Xin Bao

CHINGUAL

APPLYING GAMIFICATION INTO A LANGUAGE LEARNING APPLICATION

Pro gradu – thesis

Industrial Design

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Abstract

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CHINGUAL - Applying Gamification into a Language Learning Application

Master Thesis – Industrial Design Program

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Although Chinese language is considered one of the most difficult languages in the world, and teaching it is always a challenge for professional teachers and teaching application producers, the popularity of learning Mandarin has exploded over the past few years. The number of applications for people to learn Chinese have been growing rapidly in the last few years, but most of them are perceived as inefficient. Thus developing a Chinese learning application for users to learn Chinese with joy has a great potential in the market.

Because people believe gamification is going to be big in the educational environment (Elizabeth Corcoran, 2010), in this thesis I integrate the concept of gamification to enhance teaching Chinese in this application – Chingual. This application focuses on discovering a variety ways to apply gamification into the language teaching process and proposes an optimized interface which is easy to operate.

To ascertain proposed application design a usability test is performed with the potential users. Afterwards, feedback and suggestions from testers are used as references when making design enhancements to improve the end-user experience.

Keywords

Gamification, User-Centered Design Method, Construction Design Method, User Interface Design, Chinese Language Learning

Further Information

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1 Thesis Introduction

1.1 Motivation and Aim

Chinese learning is becoming incrementally popular these years. However it is recognized as one of the most difficult languages in the world. Often we hear people say that Chinese is too challenging for them. Learning a language should not be a struggle for people, it ought to be easy and should be fun. This gives me the motivation to develop a Chinese learning application which has simple method of operation and integrates diverse contents and methods for users to learn Chinese with joy.

We made a team which includes two developers, two marketing consultants and two designers to design a gamified Chinese learning application – Chingual, for smart phones and tablets. I am the main designer in this team, as an industrial design master's degree student, I found great passion in interaction design. Chingual is aimed to make a revolution of Chinese learning. Chingual has identified the common problems that people have while learning Chinese, such as remembering the characters, how to pronounce the characters and so on. Based on the research of the potential users, Chingual offers people who want to study Chinese for academic purposes or for casual interests the value proposition as follow:

- Practical, progressive, adaptive Chinese learning experience

- Gamified learning experiences

- Visualized-Level and interest based daily news board.

- Second language pronunciation base

Chingual brings design thinking and creative learning methods for the study of Chinese language. The aim is for users to feel relaxed while learning Chinese. The most important target is making the learning efficient.

Therefore, this thesis records the whole design process of Chingual, which uses gamification and follows User Centered Design (UCD) methodology to enhance User Experience (UX) while engaging in language learning. Furthermore, the constructive design research method is involved in the 'Second language pronunciation base' part. During the development process, I created the online survey, analyzed survey data to define user needs, designed the entire application interface, after which I organized the usability test and interviewed six testers to collect opinions about the design, and then modified the original design.

1.2 Background

1.2.1 Current Market Situation

In October 2014, the International Monetary Fund released its latest data on world economy. It ranks China's economy as the world's biggest in purchasing-power-parity terms for the first time, *China produce $17.6 trillion — compared to $17.4 trillion for the U.S.A in 2014, China now accounts for 16.5% of the global economy when measured in real purchasing-power terms, compared with 16.3% for the U.S.* (The economist, *China's back* & marketwatch.com, *It's official: America is now No. 2*)   More and more people tend to think that China is on its path to become the world's largest economy, this upstart nation's impact on the market getting greater.

Besides, Chinese is the official language of Mainland China and Taiwan, also one of the official languages of Singapore and the United Nations, more than 1 billion people speak Mandarin Chinese, making it the most widely spoken language in the world. Mandarin is spoken in many of the Overseas Chinese communities throughout the world as well. *There are approximately 40 million Overseas Chinese, mostly in Asian countries (about 30 million), but also in the Americas (6 million), Europe (2 million), Oceania (1 million) and Africa (100,000)* (mandarin.about.com, 2015). Here in *Figure 1* is a Chinese speaker's language map which shows population of Chinese speakers in all over the world (en.wikipedia.org/wiki/Chinese_language, Last accessed 16.03.2015).
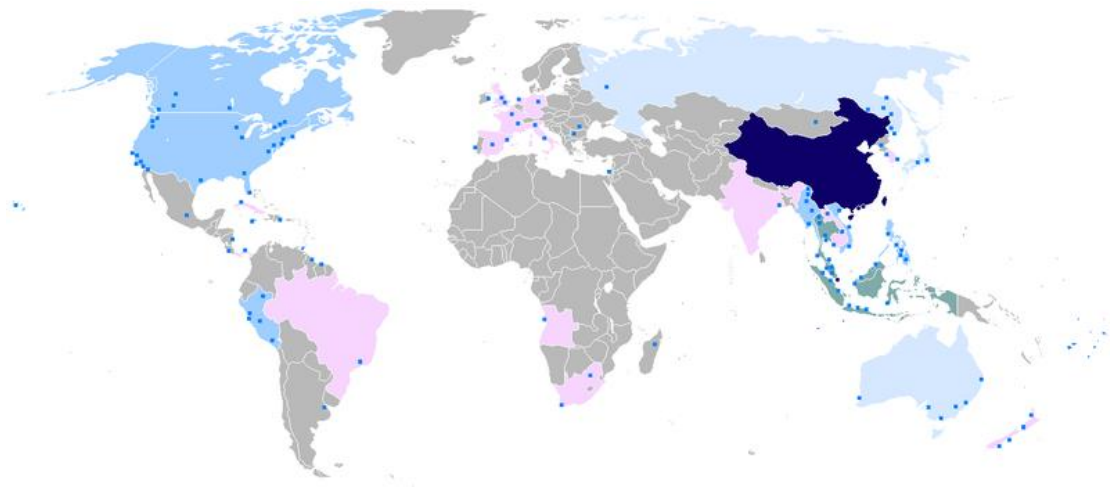
Countries identified Chinese as a primary, administrative, or native language

Countries with more than 5,000,000 Chinese speakers

Countries with more than 1,000,000 Chinese speakers

Countries with more than 500,000 Chinese speakers

Countries with more than 100,000 Chinese speakers

Major Chinese speaking settlements

Figure 1. Map of the Sinophone world

Source: ASDFGHJ, wikipedia.org (January 24, 2009)

Thus, people are learning Mandarin all over the world and realizing the great potential it offers for their personal career or the value that a company will have over its competitors if it has local employees that can connect with Chinese customers. Apart from business considerations, people who love travel or exotic Chinese culture, could travel around China or enrich their understanding of Chinese culture much easier if they can speak Mandarin.

Thus in the recent years hundreds of applications to learn Chinese and other languages have been released. Making it possible for people to learn Chinese at any time and from anywhere and often at no or very low cost. Users could find over 200 applications for helping people to learn Chinese in Google Play or Apple App Store. But, based on the comments directed at those applications in the app store most of them are perceived as inefficient.

1.2.2   Relationship between Demand and Supply

According to a senior official at the Confucius Institute Headquarters, there are over 40 million foreigners currently studying Chinese, and that number is rising (http://www.theworldofchinese.com/2010/12/how-many-people-are-learning-chinese/, Last accessed 16.03.2015). The Institutes themselves have 360,000 registered students, increasing by over 100,000 from this same time last year. And six years ago, a senior official in the National Office for Teaching Chinese as a Foreign Language (NOTCFL) said there were 30 million foreigners studying Chinese, meaning that by government estimations, the number of people studying Chinese has grown by around 10 million in half a decade.

In 2010, 750,000 people (670,000 from overseas) took the Chinese Proficiency Test (Liu lili, 2011). For comparison, in 2005, 117,660 non-native speakers took the test, an increase of 26.52% from 2004 (Xinhua News Agency, 2006).

From 2000 to 2004, the number of students in England, Wales and Northern Ireland taking Advanced Level exams in Chinese increased by 57% (Get Ahead, Learn Mandarin, 2006.).

In fact, the number of students is quickly outpacing the number of people capable of teaching them. Thus, due to the growing learner community, creating a useful mobile application- Chingual to help is expected to be successful.

1.2.3 Market Mapping

The market of language teaching applications has been growing rapidly in the last few years. For example, Duolingo, the increasingly popular online language learning service, launched for the general public on 19 June 2012 and as of January 2014 has 25 million users, out of which about 12.5 million are active. And Duolingo closed a $20 million C round of funding In February. Chineseskill, a new Chinese learning App, which launched its 1.0 version on 08th February 2014, already has 40,000 users, and earned about $38.3 million in total until now.

1.3 Involving Gamification into Design

Using games as an educational tool has been studied for decades. While gamification is a rather recent concept, researchers think it has a great

potential on the market as well as in research. Gamification has been proved to increase engagement and loyalty, brand awareness and effective marketing engagement in websites successfully (Foursquare, Stack Overflow) (Daniels, 2010), people believe it is going to be big in the educational environment (Elizabeth Corcoran, 2010).

Gamification desires to combine intrinsic motivation with extrinsic motivation in order to raise motivation and engagement. Intrinsic motivations come from individuals' emotional decisions on whether to make an action or not. Some examples include: altruism, competition, cooperation, and sense of belonging, love or aggression. Extrinsic motivations, on the other hand, occur when something or someone determines the user to make an action. For example: classifications, levels, points, badges, awards, missions (Viola, 2011).

In the book *Gamification by Design*, the authors claim that this belief in internal motivation over extrinsic rewards is unfounded, and gamification can be used for organizations to control the behavior of users by replacing those internal motivations with extrinsic rewards. They do admit, though, that "once you start giving someone a reward, you have to keep her in that reward loop forever" (Zichermann & Cunningham, 2011, p. 27). Thus, when trying to gamify a language learning application there are some challenges that need to be

taken into consideration.

1.4 Thesis Objectives and Research Questions

The objectives of this thesis is:

- To explore theories useful in user-centered gamification that is meaningful to the user and therefore does not depend upon external rewards.

- To fulfill different purpose of users learning Chinese by variety gamification design in Chingual.

Because of the vast amount of Chinese characters and cultures involved in Chinese study, I could not maintain all the learning materials in this thesis or even in Chingual. So this thesis will focus on the beginners who are just starting to learn Chinese. The designs of Chingual shown in Chapter four are only the first two sections of learning materials. That leads to the main research questions of the thesis, which are:

1. How to gamify the teaching process of pronouncing Mandarin Chinese in Chingual for beginners?

2. How to gamify the teaching process of written Mandarin Chinese in Chingual for beginners?

3. How to gamify the practice after studying Mandarin Chinese in Chingual for beginners?

1.5 Structure of Thesis

Chapter one is an introduction which includes the goal, study purposes, research questions and objectives of this thesis. Chapter two is about the meaning of gamification and the gamification using in e-learning, applications, especially analyzing the gamification involving in language learning apps. Chapter three explains the construction design research method and how it has been used in Chingual design. Chapter four introduces the process of using User Centered Design (UCD) methodology applying gamification in Chingual design by analyzing user questionnaire, creating user personae, use-cases, UI designs. The usability testing for Chingual interface design, and proposal of enhancements for Chingual is elaborated in Chapter five. As an ending part, Chapter six includes discussion about the meaning of the results, how selected gamification methods worked for users, what are the strengths and weaknesses of the research, a conclusion of the whole research and the result of research questions that came up in Chapter one.

