

## CHAPTER 5

### TESTING AND IMPLEMENTATION

#### 5.1 System Requirement

The specifications of hardware and software that is used by the Author to develop the game application will be described, also the requirements of specification will be discussed in this section.

##### 5.1.1 Platform Used for Development

The Author needs two main hardware which are smartphone and laptop with a certain specification.

*Table 5.1 Platform Used for Development*

HARDWARE	SPECIFICATIONS
Android Device	Xiaomi Mi 6 Operating system: Android 7.1.1 (Nougat) Processor: Octa-core (4x2.45 GHz Kryo & 4x1.9 GHz Kryo) Graphic: Adreno 540 Memory: 128 GB, 6 GB RAM
Laptop	ASUS N550JK Operating system: Windows 10 Processor: Intel Core i7-4710HQ CPU @2.50GHz Graphic: NVIDIA GeForce GTX 850M Memory: 1 TB, 8 GB RAM

List of software and supporting applications used to develop the game:

- Unity
- Android SDK
- Adobe Photoshop

### 5.1.2 Requirements for User

To be able to run the “Mandarin for Newbies”, the user needs to have a hardware which is Android phone with a certain specification.

*Table 5.2 Requirements for User*

HARDWARE	SPECIFICATIONS
Android Device	Operating system: Android 6.0 or above Supported with all Google services

### 5.2 System Configuration

To install the “Mandarin for Newbies” application on Android devices is by manual installation. Here is the following system configuration step using manual installation:

1. Copy “Mandarin for Newbies” into any android devices that meet the requirements.
2. Install the APK.
3. Access through the application.

## **5.3 Development Phase**

### **5.3.1 First Iteration**

#### **5.3.1.1 Planning**

The first iteration focuses on identifying the requirements, information gathering and designing the system to develop the application. The iteration includes the basic features to be developed such as: level design, achievement feature and tutorial. The technology that is selected by the author were: Android SDK, Unity and Adobe Photoshop. The author then started on forming a questionnaire for the survey and started contacting the respondents.

#### **5.3.1.2 Requirement Analysis**

Immediately after the first questionnaire and interview questions have been finalized, which is attached to the appendix; the author then started to spread the questionnaire to 25 people and interviewed 2 selected respondents. The respondents, which were chosen by the author, were people who enjoyed playing games on their smartphones. The data gained through the surveys and interviews were then compiled and is used to design the system and to determine the features that will be developed.

The author then splits the questionnaire section into three sections, the first part being a filter question with the aims of knowing the respondent's personal data such as age and gender. The second part is regarding the respondent's smartphone and game usage, while the third part of the questionnaire is about the mandarin language itself. Further information regarding the data used will be shown in the Appendix section A.

The resulting data gathered from the first part are as follows:

*Table 5.3 Gender*

Gender	Response
Male	80%
Female	20%

As can be seen from the table above, the respondents' gender is 80% male and 20% female.

*Table 5.4 Age*

Age	Response
Under 18	8%
18 – 22	76%
23 – 27	16%
Above 27	-

Based on the table above, it is seen that only 8% of the respondents' age is under 18, with 76% in the range of 18 – 22 and 16% inside the range of 23 – 27.

The resulting data gathered from the second part are as follows:

*Table 5.5 Reasons to Play Game*

Reasons to Play Mobile Game	Response
Pass the time	100%
Stress reliever	52%
Hobby	64%
Work	0%
Challenge	12%

As can be seen from the table above, a 100% of the users agreed to playing mobile game to pass the time, followed by 64% of the user partaking it as a hobby. 52% of the users plays mobile games to relieve stress and a small 12% of the user are challenge-seeking.

*Table 5.6 Time Consumed in a Day*

Time Consumed in a Day	Response
None	0%
Less than an Hour	4%
1 – 3 Hours	68%
4 – 6 Hours	28%
More than 6 Hours	0%

Based on the table above, it is concluded that most of the respondents consumed at least 1 – 3 hours of playing game, standing at a 68%. While 28% of the respondents took 4 – 6 hours of their day playing games and only 4% spent less than an hour of the day to playing games.

*Table 5.7 Categories Mostly Used in a Smartphone*

Categories Mostly Used in a Smartphone	Response
Game	48%
Tool	0%
Entertainment	20%
Photography	8%
Communication	24%

As seen on the table above, it is concluded that game is the most chosen categories based on the respondents' response based on usage, standing high at 48% with communication following through with 24%. 20% of the respondent chooses entertainment with a photography coming in last with 8%.

