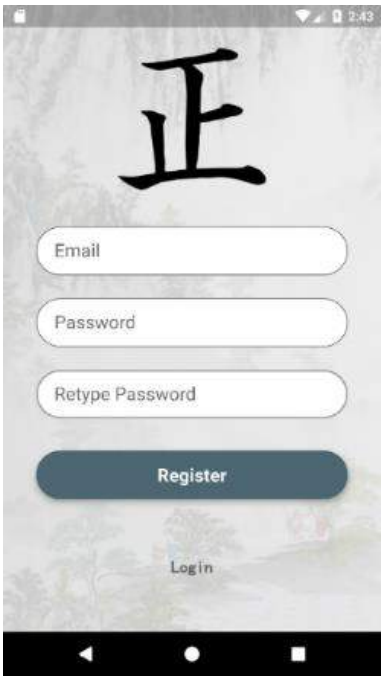
Figure. 2: Gameplay Activity Diagram

A. Login and Register Page

At the start of the application, the user will be prompted to login. If the user didn't have an account yet, they can click on the register button to be guided to the register page, as seen on Figure 3 .



(a) Login Page



(b) Register Page

Figure. 3: Login and Register Pages

B. Application Start Page

After logging in, the user will be greeted with the start page. The application start page contains the title and the start button. Here the user can click on the start button to access more of the application features. Pictured below in the view on a mobile phone as seen on figure 4.

Figure. 4: Gameplay Activity Diagram

C. Application Level Page

After clicking on the start button, the user will be directed to the level page. The user can choose the HSK level to practice here. Currently, there are three levels available to choose from, which are HSK 1, HSK 2, and HSK 3 as seen on figure 5.

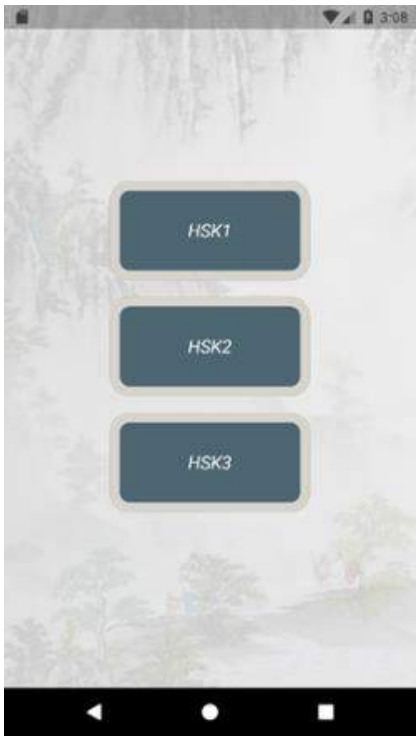


Figure. 5: Gameplay Activity Diagram

D. Application Stage Page

After choosing on the desired level, the user will be directed to the stage page. The stage page comprises of the levels' playable stages. If the level has been cleared, it will also be marked as seen on figure 6.

Figure. 6: Gameplay Activity Diagram

E. Application Game Page

Entering the game page, the user will be shown the question and the available choices. Here, the word "正" will serve as the tally mark akin to the usual hangman picture. Every time the user chooses the wrong answer, the tally will increase, indicated by the increasing strokes on the word "正". Additionally, chosen wrong answers cannot be chosen again, preventing the user from making the same mistake again. If the correct answer is chosen, the game will end, and user can choose to proceed to the next stage or exit as seen on Figure 7.

(a) Game Page 1

(b) Game Page 2

Figure. 7: Login and Register Pages

III. Discussion

A. Black Box Testing

To ensure the application runs smoothly as intended, a testing process will be carried out on the application. Black Box Testing will be used as the testing method. The application was tested on three android devices with different specifications to ensure the application can run properly.

Table I: Black Box Testing Devices

No	Device Name	Device Specifications
1	Google Pixel 2	Screen: 5.0 Inches Resolution: 1080 X 1920 Pixels OS: Android 8.0 (Oreo) Storage: 64GB RAM: 4GB CPU: Qualcomm MSM8998 Snapdragon 835 (10 nm)
2	Vivo S1	Screen: 6.38 Inches Resolution: 1080 X 2340 Pixels OS: Android 9.0 (Pie), Storage: 8GB RAM: 4GB CPU: Mediatek Mt6768 Helio P65
3	Xiaomi Poco X3	Screen: 6.67 inchesResolution: 1080 x 2400 pixels OS: Android 10 Storage: 64GB RAM: 6GB CPU: Qualcomm SM7150-AC Snapdragon 732G (8 nm)

The following section details the black box method test results using 3 different devices as follows:

1) Installation Process
2) Navigation Process
3) Gameplay Process

Table II: Black Box Testing Installation Duration

Testing Device		
Google Pixel 2	Vivo S1	Xiaomi Poco X3
Duration		
12 seconds	10 seconds	8 seconds

From Table I and II above, testing results show that all three devices can install the application successfully. It can be inferred that this application does not need high spec devices to use, and the installation time averages around 8-12 seconds. Notably, the higher spec devices will require less time to install.