2 Raising Engagement of Gamification in Digital World

2.1 What is Gamification?

As a rather recent concept, gamification obviously has great potential, having even been added to the 2011 Emerging Technologies Hype Cycle by Gartner, Inc. Yet, as gamification is new, it been given a variety of definitions in different areas. Some of them focus on content and process so that the definition of gamification is "the use of game design elements in non-game contexts" (Deterding et al, 2011, p.1). Some aim at the result, defining gamification as "the process of game-thinking and game mechanics to engage users and solve problems" (Zichermann & Cunningham, 2011). In the world of business the definition turns into "designing motivating solutions to problem situations" (Gears & Braun, CHI'13, 2013).
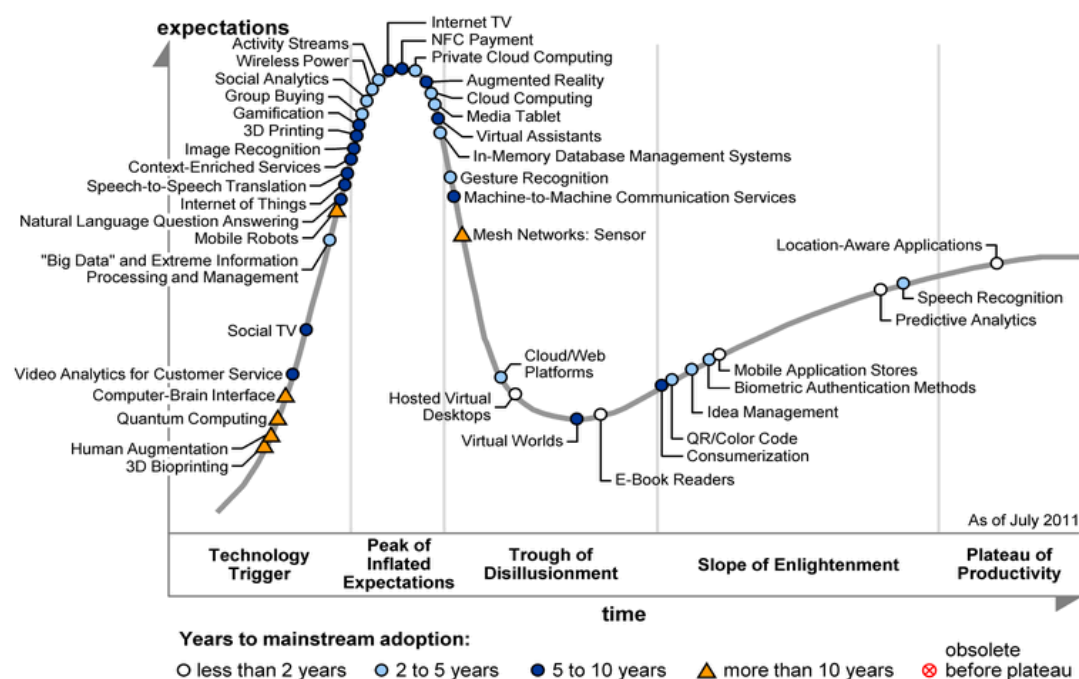
Figure 2. Hype Cycle for Emerging Technologies, 2011

Source: Gartner (July 2011)

A common implementation of gamification is to take the scoring elements of video games, such as points, levels, and achievements, marks, and apply them to work or educational contexts. Yet, some significant criticisms of gamification have been given by those who study games.

It starts with the name - "Gamification", within the word "Game" in it, people may easily assume that the entire activity will become an engaging gaming experience. One definition of games is "a form of play with goals and structure" (Maroney, 2001). While, in reality, mostly gamification uses only the arguably least interesting part of a game – the scoring system. Because the points-based gamification system always put goals first and leaves the play part behind, video game designer, critic and researcher Ian Bogost suggests to change the term "gamification" to "exploitationware", since 'it has everything to do with rhetoric, and nothing to do with games' (Ian, 2011). The term "pointsification" is another suggested label for non-game activities which have nothing but a scoring system instead of "gamification". However, all these criticisms towards gamification are implying that there is a variety of ways to attract users to get more involved than a point-based system.

2.2 Theories around Gamification Design

People can be driven to do something because of internal or external motivations. Drawing heavily from theories of social psychology, game mechanics aim to predict how users can be motivated using internal or external motivations to participate in collective systems for individual benefit (Beenen, G., Ling, K., Wang, X., Chang, K., Frankowski, D., Resnick, P., and Kraut, R., 2004). Researchers are concerned that organizations getting involved with gamification might cause long-term negative impact on gamification. They find that extrinsic rewards and intrinsic motivation have a complicated connection to people.

For example, points, levels and badges can be categorized as extrinsic rewards for participation (e.g. posting a comment, checking into a location). There is, however, evidence that extrinsic rewards can undermine intrinsic motivation to complete a task, particularly if the task is interesting and beneficial to the user.

Deci, Koestner, and Ryan examined motivation in educational settings in a meta-analysis of 128 studies, Here it turned out that internal motivation had been reduced by basically all forms of rewards (except for non-controlling verbal rewards) (2001). This means that when gamification is used to provide external motivation, the user's internal motivation will decrease. So if an

organization starts using gamification and provides external rewards, and then stops the rewards program after a period of time, this organization will be worse off than when it started. This is because users would more likely to return to the behavior with the external reward (Deci, Koestner & Ryan, 2001).

To test this point, researchers did an experiment, in which they removed gamification from a points-based system on an enterprise SNS deployed within a large IT enterprise headquartered in the northeastern United States with a globally distributed workforce of approximately 400,000 employees for four weeks. They wanted to figure out "*How does the removal of gamification features affect user activity within an enterprise social networking service?*" The data suggests that the removal of such features does negatively impact continued participation in the SNS, and that the removal of the extrinsic rewards also decreased the activity by geographically distant users, despite factors that might increase users' motivation to maintain activity. (Jennifer T., David R. M., Joan D., CSCW 2012)

In the book *Gamification by Design*, the authors made a statement that the belief in internal motivation over extrinsic rewards could not be found, and organizations can use gamification to control the behavior of users by replacing those internal motivations with extrinsic rewards. They do, however, admit that "once you start giving someone a reward, you have to keep her in

that reward loop forever" (Zichermann & Cunningham, 2011, p. 27).

Moreover, if we dig deeper of the meta-analysis of motivational literature in education we can find that if the task was already uninteresting, reward systems do not reduce internal motivation, as there was little internal motivation to start with. The authors concluded that "the issue is how to facilitate people's understanding of the importance of the activity to themselves and thus internalizing its regulation so they will be self-motivated to perform it" (2001, p. 15).

Researchers are exploring different theories to find which are useful in user-centered gamification that is meaningful to the user and does not depend upon external rewards. Introduced below are five main theories which have been used in studies.

2.2.1   16 Basic Desires Theory

16 Basic Desires Theory (Reiss, S., 2000) was employed to understand innate human desires. It requires a psychological content theory of motivation, providing utility for analyzing and predicting human behavior. Reiss derived his model from Maslow's theory of human needs (Maslow, A., 1954), and William James' theory (James, W., 1950) of internal desires, he summarized

16 basic human desires out of these two theories - Order, Power, Independence, Curiosity, Acceptance, Saving, Idealism, Honor, Social Contact, Family, Status, Vengeance, Romance, Eating, Physical Activity, and Tranquility.

Basic desires are a mostly inherent form human nature. However, manners in which humans act upon those desires are shaped by the intensity of innate desire, cultural influences, and individual experiences.

2.2.2 Organismic Integration Theory

To understanding what and how human behavior is initiated and regulated, Edward L. Deci and Richard Ryan built a formal broad framework - the self-determination theory (SDT) in 1985. An important proposition of SDT is to focus on how social and environmental conditions that affect people's sense of volition and engagement in activities.

Deci and Ryan expanded on the early work and developed four mini-theories to comprise SDT (Deci, E. L., Ryan, R. M., 1991 & 1995). Organismic Integration Theory (OIT), as one of the four sub-theories of SDT, built up to explain the different ways in which extrinsically motivated behavior can be integrated with the underlying activity into someone's own sense of self (Deci, E. L., Ryan, R. M., 1985).
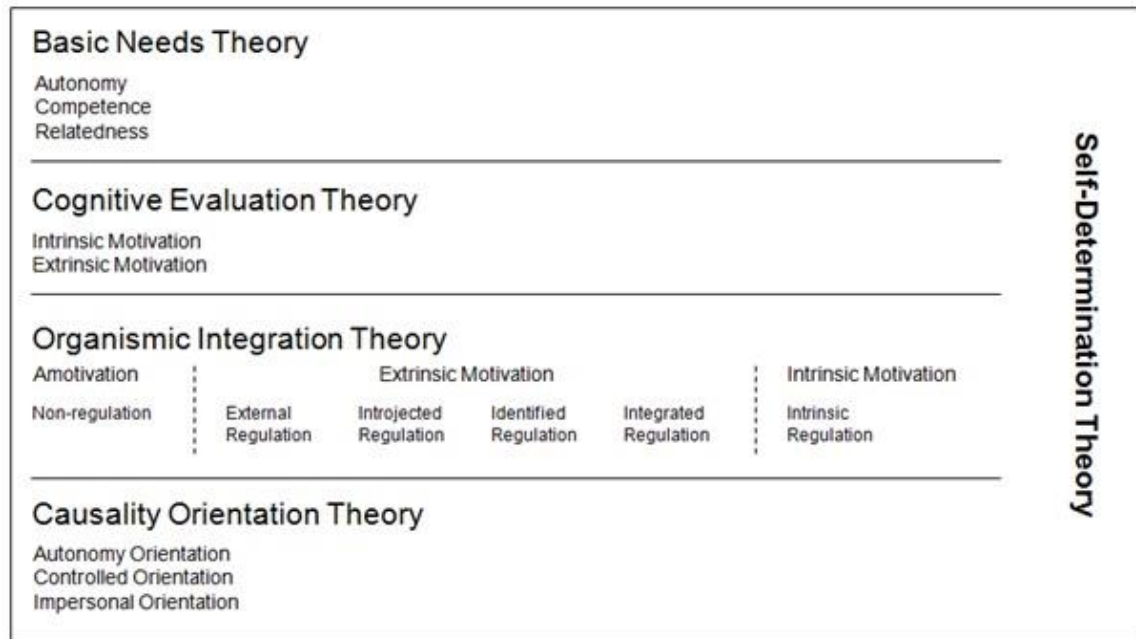
Figure 3. The Four Mini-Theories that Comprise Self-Determination Theory

Source: Lon Schiffbauer (August 2013)

This theory presents a continuum based upon how much external control is integrated along with the desire to perform the activity, instead of simply declare that motivations are either internalized or not. If the external control provides a meaningful reward, then extrinsically motivated behaviors can be integrated into the self.

To integrate someone in the activity the external rewards must be related to the activity, otherwise they feel there is someone else controlling the individual's behavior. Users are much more likely to produce autonomous, internalized behaviors, if they are allowed to self-identify with goals or groups that are meaningful to them. A user is more likely to see the activity as positive

if he/she has fully integrated the activity along with his/her personal goals and needs, than if he/she is being controlled by external motivators which are integrated with the activity (Deci & Ryan, 2004).

Thus, according to OIT, to create a gamification system that is meaningful to the user, the key is to create a long-term systemic change that could be able to offer the users positive feelings about engaging in the non-game activity. But, designers should be aware that if too many external controls are involved in the activity, negative feelings about engaging in the activity will arise among users. The ideal situation of gamification design is to create a meaningful and rewarding system without the need for external rewards to let users avoid negative feelings and most importantly, to be related.

2.2.3 Universal Design for Learning

Universal Design for Learning (UDL) is an educational framework based on research in the learning sciences, including cognitive neuroscience that guides instructional designers to create flexible learning environments that can accommodate individual learning differences (Rose, DH, Meyer, A., 2002) .

This theory indicates that courses should be meaningful for a wider range of learners, and well designed so that students can demonstrate learning in a variety of ways. For instance, students should be able to select the way in

which they demonstrate how they have met learning outcomes, rather than all of them take exams or give presentations (Rose, DH, Meyer, A., 2002).

The first definition of UDL framework that was given by the Center for Applied Special Technology (CAST) in the 1990s (Orkwis, R, McLane, K, 1998), requires creating curricular from the beginning that provides:

- Multiple means of representation - to provide learners various ways of exploring and demonstrating information and knowledge – the "How".

- Multiple means of expression - to think about alternative ways for learners to present what they know - the "What".

- Multiple means of engagement – to give learners different paths to internalize content, challenge them appropriately, to tap into their interests, and become engaged and motivated – the "Why". (Rose & Meyer, 2002, p. 75 & CAST, 2008)

The "How", the "What" and the "Why" are applied to the creation of meaningful gamification. To be meaningful to users who can carry out activities but operate it in different ways, users should be allowed to demonstrate their mastery of an activity in multiple ways. So when designing gamification systems for non-game activities the goals achievement section should either allows different paths for users to reach so that users can be involved in the

most meaningful paths to them or allow users to arrange their own goals and/or achievements.

If all tasks in activities are dull, the point system could satisfy some users, but to keep every user on board activities should be gamified. Activities will be meaningful to users when they have multiple choice so they can select the one that interests them and fits their background the most. The key of applying the "How", the "What" and the "Why" theory into gamification system design is ensuring that there are plenty of ways to let users find meaningful connections to the activities. Shallow connection as a point-based system obviously provides limited meaningful internal motivation for users to get involved in activities.

It is a challenge to design a wide range of different aspects to a gamification project, while to help designer overcome this challenge, the design of gamification should be opening up to users.

2.3 Examples of Meaningful Gamification Applying

Meaningful gamification techniques focus on the consideration of aspects of the underlying activity to understand where an integration of game elements makes sense (Nicholson, S. 2012). The game mechanisms could fit into a non-game system better by adding meaningful gamification, rather than

simply using a point-based system. Moreover, besides scoring elements the most attractive part of games is the joy of "play". Thus, users would give stronger focus on the integration of play if we removed the scoring elements from a gamification context.

