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Radical

A learning system for
Chinese Mandarin
characters

Liangchuan Sun

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by

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Abstract

Radical is a learning system for Chinese Mandarin characters based on the components of Chinese characters that helps students better memorize characters. The characters were chosen based on a dictionary of primary students in China to expose the secrets of the system and logic behind the process of endless character memorization. The learning system is designed to assist current learners of Chinese to have a smoother study experience and act as an introductory lesson for prospective students. The character representation is based on its radical. As a prerequisite, users need to have a basic understanding of Chinese characters' composition and structures for a thorough comprehension. This method is different from the existing approaches. It helps broaden learners' vocabulary beyond their textbooks. Furthermore, *Radical* is also a visualization-based tool for potential learners of Chinese or the people who are interested in aspects of the culture or language system itself.

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Language is the most fundamental method of human communication. Almost all valuable emotions, including love, passion, and friendship, are all conveyed through verbal or textual expressions. However, language differences hinder communication around the world. English has become the bridge language for most non-native English speakers in the past decades, which has allowed for less confusion in the commercial field and academia. However, unlike most people in European countries who can speak perfect English, most people in China are still unable to communicate in English without difficulty, even after years of formal training. This is due to the distinct differences between the Asian and Latin language systems. On the other hand, native English speakers find that Chinese is one of the hardest language to learn too.

Even though the Chinese language is more complicated than almost all the other languages in terms of its pronunciation and writing systems, the number of learners is increasing every year in United States and the ages of learners are younger than ever. The main reason for the growth of learners of Chinese is because China has increasingly become more influential in many aspects especially economically. Ever since the economic reform in China in the 70s, the rest of the world is eager to communicate and understand the country. The opportunity of Chinese language learning for English native speakers has been targeted by many paid educational presses and language applications; however, free resources for Chinese Mandarin learning are minimal.

As a native Mandarin speaker, I never had a problem with learning Chinese characters. The inspiration for building a method for learning the Mandarin character system came from one of my college friends who took elective Mandarin classes for two semesters. I heard many complaints during that time, the most frequent question he asked was: Is there a shortcut for learning Chinese Mandarin? My answer was always: Yes, but your level is not high enough to know the shortcut. I transferred schools after that semester ended. The opportunity to meet him again was rare although we occasionally had conversations afterwards. I know he went to Beijing for a summer camp in 2011, and

he dropped the Mandarin level 3 class the semester I transferred. He told me that he didn't want know the shortcut any longer. He felt he was just not good at learning a new language. I sensed his frustration with Mandarin, the language he had had passion for and was confident with.

Enrolling in the department of Information Design & Visualization graduate program always made me re-think his question. Current learners of Chinese deserve to have a systematic method for better comprehension of the content they have learned, not only for memory consolidation, but also to lighten the learners' burden. For prospective learners, isn't it a reasonable request to preview the language system before starting to learn, like the syllabus we obtain from instructors on the first week of a semester? Because after knowing the tasks ahead and being equipped, the learning process would be smoother than ever..

Chapter 1

Background of Chinese Mandarin learning

I used to live in New York City, close to Wall Street and the Charging Bull. If you are familiar with that area, you may know that there is also a ferry route to the Statue of Liberty. These attractions make the area always full of tourists coming from around the world, including large numbers of Chinese tourists. That fact encourages all the sellers along the streets to learn to speak simple Chinese; some can even bargain in Chinese. Also, there was a street performer who plays the violin next to the Charging Bull. One of the most frequent songs he played is the national anthem of the People's Republic of China. That performance always made Chinese tourists raise their cameras for recording, and the performer surely earned more money in his bucket.

Many learners' motivations are like that: they want to target the wealthy in China. Some other learners think this language may help them broaden their career choices since China is a rising country and growing in many sectors. Only a small fraction of Chinese learners I met enjoy the history or the cultural aspects of China. Compared to popular aspects of China's neighbors: South Korea (K-pop) and Japan (Manga), there is definitely space for China to earn more fans through cultural transmission.