*Table 5.8 Had Learn Mandarin*

Had Learn Mandarin	Response
Yes	44%
No	56%

As can be seen from the table above, it is shared equally amongst the respondents in terms of experience with Mandarin Language, though respondents with no experience in Mandarin is slightly leading with 56%, leaving respondents with experience to 44%.

*Table 5.9 Interest in Learning Mandarin*

Interest in Learning Mandarin	Response
Yes	88%
No	12%

Based on the table above, 88% of the respondents is found to be interested in learning Mandarin Language while only 12% of the respondents does not have any interest in learning it.

*Table 5.10 Difficulty in Learning Mandarin*

Difficulty in Learning Mandarin	Response
Yes	92%
No	8%

From the table above, most of the responses has led to a conclusion that learning Mandarin Language is difficult with a stunning 92% and only 8% of the respondents' finds it to be quite the opposite.

*Table 5.11 Is Mandarin Important in the Future*

Is Mandarin Important in the Future?	Response
Yes	100%
No	-

All the respondents have agreed that Mandarin is an important language in the future, as can be seen from the table above.

*Table 5.12 Why is Mandarin Important*

Why is Mandarin Important?	Response
Career	60%
Business	16%
Social	-
Education	-
Holiday Trip	24%
Not Important	-

All the agreeing respondents chose to believe career is the most important aspect for learning Mandarin with a high 60%, while 24% believe the importance of learning mandarin language is for holiday trip while a surprising 16% chooses business as the reason.

*Table 5.13 Most Efficient Way in Learning*

Most Efficient Way in Learning	Response
Book	56%
Video	28%
Game	16%

It is found through the table above that 56% of the respondents believes that the most efficient way to learn mandarin language is through reading books. 28% of the respondents sees that learning through video is the most efficient way, while 16% chooses game as their resource.

*Table 5.14 Attempted to Learning Through Games*



Attempted to learning through Games	Response
Yes	28%
No	72%

The table above shows information regarding whether the respondents have attempted to learn mandarin language through playing games in which the result is shown as 72% of the respondents with no attempt while the rest of the 28% did attempted to learn through games.

*Table 5.15 Is Learning Through Playing Effective*

Is Learning through Playing Effective?	Response
Yes	28%
No	12%
Not Sure	60%

The table above shows information regarding the effectiveness of learning mandarin language through playing games in which 60% of the respondents are unsure of it and 12% believes that it is not effective. The rest of 28% of the respondents believes that it is indeed effective.

*Table 5.16 Interested in Trying the Game*

Interested in Trying?	Response
Yes	100%
Mild	-
No	-

All the respondents were found to have an interest in trying to learn mandarin language through playing games that provides mandarin lessons.

After the interview was done, the author made the script based on the interview which is attached in the Appendix Sections B-E. The conclusion of the information gathered through the interviews are as follows:

*Table 5.17 Respondent 1*

Questions	Response (From Respondent 1)
Why does the user play games on smartphone?	To pass time
How long does the users play games in a day?	Less than 1 hour
Does the users have experience in learning Mandarin?	Yes, but it was a while ago.
Are the users interested in learning Mandarin?	Yes, because it's been a requirement in some companies.
Does the users think that learning Mandarin is difficult?	It is difficult to learn Mandarin because of the writing and intonation.
In which way does the user think is the most efficient way in learning Mandarin? (book, video or game?)	The respondents learn mostly through books
Does the user think that learning through playing is effective?	Maybe it can be effective.
Are the users interested in trying a game about learning Mandarin?	The respondent is interested.
How is the game?	Lack of instructions
Can the game help to ease the learning process regarding Mandarin language?	Yes

Table 5.18 Respondent 2

Questions	Response (From Respondent 2)
Why does the user play games on smartphone?	To relieve a stress
How long does the users play games in a day?	Around 1 – 2 hours
Does the users have experience in learning Mandarin?	Yes, but it was a while ago.
Are the users interested in learning Mandarin?	Yes
Does the users think that learning Mandarin is difficult?	It was a bit difficult to learn Mandarin
In which way does the user think is the most efficient way in learning Mandarin? (book, video or game?)	The respondents learn mostly through books and games
Does the user think that learning through playing is effective?	Yes, it can be effective.
Are the users interested in trying a game about learning Mandarin?	The respondent is interested.
How is the game?	Lack of sound
Can the game help to ease the learning process regarding Mandarin language?	Yes

### 5.3.1.3 Design

In this phase, the author compiles the data gathered through interview and questionnaire.