A brilliant project that could be called meaningful gamification is the dog feeding vending machine in central Istanbul. Those special new invented vending machines -"dog food recycling box"- take recyclable cans and bottles and in exchange dispenses free food to some of the estimated 150,000 stray dogs living in the city. They became surprisingly popular right after the first one set up on April 17, 2014. The designer received queries from 61 countries that have expressed an interest (Spiegel, 2014).

Another class example of meaningful gamification is Alternate Reality Games (ARGs), which "is an interactive networked narrative that uses the real world as a platform and uses transmedia storytelling to deliver a story that may be altered by players' ideas or actions (wikipedia.org)". As in a computer or console video game, unlike traditional other computer game where characters are actively controlled by the game's designers, ARGs use artificial intelligence to evolve and respond to players' involvement. ARGs let players define the game form and interact directly with characters in the game, "solve plot-based challenges and puzzles, and collaborate as a community to analyze

the story and coordinate real-life and online activities" (wikipedia.org).

Attempting to identify ARGs is almost an impossible task because its cross-media form allows it to incorporate elements of so many other art forms and works. Several experts, though, point to the use of transmedia, "the aggregate effect of multiple texts/media artifacts," (Watson, J., 2011) as the defining attribute of ARGs. A well-designed ARG does not need a point system or leaderboards to create an engaging and meaningful experience. McGonigal argues that good ARGs present obstacles within a story with a wide scope, and that players feel satisfied and positive about their own abilities by overcoming those (2011). Developing an ARG requires designers to understand the non-game setting well enough to integrate gaming elements in a meaningful way which is a time -consuming process.

Another example of meaningful gamification comes from wearable technologies. Psychological concepts like the quantified self and social gamification are used by Fitness device manufacturers to help individuals force themselves and their inner circle to dust off their running shoes and hit the gym, and not just so they can show off their spiffy exercise bands (Williams, O., 2013). Wearable devices such as the Fitbit Force, Withings Pulse and Nike+ FuelBand motivate individuals to move around more frequently by notifying them of their activity levels and helping them to set new goals through mobile

phone applications.

For instance, the Fitbit system sets benchmarks for distance traveled, step count, active minutes, calories burned and flights climbed daily. And it suggests users to raise their goal when the user begins to beat it, or users could add new goals, such as water intake, calorie consumption and even how many hours of sleep they get each night. These functions offer users a better understanding of how their health can be affected by food, sleep, exercise and their environment.

Despite the helpfulness of those health statistics, the real reason that wearable devices keep people committed to their goals is their social gamification aspect. Research shows that the best way to stay motivated in your fitness program is to work out with friends (Cockcroft, L., 2009) . With wearables you are able to work out with your entire social network. Take Fitbit as an example again: it successfully implemented users' social network in to its application by ranking the user and the user's friends' weekly step count or calories burned. It also allows the users to congratulate or mock each other in the process. This simple functionality makes the device much more effective as well as addictive; motivating the user to exercise for the sake of improving his or her ranking like in a sports game (Williams, O., 2013).

2.4 Gamification for Learning

As people starting to implement gamification in study, there is little research regarding the usefulness of gamification. In *Gamification in Education: What, How, Why Bother?* (Lee, J. J. & Hammer, J., 2011) the authors defined gamification as the use of game mechanics, dynamics and frameworks to promote individuals' desired behaviors. This definition actually reached the same point made by BJ Fogg. Fogg's Behavior Model (FBM) shows that three elements must converge at the same moment for a behavior to occur: Motivation, Ability, and Trigger (behaviormodel.org). So, designers can use gamification to determine certain behaviors or correct others and we can thus see the utility of using gamification in learning, and even more in e-learning. However, if the gamification design does not fit the aim of motivating students to engage in study, and if it on the contrary might make students feel that they should learn only when provided by an extrinsic motivation it could be dangerous.

3 Design Chingual with Construction Design Research Method– Use Unique Approach to Teach Chinese Characters' Pronunciation in Chingual

3.1 What Needs to Be Learned in Mandarin Chinese?

Mandarin pronunciation is customarily to be the first step in learning Mandarin Chinese. It helps with speaking and listening skills. Generally, people cannot tell the pronunciation by looking at Chinese characters, while sometimes characters with common parts have similar pronunciations. Unlike other current written languages, Chinese characters are not primarily phonetic, and certainly not alphabetic, but pictographic or ideographic (displaying combinations of pictures or symbols to convey meaning) like ancient Egyptian hieroglyphics (chinahighlights.com, Last accessed 08.01.2015).

Thus, to teach the language there needs to be a way to represent in writing the pronunciation of each character. There are several systems that have been used, for example Wade-Giles system which was established in 1892 using the English alphabet (there are many Wade-Giles names still in common use in Taiwan) and the International Phonetic Alphabet (IPA) which requires a ready knowledge of the symbols. But Pinyin is the current standard way of writing Chinese pronunciation in Mainland China.

3.1.1　Pinyin

Pinyin, as an efficient way of representing Chinese sounds with the Roman alphabet, was developed for Chinese speakers and those learning standard Chinese pronunciation. It was developed during the People's Republic of China era (from 1949) and first approved by the Chinese government in 1958 (Pinyin celebrates 50th birthday. Last accessed 16.03.2015), the International Organization for Standardization adopted it as a world standard in 1982. Last accessed 16.03.2015).

Because pinyin was not developed for the English-speaking world, half the time letters in pinyin represent different sounds from what they would in a typical English word. Previous study is required for English speakers to pronounce pinyin words.

Even though the Chinese view Chinese characters as the real Chinese written language, pinyin can be seen on many maps, road signs, and other notices. In Mandarin language more than 400 mono-syllabic sounds are created by combining 21 consonants and 16 vowels together. Details of Pinyin can be found in Appendix 3 – Initials and Finals of Pinyin.

3.1.2 Tones

As a tonal language, Mandarin Chinese has four main tones and one neutral tone (or, as some say, five tones). Each tone has a distinctive pitch contour which can be graphed using the Chinese 5-level system (Chao, Y. R., 1968). . These tones are used to differentiate meaning. The same syllable can be pronounced with different tones. Mandarin's tones give it a very distinctive quality, but the tones can also be a source of miscommunication if not given due attention (Duanmu, S., 2000).

Tones usually marked like below:

Tone number	Tone name	Tone symbol	Alternative tone name
Tone 1	high tone	ā	soprano tone
Tone 2	rising tone	á	enquiring tone
Tone 3	falling rising tone	ǎ	sarcastic tone
Tone 4	falling tone	à	emphatic tone
No tone number	light tone	a (no symbol)	quiet tone

Table 1. The five kinds of tones in Mandarin Chinese Pinyin

Source: A Grammar of Spoken Chinese (Chao, Y. R., 1968).

3.1.3 Characters

There are two types of Chinese characters: **Simplified Chinese characters** are standardized Chinese characters used in mainland China, Singapore, and Malaysia; while **Traditional Chinese characters** are standardized Chinese characters used in Taiwan, and the special administrative regions of Hong Kong and Macau. In this thesis we only talk about Simplified Chinese characters, which are simplifications of character structures that have existed for thousands of years along with regular, more complicated forms. Their number of strokes were decreased and their forms considerably simplified from traditional Chinese characters.

Chinese characters are all logograms. Nevertheless, they represent words of the language by several different strategies. A few characters are derived from pictograms, a number of them are originally from ideographs, but the vast majority are originated as phonon-semantic compound characters (Norman 1988).

The number of Chinese characters is huge. The largest Chinese character dictionary Zhonghua Zihai (1994) consisting of 85,568 different characters, and the Table of General Standard Chinese Characters (2013) which was announced by State Council listing 8,105 Chinese characters, 6,500 are designated as common. However, the New Hànyǔ Shuǐpíng Kǎoshì (汉语

水平考试, Chinese Proficiency Test) proficiency test covers approximately 5,000 characters at its highest level (level six) (HSK test, Last accessed 25.03.2015).

3.2 Competitor Analysis - How Do Other Applications Teach Chinese?

The market of language teaching apps has been growing rapidly in the last few years. For example, Duolingo, the increasingly popular online language learning service, launched for the general public on 19 June 2012 and as of January 2014 has 25 million users, out of which about 12.5 million are active ("We have a blog!". Duolingo Blog. Last accessed 16.08.2014).　Duolingo closed a $20 million C round of funding In February 2014 (Duolingo Raises $20M Series C Led by Kleiner Perkins to Dominate Online Language Learning. Last accessed 20.03.2015). Chineseskill, a new Chinese learning App, launched its 1.0 version on 08th February 2014, already has 40,000 users, and made approximately $38.3 million in total revenue until now.

After analyzing all the Chinese learning Apps and websites on the market, we agreed that our direct competitors are Duolingo, Chineseskill, Skritter and Chineasy. In the following sections, I present my analysis for those four products.

3.2.1 Duolingo

Figure 4. Duolingo application – User interface

Source: Duolingo (April 2015)

Duolingo is a language learning website and app , it offers free courses in Spanish, French, German, Brazilian Portuguese, Italian and Chinese (to learn English). Because of its success and professionalism in language learning and usability design, we see it as a strong competitor. Furthermore, offering English speaking people Chinese lessons is in Duolingo's future plan (Duolingo for Chinese? Last accessed 06.04.2015). In Duolingo much of the learning happens in the form of rapid-fire quizzes, which switch frequently between testing speaking, listening, and writing. High scores unlock further lessons. You can compare your progress with your friends' through Facebook, a successful use of "gamification".

Figure 4 shows the process of using Duolingo to study the first lesson of Spanish. *'1. Welcome page'* shows the brand and main color and style of this app. When users swipe the screen, they will see *'2. Introduce 1'* to *'4. Introduce 3'* which introduces functions of Duolingo, Click *'GET STARTED'* button to enter app, in *'5. Choose a language course'* users will be asked to choose a language course, then in *'6. Make study plan'* , the user can pick how long they want to study everyday so Duolingo will set users a notice through the application and email every day to remind them to study. Next, *'7. Set your level'* users need to tell Duolingo if they are beginners, or they can take a placement test to be assigned to study from a certain lesson by the application. Also, users could create their profile in *'8. Create account to*

learn more' to keep track of their study process or share it to their Facebook friends. Because in this thesis we focus on language study beginners, the thesis analysis is from first lesson.

As we can see from *'9. Lessons 1'* to *'10. Lessons 2'* teaches the first basic words. In screenshot *'11. LESSONS MENU'* we can see that Duolingo designed identical logos for each study section. The rest of the screenshot pictures show six different teaching methods that Duolingo used in Lesson 1. Those six methods show up in numerical order in the app. Their degree of difficulty rises from method 1 to 6. *'12. teaching method 1-1'* allows users to select one of four pictures by the given English word. Each English words has its Spanish name written below it. The user has the choice to skip this exercise or as in *'13. Teaching method 1-2'* choose one picture and check if they are correct. The app will have a banner with *"You are correct"* or *"Oops, that's not correct"* with a correct answer in response as in *'14. Teaching method 1-3'. '15. Teaching method 2-1'* users are asked to choose the word's English meaning by listening and reading a Spanish sentence as in *'16. Teaching method 2-2'. '18. Teaching method 3-1'* users need to type the English meaning of a Spanish sentence after listening and reading it. *'19. Teaching method 4'* type what users hear, the voice can be played multiple times with ordinary speed or slower speed. *'20. Teaching method 5'* is speaking practice. Users follow the app to repeat a spoken sentence. *'22. Teaching method 6'*

is similar to *'12. Teaching method 1-1'* select correct Spanish sentence from four by the given English word, but only two of them have pictures. During the whole lesson there is an orange color process bar which shows the amount of practices that have been achieved. When users finish a lesson, *'23. Learning chart' illustrates* the learning progress and the points they get to encourage users to continue studying. Users can buy products in *'24. Shop'* page, to decorate their interface.