Reasons for the popularity of the Chinese language

The popularity of Mandarin Chinese has been driven by several factors: China's increasing global economy means people doing business on an international basis are likely to encounter Mandarin speakers. The opening ceremony on the 2008 Beijing Olympics attracted tourism to China and heightened interested in Mandarin Chinese. China is the world's fourth largest country for inbound tourism. The number of oversea tourists was 131.87 million in 2007, and the number increases dramatically every year. More American parents are traveling to China to adopt Chinese babies and want to communicate with their children. Not only for Chinese children adopted by American parents, but also for local American children, parents always want to offer a better education for their future. Learning a new language like Chinese could broaden children's horizons for their future lives.

Besides the more prominent changes in public opinion, people's opinions toward China are also changing in a subtle way. From the clothes an average north American person would wear to the personal laptop, they are all very possibly made or manufactured in China. At first, you might think: China has many low paid labors so everything is made there — so what? But later when everyone around you talks about this country, you may be curious about what it looks like.

On Google Trends, when entering the search term 'China,' the results of common user search queries are interesting to look at. For comparison, the results for search terms 'Japan' and 'South Korea' are included on next page.

Queries	Top	Rising
air china	100	
china airlines	95	
google china	80	
new china	80	
china map	75	
china bank	70	
japan	70	

China

At above, the search queries related to China are basic and frequently questions of how to travel to China.

Queries	Top	Rising
yahoo japan	100	
japanese	60	
tokyo japan	30	
tsunami japan	25	
tsunami	25	
google japan	25	
earthquake japan	25	

Japan

The time period of the Google trend starts from 2004 to present, so the huge tsunami that occurred in 2011 March is also recorded.

| Queries	Top	Rising
north south korea	100	
north korea	100	
south korea	75	
korean	75	
seoul korea	45	
seoul south korea	45	
seoul	45	

South Korea

It is not surprising that the top queries including the word 'Korea' are about North Korea. Also the capital of South Korea Seoul is listed as a top query.

**The rapid growth of
Chinese Mandarin learners**

There are many types of Chinese language tests
including the Test of Chinese as a Foreign Language
(TOCFL) (formerly known as the Test of Proficiency-
Huayu or TOP) and the Chinese Proficiency Test
(known in Chinese as Hanyu Shuiping Kaoshi (HSK)),
a popular exam in mainland China. The two exams
are hosted in regions where participants are already
familiar with Mandarin and would like to prove their
proficiency, such as in mainland China and Taiwan.
For example, the HSK test in mainland China is also
the standard test for Chinese students who want to be
broadcasters through radio or hosts on TV shows as
their future career.

However, among all the tests of the Chinese language
for the situation of non-Chinese people studying
Chinese language, the data from Advanced Placement
(AP) Chinese Language and Culture can be considered
as a convincing source. Compared to the second most
popular language in the United States, Spanish, the
total number of students seems few, but the data shows
a steady increase in numbers of students taking the
exam every year.
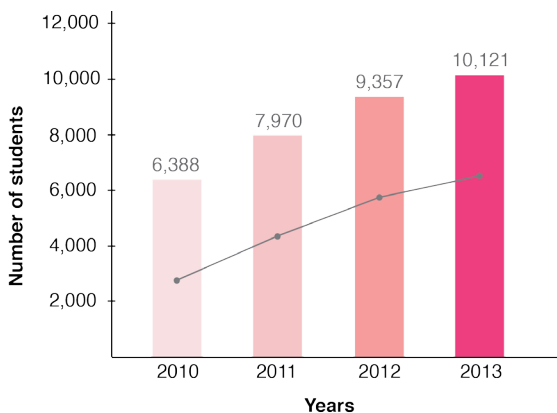
*The grade distribution for 2010[9], 2011[10], 2012[11] and 2013[12]
are shown above.*

How does the Chinese Mandarin system work?