Here are the lists of what had been concluded by the author:

1. Most of the respondents are interested in learning mandarin language.
2. Most of the respondents agreed that learning mandarin is difficult.

3. All the respondents believed that learning mandarin is important in the coming future.
4. Almost half of the respondents are unsure of the effectiveness in learning through games.
5. All the respondents are found to have interest in learning Mandarin through games.

Based on the research and the data gathered, the author then starts designing a mandarin language learning application that can:

- Provide users with basic mandarin language.
- Allow the users to choose which categories they want to improve.
- Provide users with achievement based on performance.
- Provide titles which determines the user's level depending on their achievement score.

The application will have a simple interface in order to be more accessible for users when using the application. There are five main pages that builds up the application's interface, they are as follows:

1. Home Page
  - a. This page allows the user to access the achievement page, sound option and categories menu.
2. Categories Page
  - a. This allows the user to choose which categories they want to challenge.
3. In-Game Page
  - a. This is the page where the user then starts to play, a drag and drop button to match the pinyin with the corresponding English word.
4. Achievements Page
  - a. The achievement page allows the user to see information regarding their level, unfinished achievement and finished achievements.
5. Finish Page

- a. This page shows the users their performance in partaking the challenge along with a repeat and a back button that takes them to the categories page.

#### **5.3.1.4 Development**

The functionalities of the application is made possible by implementing Unity that is stored in Android SDK as the base game application. Assets implemented in the game were made using Adobe Photoshop. Firstly, the user starts the application from the android's device home page, the user will then be greeted with Unity's logo before being redirected into the home page.

On the center of the home page lies two buttons, these are the play and achievement button. The play button will lead the users into a categories page, in which the users can then choose the categories to challenge. The user will then be redirected into the In-Game page once they have decided on a category.

The In-Game Page is divided into three parts. The highest part of the screen consists the time bar that consist of a timer that will continuously tick as soon as the users enter the page. The left part of the time bar is a back button that will redirect the users back into the categories page. The higher middle part of the screen consists of the translated mandarin language. The lower middle part of the screen consists of answers in pinyin, in which the users' goal is to drag-and-drop the corresponding pinyin into the proper translated mandarin language located in the upper half of the screen. Both the translated language and the pinyin are in fitted square boxes.

Soon after finishing the chosen level, the users will then be redirected into a Finish Page. The finish page shows the result based on the performance of the users. The users get rewarded with a certain amount of star(s) depending on how fast the user finishes the challenge. The star is then accumulated in to the user's overall level that will be shown in the Achievement page.

The achievement page which is accessible through the home page consists of the users' progression in each categories of the challenge. The achievement page also includes the overall users level marked by the total of stars the users received as they

finished each challenge based on their performance. The higher the amount of collected stars, the better the title.

#### **5.3.1.5 Testing**

In this phase, the testing was conducted through installing the application into an Android phone. The testing was conducted by handing out the application to 2 respondents that have been interviewed by the author.

Here are the main focuses on the first iteration testing phase:

- To gain opinion regarding the application.
- To know and examine the users' experience.
- To make sure that the application works as intended.

When the testing was concluded, the users were then interviewed regarding the application. The list of questions are as follows:

1. What is lacking from this application?
2. Do you think this game eases the learning process of Mandarin language?

### 5.3.2 Second Iteration

#### 5.3.2.1 Planning

In the second iteration, the author starts by gathering the information gained following the testing. To develop the application further, the results collected will then be compiled in order to have a better understanding towards the problems and inputs from the users.

#### 5.3.2.2 Requirement Analysis

The author started to analyze the problems based on the results from the interviews conducted by 2 interviewees. The scripts from the interviews are attached in the Appendix Sections B-E.