While it is a great start for language students, it is far from perfect. Its lessons are deep, but the language selection is small, which might limit its clientele by its style of teaching. The quizzes focus on mastering structural blocks and meanings of words. It does not really teach conversational skills, pronunciation rules, and grammar at the beginning. Thus, users need to know the basics of the language they are learning, before using it. The focus is great for serious beginners or long-term learners, but much less useful for casual learners or tourists who just want to learn some words for traveling abroad.
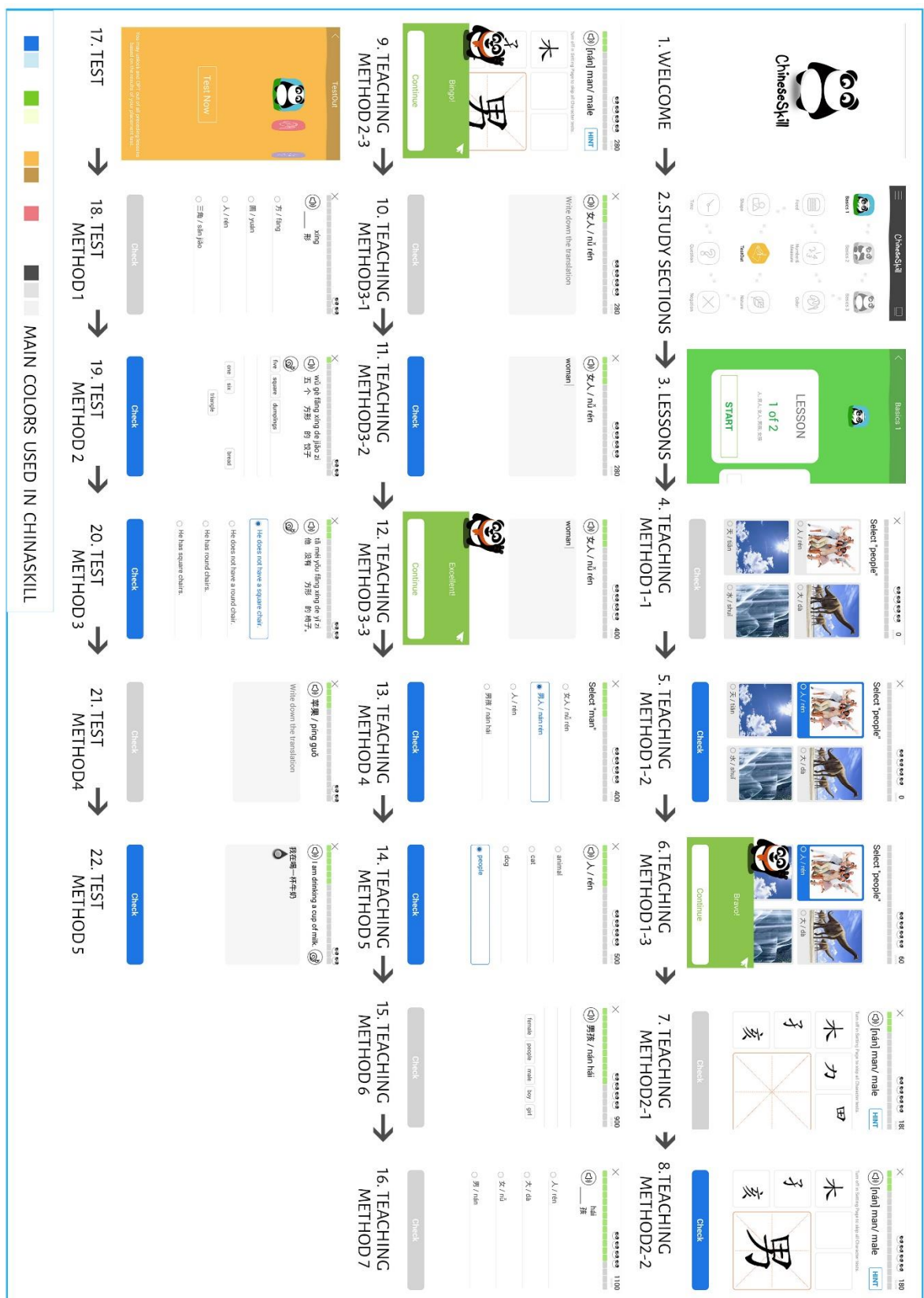
3.2.2 Chineseskill

Figure 5. Chineseskill application – User interface

Source: Chineseskill (April 2015)

Chineseskill is basically a free application using a similar gamification mechanism as Duolingo to learn simplified Chinese and Traditional Chinese with English as the source language. It barely has its own style at all, as it uses a similar mechanism and interface design as Duolingo.

As Figure 5 shows, when user start using Chineseskill, after '*1. Welcome page*', '*2. Study sections*' indicating all the contents of this application, users could take a '*17. Test*' out to unlock following study sections, or study step by step from lesson 1. There are 7 teaching methods in Chineseskill:

1. '*4.Teaching method 1*' - select the right picture for the given English word;

2. '*7. Teaching method 2*' – use the given pieces of Chinese characters and English meanings to patch up the right character;

3. '*10. Teaching method 3*' – type the English meaning of the given Chinese word and pronunciation;

4. '*13. Teaching method 4*' – choose the right Chinese meaning for the given English word;

5. '*14. Teaching method 5*' – choose the right English meaning for the given Chinese word and pronunciation;

6. '*15. Teaching method 6*' – choose the right English meaning for the given Chinese word and pronunciation. The difference from teaching method 5 is that teaching method 6 has more options;

7. '*16. Teaching method 7*' – choose the right Chinese character with the given Chinese character to form a word. In '*17. Test*' all the teaching methods are included the test. However, the degree of difficulty is higher, and there are longer sentences.

Even though it received compliments from users, there are some doubts regarding their English in the application and the effectiveness when the same method is applied to language learning between western and eastern languages (ChineseSkill vs Duolingo: Who will be successful in Chinese Learning? Last accessed 15.04.2015).

3.2.3 Skritter

Skritter (Figure 6) is popular by its efficient solution to build and maintain the ability to write Chinese and Japanese by hand so far. Its website and iOS apps charge $14.99 per month after a two-week trial (www.skritter.com/pricing , Last accessed 16.04.2015) . It allows users to practice writing Chinese characters by hand and gives feedback on the user's writing. Mostly, it is able to tell users if they are correct or not and will guide them through the standard stroke order and character composition if they forget how to write a character. But Skritter's interface of vocabulary browser and editing functions are very weak indeed.
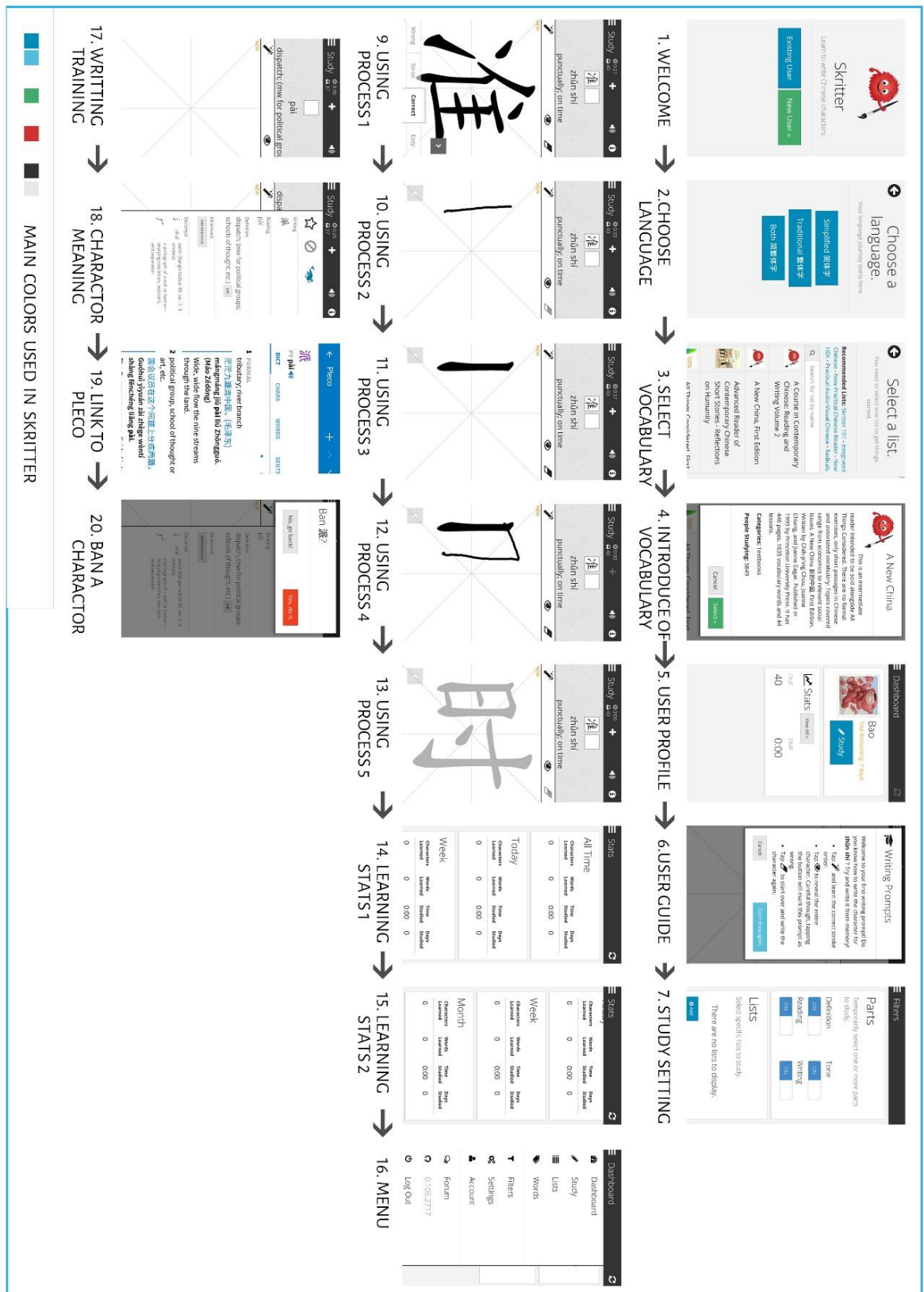
1. WELCOME

2. CHOOSE LANGUAGE

3. SELECT VOCABULARY

4. INTRODUCE OF VOCABULARY

5. USER PROFILE

6. USER GUIDE

7. STUDY SETTING

9. USING PROCESS 1

10. USING PROCESS 2

11. USING PROCESS 3

12. USING PROCESS 4

13. USING PROCESS 5

14. LEARNING STATS 1

15. LEARNING STATS 2

16. MENU

17. WRITTING TRAINING

18. CHARACTOR MEANING

19. LINK TO PLECO

20. BAN A CHARACTER

MAIN COLORS USED IN SKRITTER

Skritter
Learn to write Chinese characters.
Existing User   New User

Choose a language.
Your language journey starts here.
Simplified 简体字   Traditional 繁体字   Both 两套汉体字

Select a list.
Choose a list to study.

zhǔn shí
punctually, on time

Figure 6. Skritter application – User interface

Source: Skritter (April 2015)

As a new user, the using process of Skritter is: choose the language you want to learn from three options, which are simplified, traditional, and both. In the next step users select a vocabulary list to study, then after a pop-up user guide the study journey begins. The first page of study has two empty boxes on the top of the screen, with pronunciation and meanings below, the user is required to hand write the correct character. Skritter modifies and replaces the users' hand drawing with the standard character parts. On the right top corner of the screen there is an info icon which gives the detailed meaning of the character. The meaning is supplied by another application - Pleco. To help and encourage users to keep on studying, Skritter records users' study statistics as in Figure 6 picture: *'14. Learning stats 1', '15. Learning stats 2'.*

Obviously, Skritter is an efficient solution to build and maintain the ability to writing Chinese by hand for students who are seriously learning Chinese. But their target user group is quite narrow; people who just want to learn Chinese casually or travelers might not be satisfied with Skritter, because they might need some simple words and sentences to hold short conversations.
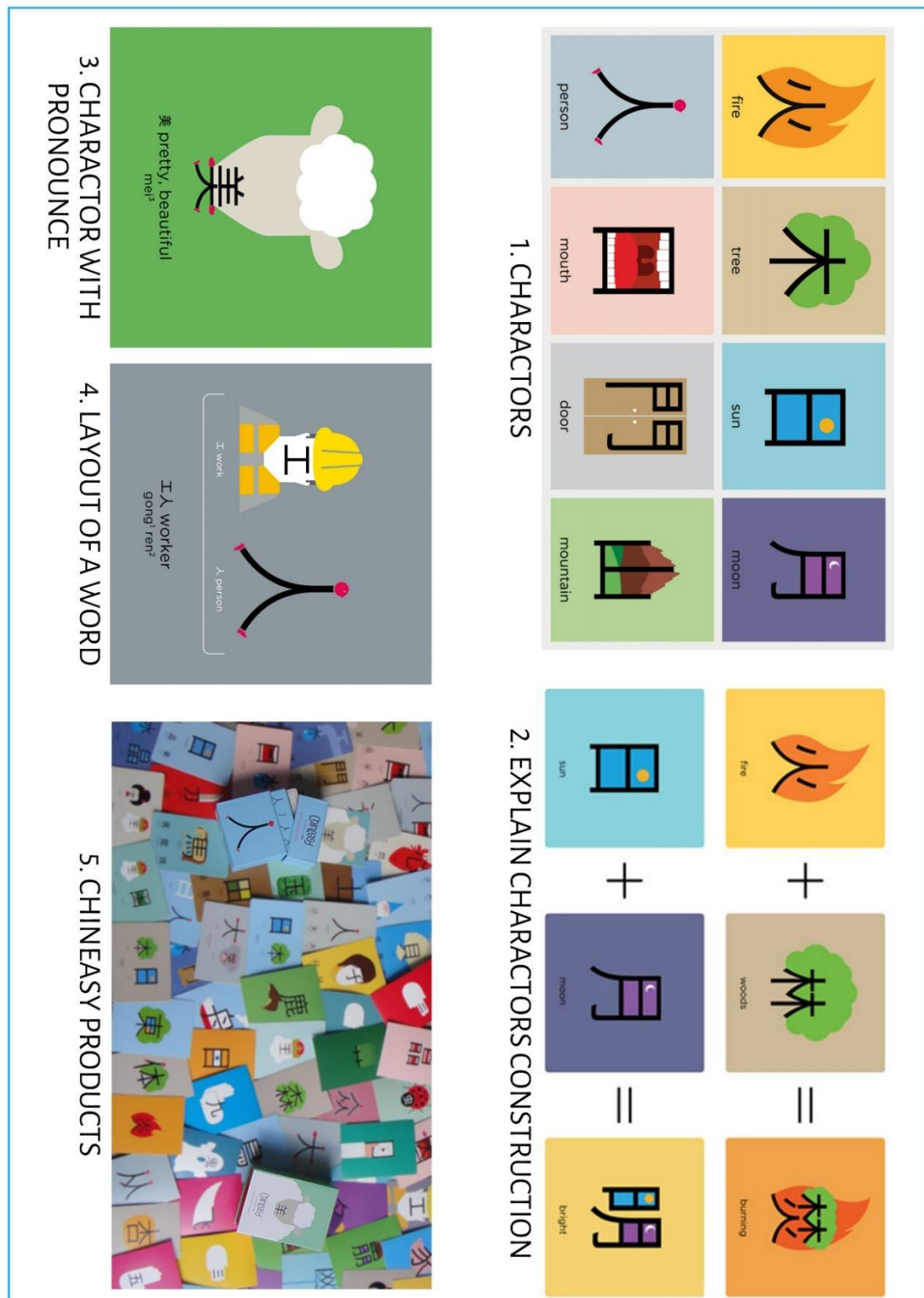
3.2.4 Chineasy