Before introducing how the new system *Radical* was developed, it is necessary to discuss the Chinese Mandarin system as a whole. In English, we have 26 letters, which are combined to create words, and a sentence is composed with words with spaces in between. However in Chinese Mandarin, the combinations are a little more complex than they are in English. There are strokes, which alone are meaningless just like the characters themselves in English. The strokes are combined in a certain way to become characters. Characters carry meaning but some times they could have one of multiple meanings when combined with another character. When characters are arranged together in groups of one to four, they follow certain rules to become words. Chinese Mandarin sentences do not include spaces between words. Sobasicallythisiswhat'sgoingtolooklikeifyouimagine theyareChinesecharacters.

It looks very intimidating because in English the whole alphabet is only 26 letters and they display horizontally. In Chinese Mandarin, on the other hand, strokes cluster together to become characters, making them look more like individual units. So most of the time it is very understandable to read through all the characters in sentences, although it looks ridiculous in most Latin languages.

In addition, unlike the languages composed with letters, the pronunciation of Chinese characters is always very difficult for new learners. It is probably not hard to guess the pronunciation of an English word that has never been seen, because there are rules to follow.

However, in Chinese character pronunciation, learners need to build up to hundreds of characters so that they can have a "guess" about the pronunciation for each character. In addition, Chinese characters are pronounced in one of four tones.

Non-Chinese speakers are always confused about the terms Chinese Mandarin, Chinese simplified, Chinese traditional and Chinese Cantonese. These terms are very necessary to know before learning the language, because learners always want to know which type of Chinese they want to study and the advantages and the disadvantages for each type.

Mandarin is the official language in mainland China, and is based on the northern accent. Due to many political shifts throughout history, the accents in China vary dramatically so that some people barely understand each other although they are neighbors geographically. Therefore, it becomes necessary to choose a language as a common tool for communication, like a lingua franca in China. The area where Chinese Mandarin is spoken most is in mainland China and Taiwan. In recent years, due to the fact that more people have flooded into Hong Kong and Macau, more local people have become familiar with Mandarin for more convenient communication with the visitors coming from mainland China. For these reasons, most new learners of Chinese adopt Mandarin as their primary learning target. Another advantage of this language is that it has more native speakers (nearly a million) than any other language.

Cantonese is primarily spoken in Hong Kong and it is the dialect used in mainland China near Hong Kong as well. Cantonese used to be the popular language that represented Chinese language around the world, because there were more Cantonese speakers who immigrated to the United States, Europe and other East Asian countries early on. Because of that, in many Chinatowns around the word, the owners of restaurants and stores are Cantonese speakers. It is definitely an interesting language to learn but because of the limitation of numbers of speakers and regions where it is spoken, the number of new learners of Cantonese decreases every year.

Simplified and traditional Chinese are two types of writing systems of characters. Traditional Chinese characters are mainly used in Hong Kong, Taiwan, Macau and to a limited use in South Korea. Simplified Chinese was promoted by the People's Republic of China government during 1950s to 1960s in an attempt to increase literacy. Simplified Chinese characters are officially used by People's Republic of China, Singapore and Malaysia.

The project *Radical* helps learners to identify the meaning and pronunciation of many characters. The existence of radicals can be represented as the anchor of the characters. For example, you may find the water radical in many water-related characters such as the characters for lake, river and ocean.

Pronunciation bō guāng lǐ   de yàn yǐng
波光 里 的 艳影

The pronunciation of Chinese Mandarin characters follows the official phonetic system called Pinyin which transcribes characters into the Latin alphabet. By defining the rules for Pinyin, the pronunciation of Chinese characters become less mysterious to learners.