*Table 5.19 Respondent 1*

Questions	Response (From Respondent 1)
How is the game after being fixed?	Good regarding the tutorial are now available
Can the game help to ease the learning process regarding Mandarin language?	Yes
Is there anything that can be added to improve the game?	Add more writing forms and more words

*Table 5.20 Respondent 2*

Questions	Response (From Respondent 2)
How is the game after being fixed?	Good regarding the sounds are now available
Can the game help to ease the learning process regarding Mandarin language?	Yes
Is there anything that can be added to improve the game?	Steps of writing in hanzi

### 5.3.2.3 Design

In this phase, the author compiled the data gained through the conducted interview.

Here are the lists of what have been concluded by the author:

1. Overall the application runs smooth and functions as expected.
2. Needs to add sound especially pronunciation to ease the learning process.
3. Needs to add a tutorial on the home page to help with accessibility.

Based on the research done and the gathered information, the author then started to fix the application's features. Here is the list of features that are shown to the user:

1. Adding sound

The adding of sound feature, specifically in pronunciation can aid the users in a better learning process. Pronunciation adds another layer of learning through hearing and matching the sound with the pinyin provided.

- Adding tutorial

The tutorial is made to improve the application's accessibility. The addition of tutorials on the home page can ease the process of getting a better understand on the goal of the game and how to play the game.

### 5.3.2.4 Development

On the center of the home page lies two buttons, these are the play and achievement button. Two additional buttons have been added to the home page which includes the tutorial and sound button. The tutorial button will redirect the user into the tutorial page where there is a display regarding the instruction on how to play the game. The play button takes the users into the categories page where the users are given a set of categories to choose from to challenge. Choosing a category in the categories page will then redirect the user to the in-game pages, where the time starts as soon as the user enters the page. The in-game pages contain the time bar, the pinyin answers and the translated questions. The goal is to match the pinyin to the translated version of the word. While the sound button will toggle an on and off



function regarding the pronunciation function in the in-game page. In the achievement page, the user can keep track of their progress inside the game. The achievement is tracked throughout the number of stars that is given according to the user's performance while doing the time-based challenges. The number of stars will determine the overall user's level through given titles.

#### **5.3.2.5 Testing**

In this phase, testing was done through installing the application into an Android smartphone. The testing was done by giving application to the respondents who have filled the questionnaires and has been interviewed by the author.

Here is the main focus on the testing phase:

- To know and examine the user's experience regarding the application.
- To gain opinion from the users regarding the newly added feature in the application.
- To examine whether the newly added features are working as intended or not.

When the testing was finished being conducted, the users will then be interviewed regarding the application.

Here is the list of questions:

- What is the user's opinion after testing the application?
- Are there any problems with the newly added features?

## 5.4 Testing

### 5.4.1 Alpha Testing

The Author will test the system first to see if there were any major bugs before presenting it to the users to be tested. In order to ensure that the application with all of its features are running properly, it would need to have the errors and bugs fixed and solved first.

*Table 5.21 Alpha Testing*

NO	Testing Description	Actual Outcome
1	View Achievement	PASS
2	View Tutorial	PASS
3	Toggle Sound	PASS
4	Claim Achievement	PASS
5	Select Categories	PASS
6	Back Buttons	PASS
7	Time in Game	PASS
8	Sound in Game	PASS
9	Drag and Drop	PASS
10	Finish Page	PASS

### 5.4.1 Beta Testing

In this part, the application was tested by the users. There were 2 users requested to conduct the testing. According to the Author's development method which is scrum methodology, there were 2 iterations in the developments. The Author was first present the user about how the application will works in order to understand the application. After that, the users were asked to do a test of application using the Author' phone, and testing all the functionalities. The Author was presents as well to observe the user's user experience and behaviors, also to ensure that no major problems occurred during the testing process. After the application was tested, the users were interviewed by the author. This was done to know the user's experience, opinion and suggestion. The results were used by the Author to further

develop, fix, and enhance the application. The interviews were recorded by the Author and translated to a script, which will be attached to the appendix session.