Figure 7. Chineasy characters design and products

Source: Chineasy (April 2015)

Chineasy is an attempt to help people to learn to read Chinese easily by recognizing characters through simple illustrations. Its system turns notoriously inscrutable Chinese characters into simple illustrations. They launched a funding campaign on kickstarter.com in July, which reaped nearly £200,000 in pledges (Learn Chinese with illustrations from NOMA bar, Last accessed 16.04.2015). A website is up-and-running, a 192-page book was produced by Brave New World Publishing in 2014, and they are working on their own application. However, Chineasy received criticism of its "simplistic method for teaching English speakers to learn to read Chinese" (Chineasy? Not , Last accessed 16.04.2015) .

One reason is, if users employ Chineasy's methods, they will not learn anything about Chinese grammar or syntax, and they will not know the sound of even a single Chinese character. Users might learn to recognize a hundred or so individual characters, but they would not know how to pronounce them or use them in any meaningful context. Another reason is, the user will be subjected to many assertions that are wrong. For instance, on TED talk, ShaoLan- The creator of Chineasy- says that "A Chinese scholar would understand 20,000 characters. You only need 1,000 to understand the [sic] basic literacy." And on the Amazon preview for her book, her treatment of zì 字 ("character") and cí 词 ("phrase" [sic] -> "word") is woefully inadequate (Chineasy? Not , Last accessed 16.04.2015).

3.2.5 What Makes Chingual Special?

Features / Apps	Target Customer	Content focus	Price
Duolingo	All age range	Listening, Writing, Meaning, Pronunciation	Free
Chineseskill	Early childhood education	Listening, Writing, Meaning, Pronunciation	Free
Skritter	All age range	Writing, Meaning,	$14.99/ month
Chineasy	Early childhood education	Writing, Meaning,	$19.26/ book
Chingual	All age range	Listening, Writing, Meaning, Pronunciation, Speaking	Free for Beginner level

3.3 Using Construction Design Research Method to design Chingual

3.3.1 What Is Construction Design Research

In the 21st century, some researchers started to try researching design through design concepts. They believe that they can explore new materials and actively participate in intentionally constructing the future, by making prototypes, products, and models to codify their understanding of design, instead of limiting their research to an analysis of the present and the past.

Some other researchers pointed out that any research needs strong theory to guide practice, while this concept lacks appreciation for many things at work behind any successful piece of research.

Thus, a new concept - "constructive design research" became introduced to academic areas. This concept is about letting a prototype of a product, system, space, or media take center place and become the key means in constructing knowledge, then research into it. Constructive design research is aimed to explicate practice rather than try to define a field with big concepts. Why constructive design research is special?

So far, interaction design in Eindhoven, critical design in London, Empathic design, co-design, and action research in Scandinavia, service design and sustainability design in Milan, user experience in Carnegi Mellon have been programmatic in constructive design research over the years and there are several successful research programs.

In those programs, the most influential work on conceptual and theoretical development took several routes. Researchers turned design issues of ecological psychology toward pleasure and emotions, then shifted to emotions and experience after a few years. They have created several frameworks for designing interactive technology, and those programs created little new theory.

Furthermore, during the study of these programs, research methods were borrowed from other researchers and practices, but were used creatively. Thus, whether it is imaginative in design terms becomes the crucial requirement of working successfully in constructive design research.

Constructive design researchers imagine new realities and build them to see whether they work, rather than try to analyze the material world or see design as an exercise in rational problem solving. They create concepts, building mock-ups and prototypes. These works take place in a cycle that begins with an objective of some kind, and continues to user studies. Yet, the things produced by researchers are seldom produced, because the requirements for making them into commercial products is clearly beyond most researchers' powers. Especially some of the issues that researchers faced can hardly be solved by anyone.

Typically, besides imagination, constructive design research has another design-specific characteristic, which is that it builds things in comfortable studio-like places that house discussions and create concepts and goes all the way to workshops with heavy machinery as well as computer and electronics labs.

This work often begins with playing with materials, technology, and design precedents, and may start from theories, methods, and fieldwork findings. Doing this kind of work has always been more important than reflection for designers. Without doing this, many things of interest to designers would go unnoticed, things like how some material feels, how some angle flows gracefully over an edge, or how interaction works.

Then how do constructive design researchers understand their contribution? What meaning does constructive design research produce?

Most constructive design researchers agreed with Andrea Branzi when he points out that the task of design research is to keep distance from the "pure practice of building". From my understanding, the meaning that constructive design research produces is providing alternatives to deeply ingrained habits of thinking (Branzi, A. 2006).

3.3.2 Is It Enough To Study Design Only In The Laboratory?

Almost anything can be studied in the laboratory: armies, design, chemical reactions, rich interaction, and so forth. Studying a phenomenon in a laboratory means that something is taken out from its natural environment and brought into a controlled area where it can be subjected to experimentation. Studying in a laboratory avoids all the troubles associated with studying in the real world. It helps researchers study alternative explanations and competing hypotheses; doing this is far more difficult in natural settings.

There are many other benefits of working in a laboratory, such as that a laboratory can be equipped with instruments that help make detailed and accurate observations and measurements, and it is also makes the replication of the study in other laboratories possible. Like Philip Ross's opinion that study design in laboratory limited designer's ability to generalize but also made their analysis easier.

Besides theory, the designer's skill and intuition are important components when adding the design phase to research. So prototyping is more than theory testing, it is also an embodiment of design practice. But it also goes beyond theory, it embodies design values. Most design researchers find it easy to

agree that prototypes are done to see where theoretically informed design leads to. They think it is better to leave the concern for production to industries.

However, when things are taken from the society to the laboratory, conditions are different, things that happen in the laboratory may not happen in society or may happen in a different way.

Researchers realized that workshops and studios are necessary, but are not the right condition for a healthy constructive design research program. They try to produce prototypes during fieldwork to create dialogs with people in the study. All in all, a successful constructive program should participates in public discourse and interprets society.

3.3.3 Use Construction Design Research Method to Teach Chinese Pronunciation.

So far there is no perfect solution for people to learn Chinese Pronunciation by themselves. Although Pinyin is used to teach Chinese, transcribing names and places into the Roman alphabet, and used as an input method for typing Chinese characters, native English speakers often have trouble spelling and distinguishing between these sounds.

Thus I decide to experiment on my own to create a method for pronunciation in Chingual to see if it is efficient for people to use for learning. My Method is to find English words which have similar or even the same pronunciation part as initials and finals of Pinyin to help students to remember and spell Chinese character correctly. Here are the initials and finals list I made with corresponding English words below:

PINYIN WITH CORRESPONDENT ENGLISH WORDS

INITIALS		FINALS			
B	**B**AY	A	**AH**-HAH	ANG	**ON**
P	**P**AY	O	**WH**Y	ENG	**OWN**
M	**M**OM	E	D**UH**	ING	**EN**GLISH
F	**F**UN	I	S**I**T	ONG	**WON**'T
D	**D**AY	U	R**OO**M		
T	**T**OP	Ü	J**UI**CE		
N	**N**AME	AI	**A**PPLE		
L	**L**AY	EI	W**EI**GH		
G	**G**O	UI	**WE**		
K	**K**EY	AO	**ALL**		
H	**H**AY	OU	S**O**		
J	**J**EEP	IU	**YOU**		
Q	**CH**EAP	IE	**YE**S		
X	**SH**ARE	ÜE	J**UI**CE+**EH**		
ZH	**J**AM	ER	TEACH**ER**		
CH	**CH**IN	AN	C**AN**		
SH	**SH**OE	EN	TAK**EN**		
R	**R**ULER	IN	T**EEN**		
Z	KI**DS**	UN	**WEN**T		
C	CA**TS**	ÜN	J**UI**CE+TAK**EN**		
S	**S**UN	UO	**WH**Y		

Figure 8. Initials and finals list with correspondent English words

The whole interface design of Chingual will be explained in Chapter 4. In Chapter 5, I will discuss how my own pronunciation method works for users after tests with volunteers and personal interviews with them.

4 Design of Chingual

4.1 User Centered Design (UCD) Method for User Interaction Design

User centered design (UCD) method can transform data into actionable ideas. It helps design organization connect better with the people they serve. Designers become able to see new opportunities, creating new solutions faster and more effectively with the help of the user centered design method.

User centered design (UCD) is a process and a set of techniques used to create new products, services, environments, organizations, and modes of interaction for end-users. It starts by examining users' needs, dreams, and behaviors which designers want to affect with new solutions (Human-Centered Design Toolkit-IDEO, Last accessed 16.04.2015).

For my consideration in this thesis, I will talk about interaction design for the language learning application based on user centered design. People often confuse interaction design with graphic design. However, this is not totally true.

This is because our life styles are getting involved with technology more and more nowadays. Interaction design concentrates on studying people's behaviors, such as how they think and what they expect about the way that interfaces work, to help people build their own interaction experiences through

interacting with technology. Also, as a part of interaction design, graphic design is used to build an aesthetically pleasing interface for it. Designing for people is what interaction design focuses on.

4.2 Five Interaction Design Principles

Interactive experience design expert David Hogue defines five key principles of interaction design: Consistency, Visibility, Learn-ability, Predictability, and Feedback. These five interaction design principles provide guidelines for interaction designers to promote their designs and enrich users' experiences (David M. Hogue. 2010, Last accessed 25.03.2015).

4.2.1 Consistency

Changes and differences always grab people's attention. They can also confuse users by leading the user's attention to something unwanted in which something is irrelevant to the main interaction. So when designing an interaction, designers should think about which part needs the users' attention and which parts do not.

4.2.2 Visibility

Users always need to know when to start the interaction and identify chances for interaction from hints provided by the interface. Hints like legible text, icons which are easy to distinguish and read, hyperlinks with different colors,

and interactive elements distinguished from non-interactive ones emphasized by different colors, etc.

4.2.3 Learn-ability

A good interface should be easy to learn and the experience should be remembered by users. Furthermore, users will have to interact with the interface a couple of times in order for them to learn it, so harnessing users' past experience is also related to learnability. Designers should maximize usage of users' past experience while trying to create something new and test it with users to get feedback. This often helps them in refining the interaction which might end up with a more acceptable design and match the targeted users' requirements.

4.2.4 Predictability

A predictable interaction should have clear instruction for users to find the interaction opportunities, be aware what can be done and what will be the outcome. The interaction process for users' needs to be as intuitive as possible.

4.2.5 Feedback

Feedback should always be provided to users. They need to know what is happening inside the application. Feedback can take several forms to show

if the application is still working, having a problem, or done. At the same time, feedback ought not to be overdone, as it often leads to irritating the users.