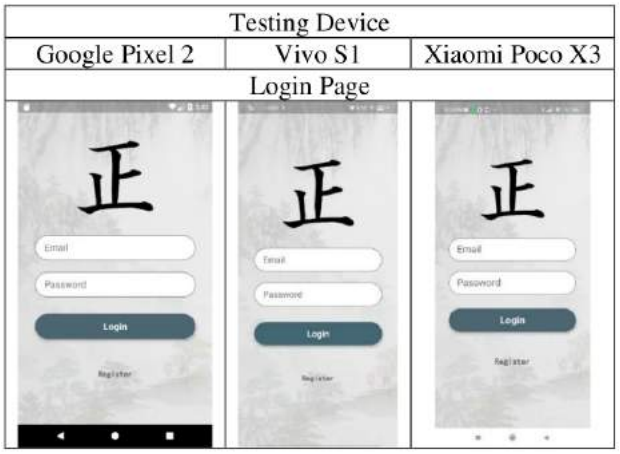


Figure. 8: Black Box Testing Login Page

Figure. 9: Black Box Testing Register Page

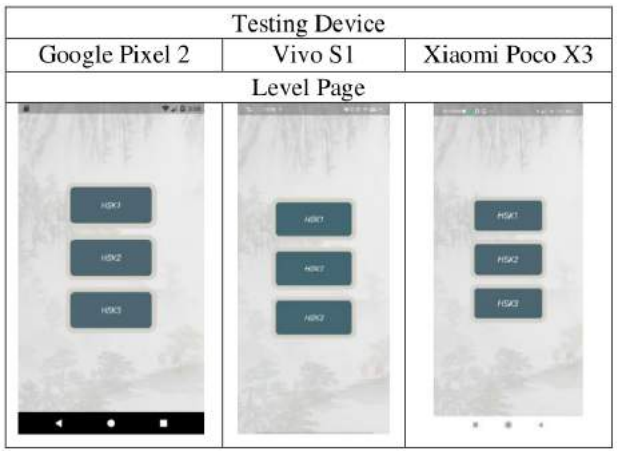


Figure. 10: Black Box Testing Level Page

Testing Device		
Google Pixel 2	Vivo S1	Xiaomi Poco X3
Stage Page		

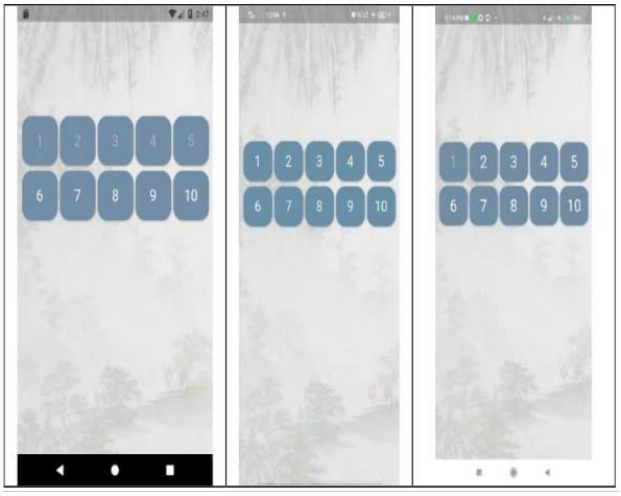


Figure. 11: Black Box Testing Level Page

Testing Device		
Google Pixel 2	Vivo S1	Xiaomi Poco X3
Game Page		

Figure. 12: Black Box Testing Level Page

Testing Device		
Google Pixel 2	Vivo S1	Xiaomi Poco X3
Game Page – Choosing Correct Answer		
		

Figure. 13: Black Box Testing Level Page

Testing Device		
Google Pixel 2	Vivo S1	Xiaomi Poco X3
Game Page – Choosing Wrong Answer (<5 times)		
		

Figure. 14: Black Box Testing Level Page

Testing Device		
Google Pixel 2	Vivo S1	Xiaomi Poco X3
Game Page – Choosing Wrong Answer (=5 times)		
		

Figure. 15: Black Box Testing Level Page

The last and final step is the gameplay test. In essence, this is the most crucial part of the application, since the user will be spending most of their time in this application at this stage. In this test, the major gameplay controls are tested. Firstly, the author will test the scenario when the user chooses the correct answer. The expected result is the screen will show a success prompt, and the user can decide to quit or proceed to the next stage. As indicated on the table, all devices were able to reach this step successfully. Next is to test the scenario when the user chooses the wrong answer. Per hangman rules, the player has 5 chances to get to the correct answer, in this application, the same rule will apply. When the user chooses the wrong answer, the tally will increase, and the selected answer will be locked. When the wrong answer count is 5, the game will end, and the user can choose to quit or retry the stage. The above table shows that all devices were able to complete the scenarios successfully.