Foreign learners of Chinese always start with the step of memorizing the rules of Pinyin. I used to teach Chinese at a weekend school for all ages when I first came to this country. Some parents questioned the method of transcribing Chinese pronunciation to the Latin alphabet, and thought it was not "real" Chinese. However, students in China start school with learning Pinyin to improve their pronunciation and their Chinese Mandarin accent. Furthermore, Pinyin nowadays is considered to be one of the most frequently used input methods for entering Chinese characters into computers. So I would say, as a native Chinese person, even though I have forgotten how to write some complex characters by hand, the Pinyin of those characters was learned by heart, because I need to use my computer everyday.

It might be a little bit tedious to introduce the rule of Pinyin, but it is important to distinguish their pronunciations in Chinese from that of their pronunciation in the Latin alphabet. For example, we have the letter K in Pinyin, which can be combined with many other letters just as in English. In Pinyin, the letter K is pronounced just as in English: "kay." On the other hand, the letter C in PinYIn is pronounced as the underlined part of the English word hats. You may find some Pinyin words are pronounced in a way that is highly similar to their pronunciation in English, such as the common Chinese last name Mao, pronounced the same as an English speaker would, because the rules for pronouncing are highly similar. What about the current chairman's last name, Chairman Xi? Do you find it difficult to pronounce it based on the English pronunciation rules you are familiar with? Well, that's a situation where Chinese has a different rule for Pinyin, as mentioned earlier. It is pronounced as the underlined letters in the English word push, so the correct pronunciation is chairman Xi (-sh y-).

Some people may be curious how many Pinyin are there and what the rules are. There are 412 possible combination of sound for Pinyin, and they stand for over 8,000 characters. A Pinyin combination includes two parts, the initials and finals; there are 21 initials and 37 finals. As their names suggest, the initials are the beginning part of a Pinyin and the finals are the last part of a Pinyin. By combing the initials and finals together using an alphabet of 26 letters, the pronunciation becomes more readable for people who understand English prior to learning Chinese Mandarin.

The fact that we have 412 possible combination sound of Pinyin does not mean that the 412 sounds stand for all sound of Chinese Mandarin. Because in Pinyin, pronunciation effected by another factor: tones. There are as many as five tones for each of the Mandarin characters.

1. The first tone (Flat or High Level Tone) is represented by a macron (¯), which is added to the pinyin vowel.

2. The second tone (Rising or High-Rising Tone) is denoted by an acute accent (´).

3. The third tone (Falling-Rising or Low Tone) is marked by a caron/háček (ˇ). It is not the rounded breve (˘), though a breve is sometimes substituted due to font limitations.

4. The fourth tone (Falling or High-Falling Tone) is represented by a grave accent (`).

5. The fifth tone (Neutral Tone) is represented by a normal vowel without any accent mark.

If you think the Chinese Mandarin pronunciation system is very confusing to learn at this point, there is one more thing to probably make you more desperate. For some characters in Mandarin, they have more than one pronunciation. The Pinyin of certain characters changes pronunciation based on the context. Oftentimes they represent different meanings as well. For example, the character 朝 has two primary pronunciations, one is zhao1, which means morning, the other pronounces as chao2 means face, which means to have the front part toward something..

Stroke

波光 里 的 艳影

The stroke is the fundamental infrastructure of a character; its existence makes it possible to compose all the characters. There are only six basic strokes and four combining stokes in total.

Just as in English writing, there is a proper order in drawing the strokes of the Chinese characters. This applies not only to the order of drawing strokes in characters, but also to the strokes themselves. There is an example in Figure 01. For example, the horizontal stroke starts from left and ends on the right; and the vertical stroke starts from top and ends as at the bottom.

The stroke system also appears in many other east Asian languages like Japanese, Korean and Vietnamese. Unlike Japanese, both Korean and Vietnamese government officially stopped using Chinese characters in the 19th century. However, many historical documents in Korea and Vietnam still have many Chinese characters. When people search the term 'strokes' online, they might find CJKV strokes, which stands for Chinese, Japanese, Korean and Vietnamese.