4.3 Five Steps of Chingual Interface Design Process

When I design the interface for Chingual I went through five steps as following:

4.3.1 Step 1 – Analysis and Find out User Requirements

Before beginning designing I interviewed (Appendix 1) two Chinese teachers – Yu Wang and Jinhua Chen, from The Confucius Institute at the University of Helsinki teaching Chinese in Finland. From the interview I learned that if students want to learn by themselves after class, teachers usually suggest students to get study materials from http://edu.chinese.cn/zh-cn/onlinelearning/learningchinese/ and for beginners the best study book is Happy Chinese (《快乐汉语》). The most difficult parts for students learning Chinese are the 'four tones' and the order of strokes of writing Chinese. The reasons that foreigners want to learn Chinese is mainly because they have Chinese relatives, for their future careers and interest in Chinese culture. The process of teaching Chinese usually is: Pinyin, construction of Chinese characters, stroke order, works, and sentences. Students need to follow teachers' example to learn pronunciation, learn names of each stokes and practice by disassembling and assembling stokes to remember Chinese

characters. Lessons that have been taught are according to Chinese Proficiency Test (HSK) examination syllabus.

I created an online survey (Appendix 2) to find out potential users' needs of Chingual. I received 14 answers. Here I present the data analysis of those answers:

First of all, 86% of participants are 20 to 30 years old. The main reason for them to study Chinese is that they have Chinese friends or relatives, they want to talk to them in Chinese (64%) other reasons are for traveling (43%) and for work (43%) only 21.4% of participants learn as a hobby. What attracts most of them to learn Chinese is the culture (86%), history (64%), travel information (43%), slang (43%) and literature (36%). Only 2 respondents mentioned they learn for business and career purposes.

According to the survey, individuals are inclined to learn by themselves or with smaller groups. The way that participants study Chinese is by books (57%), mobile applications (50%), and internet (43%). A few of them study with a private teacher (21 %). But it is worth mentioning that none of them learn from language institutions. Half of the participants spend 10 to 30 minutes on studying Chinese every day, 29% of them study more than 30 minutes, 2 of them spend 10 minutes on studying Chinese.

Apparently, among listening, speaking, reading and writing, people feel writing is the hardest part to learn. 8 of the participants think it is very hard for them to learn writing, 5 of them chose speaking as their weak point and participants spend most of their study time on reading and writing. When studying by application, after studying each chapter, all of the participants prefer to take a study test. 93% of them like to spend less than 15 minutes on the test. 93% of them want to have exercises to practice how to write Chinese characters. About the study contents of a Chinese application, 64% of the participants would love to choose lessons freely rather than follow the structured content and learn chapter by chapter.

If the application enhances their study but charges money, 64% participants are willing to pay for further subscription of more study content. 3 of them would pay 1.89 € for an application with basic and advanced content. 3 of them would pay 2.69 € with advanced content and updated subscription.

4.3.2 Step 2 – Create Persona

After analyzing survey data, I created a mock persona as a target user of Chingual.

Persona Name – Nick Smith, Male, 22 years

Location - Helsinki, Finland

Profession – Master degree student of Social Science.

Hobbies – Sports, Travelling, photography, watching movies, reading books about history and culture.

Nature – Outgoing, smart, interest in new things, love to explore the world get to know local culture while traveling.

Nick wants to go to exchange study and traveling around in China, so he needs to learn Chinese for studies and daily communication.

4.3.3   Step 3 – Coming Up with User Scenarios

In order to satisfy user's requirements; understand what they want from Chingual, I created two scenarios to describe the most possible occasions of users' interaction with the application.

Scenario 1

Nick takes beginning level Chinese lessons in his university in Helsinki. He wants to review after class and learn more about Chinese. Thus, he visits some websites that his Chinese teacher suggested, reads a study book and downloads Chinese teaching applications on his phone, so that he can study when he has spare time. He can read short articles or remember some characters.

In this case, Nick needs an application with which he can view short Chinese conversations that he learned in class and word list that he could learn pronunciation and writing one by one, also some exercises that he can use to practice. All these functions should be clear and easy to access by a few clicks.

Scenario 2

While Nick is living or traveling around China, he will meet many people who can only speak Chinese. For example shopping at the market, going to the bank or the hospital, Nick is unable to express his needs as a Chinese beginner. He wants to find some Chinese sentences from an application which could be played from his phone to the locals.

In this case, the application should have different categories that fit a variety of contexts with English translations and audio sources. Each category needs to be reached directly by one click, and the option to play audio should be obvious for him.

4.3.4 Step 4 – Create Prototypes with Use Cases

Because of limited time, I only designed a prototype for the main interface and the first lesson of Chingual. Now I will separately evaluate my design by two scenarios-user case that was introduced before, by five User-Centered design principles and by gamification applied in my design as follows.

Figure 9. Case 1- operation process 1 to 4
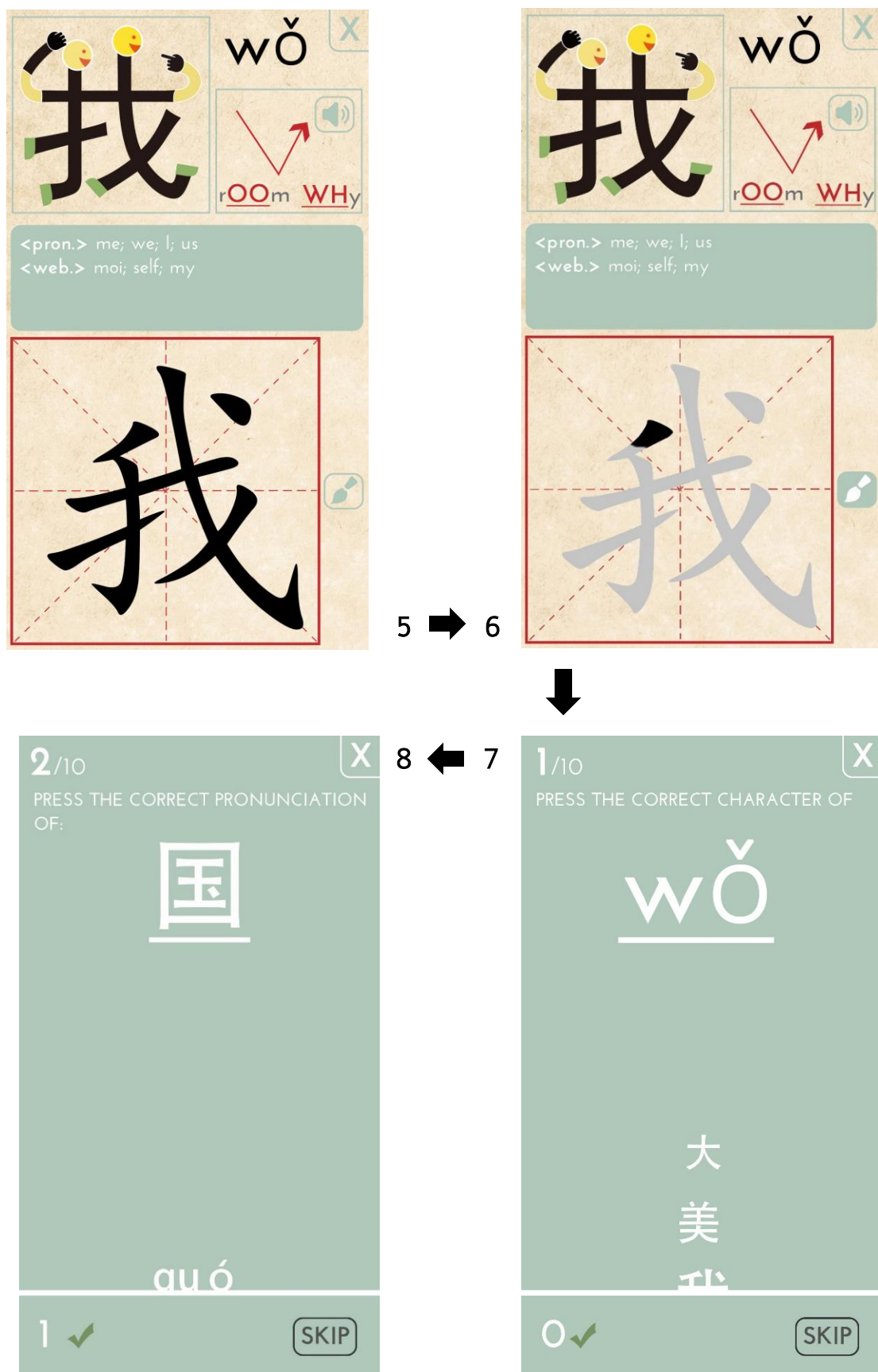
Figure 10. Case 1- operation process 5 to 8

For case 1

Nick opens Chingual, wanting to learn a few words, while he take bus to school. The operation process is: Chingual welcome page (1) showed up for a few seconds, then all the courses that were created based on the book "Happy Chinese (《快乐汉语》)" listed (2) on the screen. He chooses the first lesson – personal (3) to learn how to introduce himself and all the personal pronouns: you, me, her, it, we .etc. He presses the speaker button on the right corner (4) to know the pronunciation of each sentence and its meaning in English. Because every character has its own page for a detailed description, Nick clicks "我" (5) which means me. He can see the visualized picture for "我" on the top left and the official Pinyin to mark the pronuncation on the right. Below Pinyin there are signs of character tones and two English words in which part of their syllables have similar pronunciations to match Pinyin syllables. This part is designed using construction design method, meant to help users to remember Pinyin pronunciation. The meaning of the character is written in a light cyan box in the middle of screen. In the bottom is the official written character, and on its right is a button with a pen on it. Nick clicks this button (6), the character area start to play a short animation to show the standard order of writing each stroke. He presses the speaker sign to listen to the pronunciation of "我". After Nick learns this character, he presses the button "X" on the top right corner to go back to lesson 1 (3). Next, Nick tries some exercises. He taps the button "EXERCISE NOW", page

7 appears. He is asked to choose the correct character which is pronounced as "wǒ". Different characters begin ascending. If he taps the right answer, he will arrive to page 8.

For case 2

Nick want to tell people his name, so he opens the application go through page 1 and 2 arrives on page 3. He clicks the speaker button to play the audio for 'I AM NICK.'

4.3.5 Analyze Prototype by Five User-Centered Design Principles

In the design, menu of all the lessons is categorized by different colors so that users can easily recognize the category they want to learn. Meanwhile, the background color of lessons and practices is always blank cyan which usually gives people a soft and calm feeling, so users would focus on the contents being presented on the screen. A traditional Chinese rice paper pattern is used on the rest of the pages which require less attention from users.

When designing all the buttons, I used a simple thin line frame with a sign in the middle, like: , and on the practice page or on the instruction page the line frame color is dark gray like these two to give users an objective feeling. When those buttons are activated the background of the frame and icons or text in the

middle of the buttons will change their color as a feedback from Chingual.

For example changes into , changes into , changes into . I keep this design style for users to learn how to operate Chingual quickly.

To help users to learn how to use the application, Chingual has some instructions for people who use it for the first time. In Figure 11, when users enter Lesson 1, the instruction page 1 will show up in three seconds. Pressing button application flips to instruction page 2. Furthermore, the first time users press a character they will go through instruction page 3 to page 6, interface presented in Figure 12.
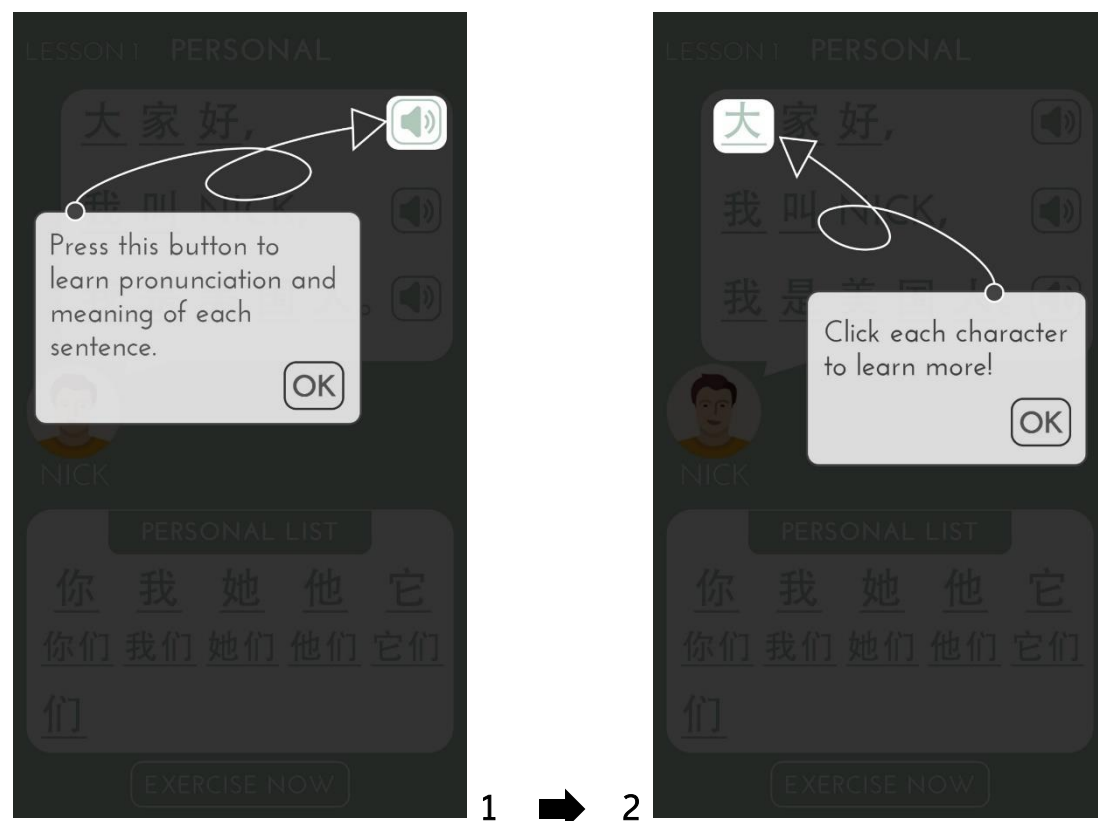
Figure 11 User instruction page 1 and page 2, in Lesson 1