B. User Reviews

After making sure the application is working perfectly for various devices, the author made a simple question- naire for users to assess the effectiveness of this application. Currently, the questionnaire has 23 respondents. Out of 23 respondents, 82.6% of respondents expressed interest in learning Mandarin, and 69.6% of them are familiar with the Hangman Game as seen on Figure 16, 17 and Figure 18.

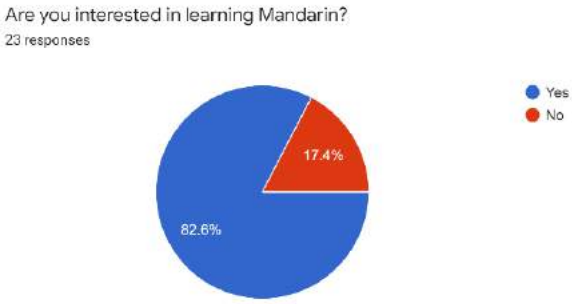


Figure. 16: Mandarin Interest Chart

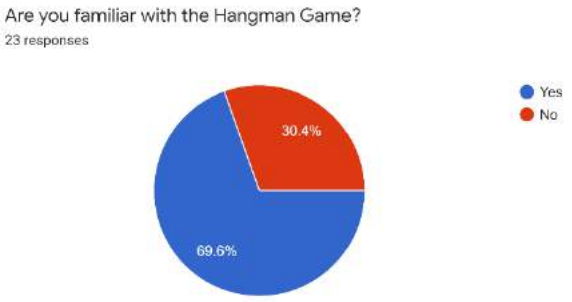


Figure. 17: User Review Chart

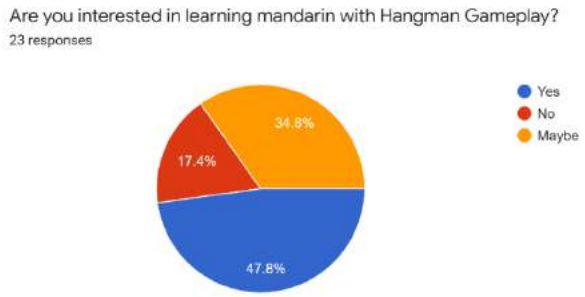


Figure. 18: Application Interest Chart

The next question is to gauge the interest of users in using the application. Out of 23 responses, almost half of them show interest in using the application, while 34.8% of the responses still indicate inconclusiveness. Mean-while, 17.4% of the answer shows disinterest in using the application as seen on Figure 19.

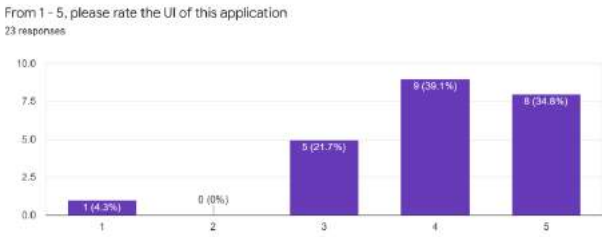


Figure. 19: User Interface Rating Chart

Additionally, the writing also asked the user to rate the UI of this application. The result is leaning towards the positive side, with scores 4 and 5 are currently tied at 8 votes. 3 respondents rated it average with the score 3, and 1 respondent rated it as poor at 1 as seen on Figure 20.

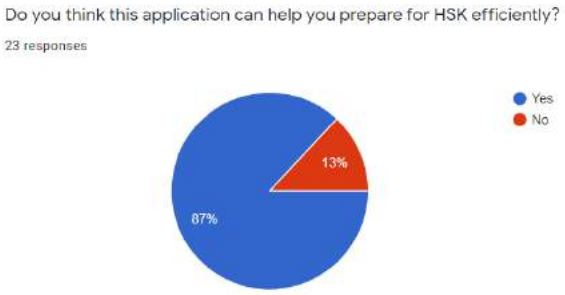


Figure. 20: Application Efficiency Chart

Next, the author also asked if the user thinks this application can help them prepare for HSK efficiently. Out of 23 respondents, 87% of them thinks this application can help them be more prepared for HSK. Meanwhile, 13% of them thinks that this application would not be any help in HSK preparation. Finally, the author also asked for some constructive criticism for this application. Most of the answer draws attention to the difficulty of the game, noting that it may be too hard for beginners. Respondents suggested that adding a translation feature or hint system would be better. Additionally, some respondents also request that pinyin is added to the application. All the suggestions are duly noted and will be considered as to be added as improvements in the future.