The results of users' applicant testing are presented by testing table; each table describes the application functionality listed in the use case diagram. The tables are as follows:

*Table 5.22 TCU-01*

Test Id		TCU-01	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Start Application	
Description		Test the application to make sure the application is running properly	
Pre-Condition		Application installed	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	Open the application	The application will display 'Home' page	<b>Pass</b>

*Table 5.23 TCU-02*

Test Id		TCU-02	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Select Achievement	
Description		Test the application achievement page to let user view their achievement	
Pre-Condition		TCU-01	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click 'Achievement' Button	The application will display 'achievement' page	<b>Pass</b>

Table 5.24 TCU-03

Test Id		TCU-03	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Select Tutorial	
Description		Test the application 'Tutorial' page to let user view the tutorial page	
Pre-Condition		TCU-01	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click '?' button	The application will display 'tutorial' page	<b>Pass</b>

Table 5.25 TCU-04

Test Id		TCU-04	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Toggle Sound	
Description		The application will toggle the sound on or off	
Pre-Condition		TCU-01	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click 'Sound' Button	The 'sound' button will change each clicked	<b>Pass</b>

Table 5.26 TCU-05

Test Id		TCU-05	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Categories	
Description		Test the application categories to let the user view the 'Categories' page	
Pre-Condition		TCU-01	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click the 'Play' Button	The application will display the 'Categories' page	<b>Pass</b>

Table 5.27 TCU-06

Test Id		TCU-06	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Select Numbers Category	
Description		Test the application Numbers category to let the user play numbers vocabulary game	
Pre-Condition		TCU-05	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click the 'Numbers' Button	The application will display the numbers vocabulary game	<b>Pass</b>

Table 5.28 TCU-07

Test Id		TCU-07	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Select Fruits Category	
Description		Test the application Fruits category to let the user play fruits vocabulary game	
Pre-Condition		TCU-05	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click the 'Fruits' Button	The application will display the fruits vocabulary game	<b>Pass</b>

Table 5.29 TCU-08

Test Id		TCU-08	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Select Colors Category	
Description		Test the application Colors category to let the user play colors vocabulary game	
Pre-Condition		TCU-05	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click the 'Colors' Button	The application will display the colors vocabulary game	<b>Pass</b>

Table 5.30 TCU-09

Test Id		TCU-09	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Select Clothes Category	
Description		Test the application Clothes category to let the user play clothes vocabulary game	
Pre-Condition		TCU-05	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click the 'Clothes' Button	The application will display the clothes vocabulary game	<b>Pass</b>

Table 5.31 TCU-10

Test Id		TCU-10	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Select Animals Category	
Description		Test the application Animals category to let the user play animals vocabulary game	
Pre-Condition		TCU-05	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click the 'Animals' Button	The application will display the animals vocabulary game	<b>Pass</b>

Table 5.32 TCU-011

Test Id		TCU-11	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Play Games	
Description		Test the application Play Games to let the user play the game	
Pre-Condition		TCU-06, TCU-07, TCU-08, TCU-09, TCU- 10	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Click One of the Category	The application will display the gameplay	<b>Pass</b>

Table 5.33 TCU-12

Test Id		TCU-12	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Drag answer	
Description		Test the application Drag answer to let the user drag the answers	
Pre-Condition		TCU-11	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Drag the Answers	The application will display the answer being dragged	<b>Pass</b>



Table 5.34 TCU-13

Test Id		TCU-13	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Drop answer	
Description		Test the application Drop answer to let the user drop the answers	
Pre-Condition		TCU-11	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Drop the Answers	The application will display the answer being dropped	<b>Pass</b>

Table 5.35 TCU-14

Test Id		TCU-14	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		Tap to hear sound	
Description		Test the application Tap to hear sound to let the user hear the sound	
Pre-Condition		TCU-11	
<b>No</b>	<b>Step</b>	<b>Expected Result</b>	<b>Actual Outcome</b>
1	User Tap the Questions	The application will produce the sound of the answers	<b>Pass</b>

Table 5.36 TCU-15

Test Id		TCU-15	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		View Level	
Description		Test the application View Level to let the user view their level	
Pre-Condition		TCU-02	
No	Step	Expected Result	Actual Outcome
1	User Achieve Enough Stars to Level Up	Level will be changed according to the number of stars	Pass

Table 5.37 TCU-16

Test Id		TCU-16	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		View Completed Achievements	
Description		Test the application View Completed Achievements to let the user view completed achievements	
Pre-Condition		TCU-02	
No	Step	Expected Result	Actual Outcome
1	User has Finished the Current Category with Three Stars	The completed category achievement will change colors	Pass
2	User Click on the 'Completed Category Achievement' button	The completed category achievement will be marked	Pass

Table 5.38 TCU-17

Test Id		TCU-17	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		View Incomplete Achievements	
Description		Test the application View Incomplete Achievements to let the user view incomplete achievements	
Pre-Condition		TCU-02	
No	Step	Expected Result	Actual Outcome
1	User has not Finished the Current Category with Three Stars	The completed category achievement will not change colors	Pass