Panel 3 (top-left):
dà
Day AH-hah
Similar pronounce from parts of English words with tone instruction to help you read.
OK

Panel 4 (top-right):
dà
Day AH-hah
Pinyin - the official phonetic system of Chinese characters' pronunciations.
OK

Panel 5 (bottom-right):
dà
Day AH-hah
Press it to watch the animation of writing this Chinese character on the left side.
OK

Panel 6 (bottom-left):
dà
Day AH-hah
Visualized Chinese character to help you remember its meaning and shape.
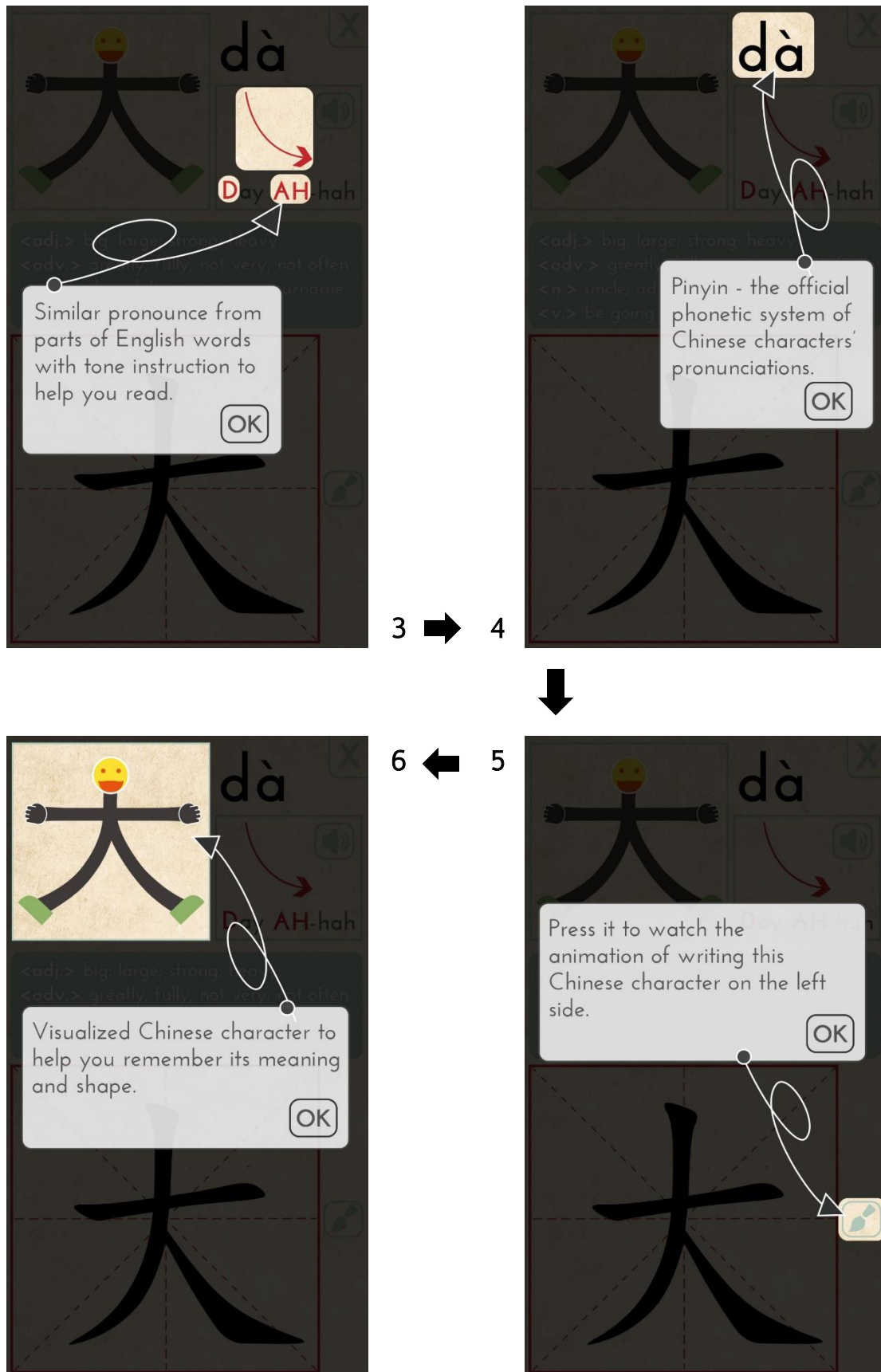OK

3 ➡ 4

6 ⬅ 5

Figure 12 User instruction page 3 to page 6, in Lesson 1

4.3.6 Analyze Prototype By Apply Gamification into Design.

During the whole design process, multiple gamification elements were integrated into Chingual. From the colorful course menu, visualized icons for each lesson to fictional characters . In the future development of Chingual, I plan to add a function that allows users to modify character's names to their own name in the application to create dialogs, so they will feel more engaged in the application and studying. In the character page, visualized Chinese characters and animations of character stroke, as well as practices, these elements are all picked from game design. I discarded the points-based gamification system, because it might lead users' attention away from studying. Instead, in practices I used numbers like: (Figure 17) on the top left corner to indicate the total amount of practices and the number of practices that the user has finished. Moreover, on the bottom left the results of practices are shown in real time as follows: for users to adjust their study plan. Next, in Chapter V I will discuss how these gamification elements work while users interact with this application.

5 Usability Test and Design Iteration

5.1 Usability Test

After making a prototype design for Chingual, I decided to find testers who match the Chingual potential user to test this prototype. I invited 6 testers for usability test interviews. All of their ages were between 20-35 years old, and two of their nationalities were Finnish, the rest four are Iranian, Japanese, Russian, and Korean. One of the Finnish testers and the Japanese tester took a short Chinese introductory lesson. The method of recording interviews I used is as follows: two of the interviews are written records, four of them are audio records.

Below, I will evaluate the six interviews together with each question.

1. When you download Chinese learning applications, what kinds of function do you expect them to have?

Testers expect a Chinese learning application to teach pronunciation, writing characters, pictures to show the meanings of characters and words, even sentences. Also, they want to learn basic words and sentences in different situations in order to communicate with locals when they travel, so that they can ask for directions or places to eat etc. One of the testers mentioned: she wants to be attracted by the application constantly while she studies the language, but most of them are boring and use the same teaching methods.

2. Do you think Chingual covers all the functions you need?

It is gratifying to know that all of the testers agree that Chingual covers all the functions and aspects they need. Even though the contents are limited, the testers believe it has potential.

3. Which menu do you prefer among these two? Why?

When designing lesson menus for Chingual, I had 2 proposals as shown below and could not decide which one to use. The first proposal in Figure 13 lists all categories and lessons with matched icons. Users can swipe the screen to see the full list. The second proposal is Figure 14 which only shows categories on screen. Users are required to press each of the categories to enlarge its category box to view the lessons list.

Figure 13 Chingual lessons menu 1

Figure 14 Chingual lessons menu 2

Turns out five of the six testers tended to choose the second menu because, before deciding which lesson to learn, users can read all the categories at the first glance without swiping the screen to go through a long list. This contradicted the theory outlined by Susan M. Weinschenk: "People are very willing to click multiple times. In fact, they won't even notice they're clicking if they're getting the right amount of information at each click to keep them going down the path. Think progressive disclosure don't count clicks."

4. Which parts of the application do you like?

All the testers showed great interest in the animations of character writing. They also liked the interface design, different colors for each categories and

the designs of visualized characters. Moreover, they found it is easier for them to have separate categories in this application so that they could decide what to learn for a variety of purposes and consequences. Furthermore, there are multiple ways in Chingual for them to learn which attracted them to spend more time on studying.

5. Did you have any difficulties or confusion with the interface while using Chingual?

Because of the simple interface, icons and the proper amount of content on each page, testers found Chingual to be clear and easy to operate, especially with the instruction page for first time users.

6. Do the English words help you to remember Pinyin?

Generally all the users believed that using English words to mark pronunciations helps them learn to read Chinese characters. Especially for the four testers who never learned Chinese, they read Chinese characters without listening audio pronunciation during the interviews. But testers were concerned that their English pronunciation is not correct since they are not native speakers.

7. How do you feel about the practices? Do they attract you to practice more?

Most of the testers think that the practices are good for users to learn Chinese in the first stage. They could combine the application with textbooks they used in Chinese classes and they feel more engaged with the practice approach in Chingual. They are able to 'play' this application on many occasions when they have a short amount of spare time.

8. Will you be more engaged if there is a score system in Chingual?

Testers generally assumed that scores might be a fun element, but they would not change their study plans in order to get a visual prize. Prizes such as scores or award icons would not encourage them to study more.

9. Do you have any suggestions for this application?

I received quite a lot of advice form the testers to help me improve the design of this application. Advices include:

- Evaluate user's learning process for each theme by visualized charts to motivate them.
- It is better to involve diverse ways for users to practice speaking and hand writing skills instead of just asking questions.
- Should have a section to explain grammar
- Use different language versions when marking character pronunciations for multiple user nationalities.

- In the lessons, showing English meanings of all Chinese sentences, lest beginners become confused.

5.2 Design Enhancement

After integrating the feedback, advice, and observations received from the usability test as enhancements to the proposed application interface design, these enhancements are as follows:

1. Add English meanings below each Chinese sentence (Figure 15), but in order to force users to remember characters and words they have to click each one in the word list to get meanings and detail introductions.

Figure 15 Design enhancement-Add English meanings

2. Hand writing practice (Figure 16), users could write characters on the

touch screen, they can get hints by clicking ![lightbulb icon], and write under the