IV. Conclusion and Recommendation

From the testing above, the author has made several conclusions, namely:

- The e-learning mobile application is built to help HSK test takers expand their vocabularies.
- The mobile application is built with Flutter and Firebase Cloud Firestore as the primary data storage.
- The application works on low-end devices and high-end devices with no performance issues between them.
- The e-learning mobile application is believed to be helpful for HSK test takers.

In making this e-learning mobile application for HSK test takers, there are some aspects that can be improved and taken in the future, such as:

- Making more HSK levels available and cranking up the difficulty.
- Generating more stages for each level.
- Enhancing the UI and adding quality of life improvements.
- Publishing the application on the IOS market

REFERENCES

[1] E. Caplan, "What are the Most Spoken Languages in the World?," Fluent in 3 Months. 2020, [Online]. Available: https://www.fluentin3months.com/most-spoken-languages/.
[2] Y. Peng, W. Yan, and L. Cheng, "Hanyu Shuiping Kaoshi (HSK): A Multi-Level, Multi-Purpose Proficiency Test," Lang. Test., 2020, doi: 10.1177/0265532220957298.
[3] E. Caplan, "What are the Most Spoken Languages in the World?," Fluent in 3 Months. 2020, [Online]. Available: https://www.fluentin3months.com/most-spoken-languages/.
[4] Y. Peng, W. Yan, and L. Cheng, "Hanyu Shuiping Kaoshi (HSK): A Multi-Level, Multi-Purpose Proficiency Test," Lang. Test., 2020, doi: 10.1177/0265532220957298.
[5] W. Jiang, "Benchmarking Students' Attainment in Australian Tertiary Chinese Programs Using the New HSK Tests," Creat. Educ., vol. 11, no. 05, pp. 624–638, 2020, doi: 10.4236/ce.2020.115047.
[6] B. DaCosta and S. Seok, "Mobile Game-Based Learning: Exploring the Anytime, Anywhere, and on Any Device Characteristics of Mobile Devices," Soc. Inf. Technol. Teach. Educ. Int. Conf. 2017, pp. 752–756, 2017.
[7] Z. Farihah Lailatul and E. Rachmawati, "Digital Hangman Game to Improve Student's Vocabulary Mastery in Teaching Narrative Text," vol. 4, no. 1, 2020.
[8] E. Putri Yuliana, "The Effect of Riddles Technique to Eighth Grade," 2020.
[9] Y. Ying, F. Ruomei, and P. M. Susilo, "Smart Word Aplication Design for Learning Mandarin-Indonesia Vocabulary," J. Phys. Conf. Ser., vol. 1477, no. 4, pp. 0–7, 2020, doi: 10.1088/1742-6596/1477/4/042015.
[10] W. Apriani, "Educational Games Let's Learn Japanese Using The Unity 3d Based Android," Educ. Games Let's Learn Japanese Using Unity 3d Based Android, vol. 3, no. 2, pp. 10–19, 2019.
[11] M. S. Muslimin, N. M. Nordin, and A. Z. Mansor, "The Design and Development Of Mobieko: A Mobile Educational App For Microeconomics Module," Malaysian J. Learn. Instr., vol. 2017, no. Special Issues, pp. 221–255, 2017.
[12] A. Abdulkarim, N. Ratmaningsih, and D. N. Anggraini, "Developing Civicpedia as a Civic Education E-learning Media to Improve Students' Information Literacy," J. Soc. Stud. Educ. Res., vol. 9, no. 3, pp. 45–61, 2018, doi:10.17499/jsser.32139.
[13] S. Tanjung, H. Rahmansyah, and S. R. Siregar, "The Effect Of Hangman Game On Students ' Vocabulary Mastery (A Study At The Eighth Grade Of SMP NEGERI 1 PADANG BOLAK 2019 / 2020 Academic Year)," vol. 2, no. 3, pp. 77–89, 2020.
[14] T. Huynh, "A Flashcard Mobile Application Development With Flutter," 2021.
[15] C. M. Budoya, M. Kissaka, and J. Mtebe, "Instructional Design Enabled Agile Method Using ADDIE Model and Feature Driven Development Process.," Int. J. Educ. Dev. Using Inf. Commun. Technol., vol. 15, no. 1, pp. 35–54, 2019.
[16] J. Zhang, "The Construction of College English Online Learning Community under ADDIE Model," English Lang. Teach., vol. 13, no. 7, p. 46, 2020, doi: 10.5539/elt.v13n7p46. A. Rahardi, N. Zaidal, and I. Palaguna, "Perancangan Aplikasi Game 3D Virtual Reality Sosialisasi Evakuasi dari Kebakaran Berbasis Android," Semin. Nas. Has. Penelit. dan Pengabdi. 2019, pp. 366–372, 2019.