Table 5.39 TCU-18

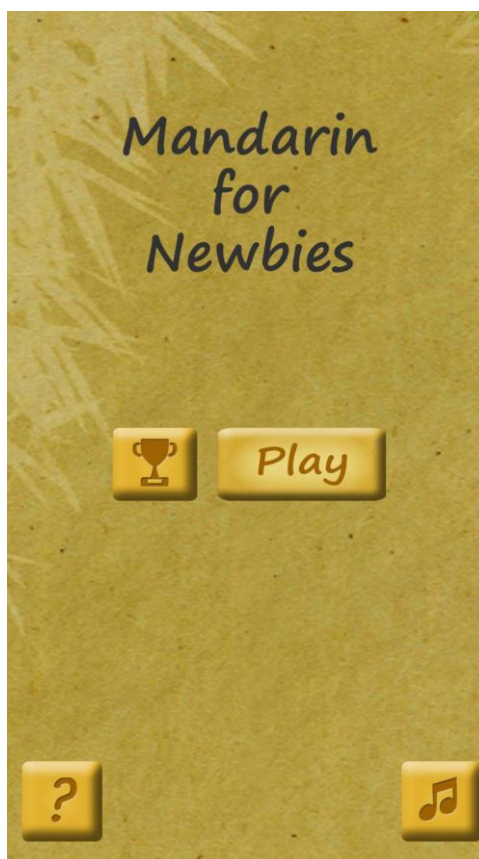
Test Id		TCU-18	
Module		Mandarin for Newbies Application Unit Testing	
Test Name		View Tutorial	
Description		Test the application View Tutorial to let the user know how to play the game	
Pre-Condition		TCU-01	
No	Step	Expected Result	Actual Outcome
1	User has open the 'tutorial' page	The application will display the instructions	Pass

Test Case Unit 1 until 18 are done to test all functionality of the program. Therefore, the user will have no problem playing the game.

## 5.5 Application Screenshots

The screenshots of the application displayed below are taken by the Author's phone. Each of them shows the page name and the features will be described.

### 5.5.1 Home Page



*Figure 5.1 Home Page*

The user interface for the home page is made as simple as it can. It contains Play button which will redirect the user to the Categories page. The Achievements button is made of trophy symbol and is functioned to redirect the user to the Achievements page. For the Tutorial page that is represented by "?", will redirect the user to the instructions of how to play the game. The Sound button will toggle the sound on or off.

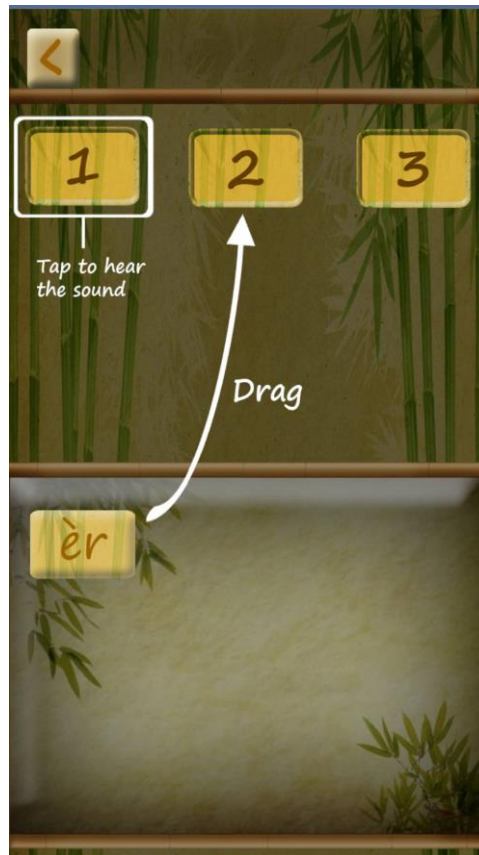
### 5.5.2 Achievement Page



Figure 5.2 Achievements Page

The Achievements page will display the current level of the user, the completed achievements and the incomplete achievements. The level of the user will be counted by number of “Stars” the user had earned. The achievements will be completed when the user finishes a category with three “Stars” and it will be clickable to claim another “Star”. When the user had clicked the completed achievements, it will be marked and the user will not be able to click it again. The Back button will redirect the user back to the Home page.