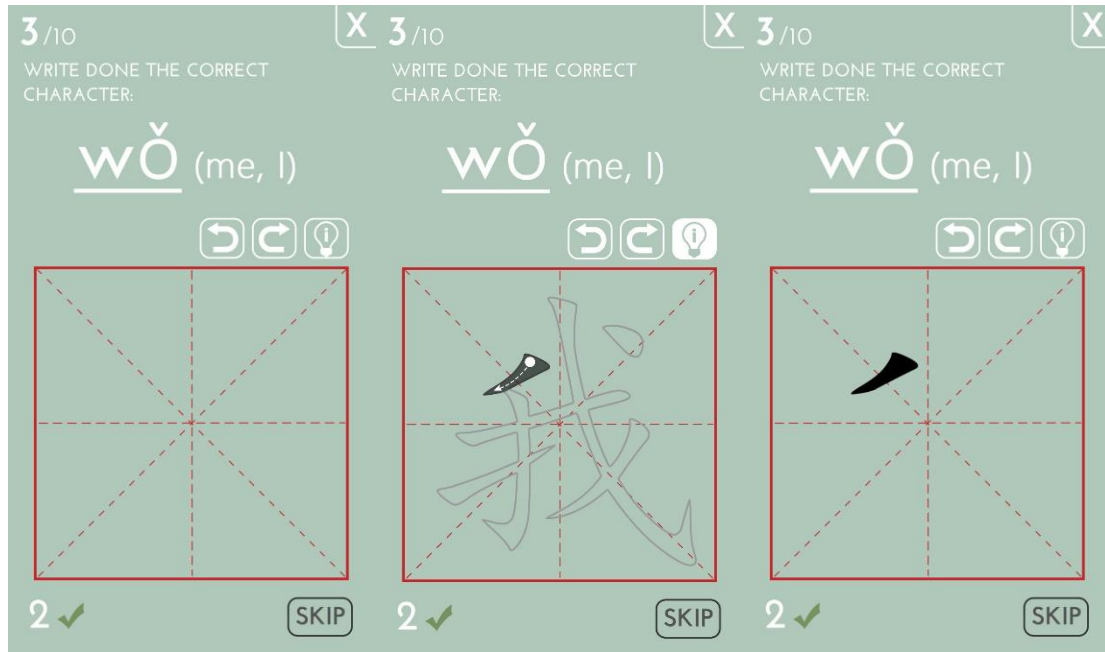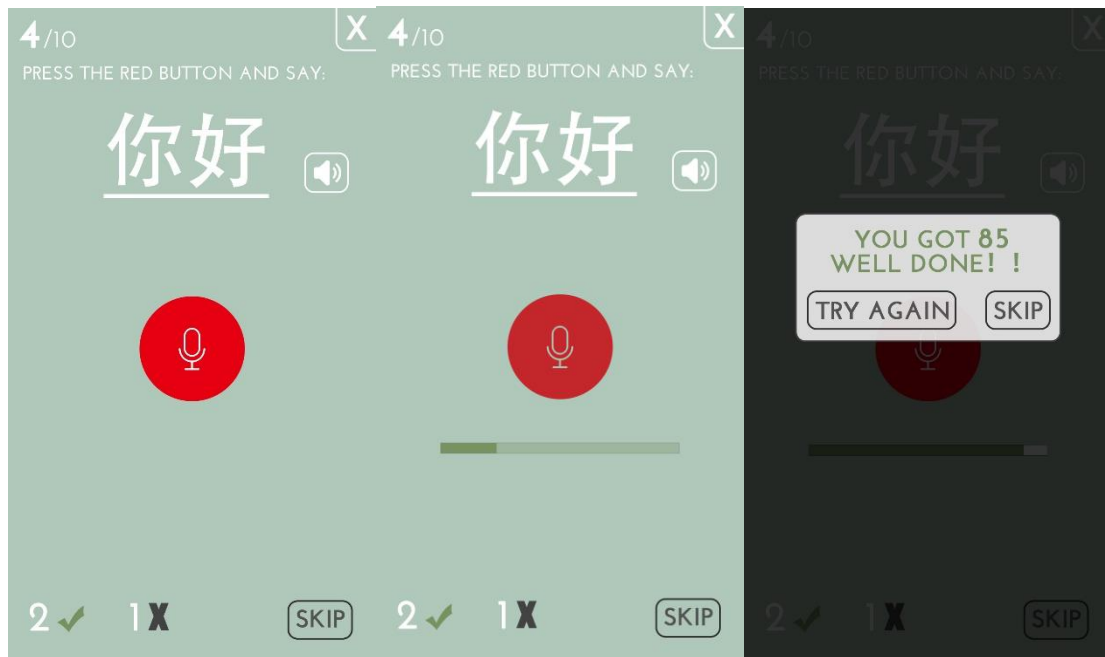stoke order instructions as ![stroke order icon].

Figure 16 Design enhancement-Hand writing practice

3. Speaking practice (Figure 17), holding ![microphone icon] while pronouncing the given Chinese words and get a grade. Get example audio by clicking ![speaker icon].

Figure 17 Design enhancement-Speaking practice

Therefore, these enhancements provide some important and necessary functionalities which were missing in the previous design. Some of testers' suggestions are incorporated into the Chingual application, which enables it to become more consistently effective and user friendly. The rest of the suggestions need to wait until further development.

6 Discussion and Conclusion

My main research question was how to include gamification into Chinese teaching and practicing processes to help beginners learn Mandarin Chinese. It requires great efforts to design an attractive language learning application. Hopefully, with the easy-to-use interface and gamified teaching methods Chingual would enhance the study process of users.

The challenge of this application is not only the process that using user-centered design methods to design a user friendly interface, or bringing game mechanics into study activities, but how to combine these two elements has to be considered. The design of the Chingual application integrates: distinguishing study categories by different colors; Chinese character visualization to help users read; mark the pronunciation of Chinese by similarly pronounced English words; present characters' written stroke order by animation and playful practices. It avoids the loss of user interest during studying; dynamic design elements stimulate users, encouraging them to stay with this application and to become long-term users. After evaluating the prototype of the Chingual application by performing usability tests with potential users, a proposed Chingual application with certain suggested enhancements is presented in the end of Chapter five.

Though the design received many approving comments from testers in usability tests, there are some possibilities for further development and study to enhance the user experience by adding users' study evaluations, explanations of grammar, introducing of Chinese culture and different language versions for multiple user nationalities. Moreover, applying designs like interactive animations and more gamified practices should be more attractive to keep long term users. Additionally, in this thesis the number of testers and questionnaires are not rich enough to get comprehensive usability test results, which is also a long term study would be needed in the future.

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Appendix 1. Interview with Chinese teacher in Finland

1. Do you have any suggest application or website for your students use to study after class?

2. What's the feedbacks from foreign student for Chinese teacher?

3. What's the most difficult part for your students when they study Chinese?

4. Why do your students learn Chinese?

5. What do you start to teach beginners? Pronunciation? Writing? Or something else?

6. How to teach pronunciation?

7. How to teach writing?

8. What is your current books for teaching Chinese?

9. Normally as beginner how many words they can recognize?

Appendix 2. Survey of Chinese learning

Our team is aiming to find out better methods for learning Chinese, thus, design an efficient mobile APP to make Chinese study easier. We sincerely appreciate your time to help us finish the survey and give us the precious feedback.

1. What is your purpose of studying Chinese? (Multi-choices)

o   As a hobby

o   I have Chinese friends/relatives, I want to talk to them in Chinese

o   Traveling

o   For work

2. How old are you?

o   younger than 20-year old

o   20 to 30-year old

o   30 to 40-year old

o   40 to 50-year old

o   older than 50-year old

3. What are your interests related to China? (Multi choices)

o   Culture

o   History

o   Geography

- o Travel information

- o Society

- o Literature

- o Slang

- o Internet

4. How do you study Chinese? (Multi choices)

- o Language institution

- o On website

- o With mobile apps

- o Books

- o Private teacher

5. How difficult do you think they are? -*Learning Chinese is never an easy job, you need to understand how to listen, speak, read and write. For your own experience, which part(s) do you think is (are) the most challenge one(s)?*

	NOT DIFFICULT AT ALL	DIFFICULT	VERY DIFFICULT
LISTEN	○	○	○
SPEAK	○	○	○
READING	○	○	○
WRITING	○	○	○

6. How do you want to process your learning progress? - *When you study with the mobile app, do you prefer to follow the order of study content? Or do you prefer the flexibility to choose what you want to learn, so that you have more control of the learning process?*

o I would love to follow the structured content and learn by chapter.

o I would love to choose which chapter I want to learn.

7. How much time do you spent on learning Chinese every day?

o 10 minutes

o 10-30 minutes

o More than 30 minutes

8. What is the distribution of your study time? - *When you study Chinese, how do you distribute your time to practice listen, speak, reading and writing? (1 point means very little time and 5 points means a lot of time)*

	1	2	3	4	5
LISTEN	○	○	○	○	○
SPEAK	○	○	○	○	○
READING	○	○	○	○	○
WRITING	○	○	○	○	○

9. Do you prefer to have a study test after finishing each chapter? - *When you study with mobile app, would you like to have some tests/exercises after you finishing each chapter to enhance your study result?*

o Yes

o No

10. If you prefer to have the after-study-test, how long time would you like to spend on it?

o 5 minutes

o 10-15 minutes

o 20-30 minutes

o More than 30 minutes

11. Do you prefer to have exercises to practice how to write Chinese characters?

o Yes

o No

12. If you consider the mobile app is useful, are you willing to pay for the further subscription of more study content?

o Yes, if it is good.

o   No, I always like the free ones.

13. If "Yes", how much are you willing to pay?

o   0.89 € (with basic learning content)

o   1.89 € (with basic and advanced content)

o   2.69 € (with basic/ advanced content and updated subscription)

14. What kind of extra study content do you prefer to have? (Multi choices)

o   Listening materials.

o   More oral Chinese exercise.

o   Everyday news buzz based on your interests.

o   Content related to your interests. E.g. Traveling, business and shopping.

Survey result could be accessed on:
https://docs.google.com/forms/d/11vvcDCVnJNm5Pj6mPzpIb7xBDQ461_UnEBOjLpFIVPs/viewanalytics

Appendix 3. Initials and Finals of Pinyin

There are more details on Pinyin explained on wikipedia.org (wikipedia.org, Last accessed 16.03.2015):

Unlike European languages, clusters of letters – initials (声母; 聲母; shēngmǔ) and finals (韵母; 韻母; yùnmǔ) – and not consonant and vowel letters, form the fundamental elements in pinyin (and most other phonetic systems used to describe the Han language). Every Mandarin syllable can be spelled with exactly one initial followed by one final, except for the special syllable er or when a trailing -r is considered part of a syllable (see below). The latter case, though a common practice in some sub-dialects, is rarely used in official publications. One exception is the city Harbin (哈尔滨; 哈爾濱), who's name comes from the Manchu language.

Even though most initials contain a consonant, finals are not always simple vowels, especially in compound finals (复韵母; 複韻母; fùyùnmǔ), i.e., when a "medial" is placed in front of the final. For example, the medials [i] and [u] are pronounced with such tight openings at the beginning of a final that some native Chinese speakers (especially when singing) pronounce yī (衣, clothes, officially pronounced /í/) as /jí/ and wéi (围 , to enclose, officially pronounced /uěi/) as /wěi/ or /wuěi/. Often these medials are treated as separate from the finals rather than as part of them; this convention is followed in the chart of finals below.

Initials

In each cell below, the bold letters indicate pinyin and the brackets enclose the symbol in the International Phonetic Alphabet.

		Bilabial		Labiodental	Alveolar		Retroflex		Alveolo-palatal	Velar
		Voiceless	Voiced	Voiceless	Voiceless	Voiced	Voiceless	Voiced	Voiceless	Voiceless
Nasal			m [m]			n [n]				
Plosive	Unaspirated	b [p]			d [t]					g [k]
Plosive	Aspirated	p [pʰ]			t [tʰ]					k [kʰ]
Affricate	Unaspirated				z [ts]		zh [tʂ]		j [tɕ]	
Affricate	Aspirated				c [tsʰ]		ch [tʂʰ]		q [tɕʰ]	
Fricative				f [f]	s [s]		sh [ʂ]	r [ʐ~ɻ]1	x [ɕ]	h [x]
Lateral						l [l]				
Approximant		y³ [j]/[ɥ]² and w³ [w]								

Table 2. The initials of Chinese Pinyin

Source: wikipedia.org (Last accessed 16.03.2015)

Finals

The following chart gives the combinations of medials and finals based on an analysis that assumes just two vowel nuclei, /a/ and /ə/;[28] various allophones result depending on phonetic context.

In each cell below, the first line indicates IPA, the second indicates pinyin for a standalone (no-initial) form, and the third indicates pinyin for a combination with an initial. Other than finals modified by an -r, which are omitted, the following is an exhaustive table of all possible finals.1 [29]

The only syllable-final consonants in Standard Chinese are -n and -ng, and -r, which is attached as a grammatical suffix. A Chinese syllable ending with any other consonant either is from a non-Mandarin language (a southern Chinese language such as Cantonese, or a minority language of China), or indicates the use of a non-pinyin Romanization system (where final consonants may be used to indicate tones).

Final	Nucleus	/a/					/ə/					∅
	Coda	∅	/i/	/u/	/n/	/ŋ/	∅	/i/	/u/	/n/	/ŋ/	
Medial ∅		[ä]	[aɪ̯]	[ɑʊ̯]	[än]	[ɑŋ]	[ɰʌ]	[eɪ̯]	[oʊ̯]	[ən]	[ɤŋ]	[ɨ]
		a	ai	ao	an	ang	e	ei	ou	en	eng	
		-a	-ai	-ao	-an	-ang	-e	-ei	-ou	-en	-eng	-i

/i/	[i̯ä] ya -ia		[i̯ɑʊ̯] yao -iao	[i̯ɛn] yan -ian	[i̯ɑŋ] yang -iang	[i̯ɛ] ye -ie		[i̯oʊ̯] you -iu	[in] yin -in	[iŋ] ying -ing	[i] yi -i
/u/	[u̯ä] wa -ua	[u̯aɪ̯] wai -uai		[u̯än] wan -uan	[u̯ɑŋ] wang - uang	[u̯ɔ] 3 wo -uo/- o	[u̯eɪ̯] wei -ui		[u̯ən] wen -un	[u̯ɤŋ], [ʊŋ] 4 weng -ong	[u] wu -u
/y/				[y̯ɛn] yuan - üan 2		[y̯œ] yue -üe 2			[yn] yun -ün 2	[i̯ʊŋ] yong -iong	[y] yu -ü 2

Table 3. The finals of Chinese Pinyin