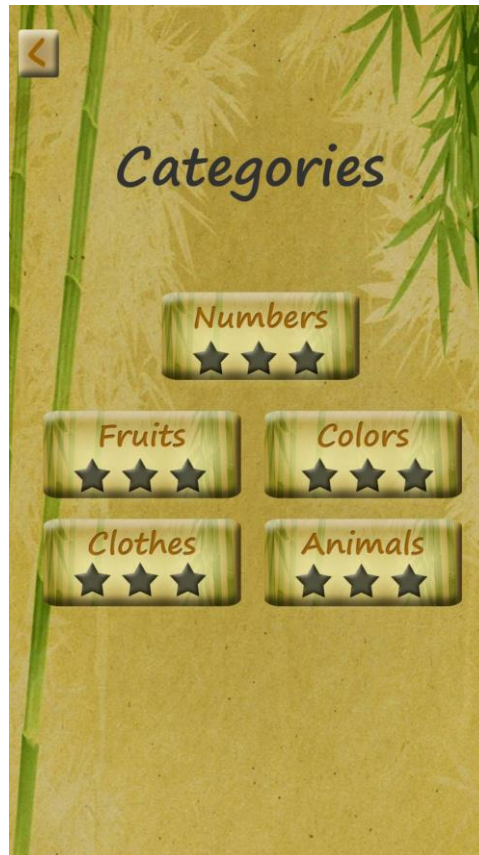
### 5.5.3 Tutorial Page



*Figure 5.3 Tutorial Page*

The Tutorial page will display the instructions of how to play the game. The Back button will redirect the user back to the Home page.

### 5.5.4 Categories Page



*Figure 5.4 Categories Page*

The Categories page will display the categories of the game that can be played and will show how many “Stars” they had earned by playing the game before. The Back button will redirect the user back to the Home page.

### 5.5.5 Numbers Page



*Figure 5.5 Numbers Page*

The Numbers page is one of the game's category where the user can learn about numbers in mandarin language. The goal of this page is that the user can drag and drop the pinyin according to their designated place, while the clock is ticking. The user will also be able to click on the numbers to listen to the pronunciation of the pinyin. The user will get a set amount of “Stars” depending on how fast they can finish the category. The Back button will redirect the user back to the Categories page.



### 5.5.6 Fruits Page



Figure 5.6 Fruits Page

The Fruits page is one of the game's category where the user can learn about fruits in mandarin language. The goal of this page is that the user can drag and drop the pinyin according to their designated place, while the clock is ticking. The user will also be able to click on the words to listen to the pronunciation of the pinyin. The user will get a set amount of “Stars” depending on how fast they can finish the category. The Back button will redirect the user back to the Categories page.

### 5.5.7 Colors Page



*Figure 5.7 Colors Page*

The Colors page is one of the game's category where the user can learn about colors in mandarin language. The goal of this page is that the user can drag and drop the pinyin according to their designated place, while the clock is ticking. The user will also be able to click on the words to listen to the pronunciation of the pinyin. The user will get a set amount of “Stars” depending on how fast they can finish the category. The Back button will redirect the user back to the Categories page.

### 5.5.8 Clothes Page



*Figure 5.8 Clothes Page*

The Clothes page is one of the game's category where the user can learn about clothes in mandarin language. The goal of this page is that the user can drag and drop the pinyin according to their designated place, while the clock is ticking. The user will also be able to click on the words to listen to the pronunciation of the pinyin. The user will get a set amount of “Stars” depending on how fast they can finish the category. The Back button will redirect the user back to the Categories page.

### 5.5.9 Animals Page



*Figure 5.9 Animals Page*

The Animals page is one of the game's category where the user can learn about animals in mandarin language. The goal of this page is that the user can drag and drop the pinyin according to their designated place, while the clock is ticking. The user will also be able to click on the words to listen to the pronunciation of the pinyin. The user will get a set amount of “Stars” depending on how fast they can finish the category. The Back button will redirect the user back to the Categories page.

### 5.5.10 Finish Page



*Figure 5.10 Finish Page*

The Finish page will appear after the user has finished a category. It will display the amount of time the user took to finish a category, the amount of “Stars” the user achieved and the repeat button which will redirect the user to the selected game’s category. The Back button will redirect the user back to the Categories page.