Some people may find that there are many "types" of Chinese characters, but they are simply the different stlyes of calligraphy. It is same as the different fonts in English like serif, san-serif and others. In Figure 02, the different major calligraphies styles throughout the history are shown.
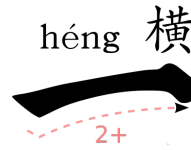
héng 横

Figure 01

那河畔的金柳，
是夕阳中的新娘；
波光里的艳影，
在我的心头荡漾。

Figure 02

Character

波光 里的艳影

The character becomes the most confusing part when I try to explain the project to my peers, because this is a new term for English speakers. Characters are neither letters nor words. They are something in between, because they are the components of the words. At the same time, they also possess meanings individually. For example, the character "clear" (清) has a meaning by itself, but in order to make the subject more specific, there should be another character goes before or after it, like "clear water" (清水).

After introducing the function of a character in Chinese language, it is time to introduce some background of one of the oldest language, Chinese.

As I mentioned earlier, there are two types of characters: simplified and traditional. Traditional Chinese is mainly used in Hong Kong, Taiwan, Macau and to a limited use in South Korea. Simplified Chinese is used by People Republic of China, Singapore and Malaysia.

The differences between those two character systems is easy to notice from their names. The traditional character system uses the authentic Chinese characters, but it is composed of many more strokes. The simplified version, on the other hand, was transformed from traditional characters about 50 years ago. The main reason for the transformation is to increase the literacy in mainland China.

These features become the main motivation for choosing a character system. The good thing is that as communication increases among mainland China, Hong Kong and Taiwan, residents from each place are mostly capable of reading both character systems.

Radical

波光 里 的 艳影

The radical is a necessary component in every character. In every Chinese dictionary, there are two ways to search for specific characters. The first method is to look for the pronunciation in order to see how to write the character; the other way is having the character in front of you and wanting to know the pronunciation. Based on the two approaches, Chinese dictionary offers two solutions: Pinyin and radicals.

Radicals can indicate the meaning of the characters, and become very important anchors of the characters. For example, the water radical (氵) can be found in the characters lake (湖)，ocean (海) and river (河).

There are a total of 267 radicals for the combined domain of traditional and simplified characters. But among those radicals, many of them do not have meaning indicators. Especially for some simple characters, they were transformed from logographic characters so their radicals exist only for the purpose of indexing. For example, one radical is "｜," and under that radical, you could find the character "ten" (十) that belongs to it. How many characters have meaning indicators as their radicals? This may be unknown, because after thousands of years of evolution, some characters may have changes or their meanings expanded, which causes the inconsistency of what the radical should mean. Things like that happens in many radicals, sometimes frequently, sometimes occasionally and sometimes very rarely.

For the *Radical* project, I want to emphasize the characters that have a strong correlation to the meaning of their radicals.

The fact that learners start with textbooks that teach conversations and correlated characters may help them increase the ability of to converse in Chinese, but the characters they learn from the conversations are not easy to remember. For example, in one textbook, there is a class about saying hello to the person you just met. The Chinese characters are unbelievably hard for starters to memorize. On the other hand, if you pick out one character you just learned today, then go to the products created by *Radical*, you will see more radical-shared characters that are highly related to the one you learned. So you come to the products with one character, and after an incredibly short amount of time, you know over ten related characters.

Word

bō guāng   lǐ   de yàn yīng

波光 里 的 艳 影

Just as in English, words in Chinese are the basic element for a sentence. Words (with no space in between) plus punctuation form a normal sentence in Chinese. In English, the length of words varies from one letter to over ten letters; there is not a clue to trace the meanings' relevance to the length of the words.

In all types of Chinese, the most often used length of words varies from one to four. There are no rules as to why some types of words are one character and others are two characters. But mostly, you can think of Chinese word combination as a process of building the word 'LEGO.' Simpler words usually start with less characters and expand to more characters when the meaning is needed. For example, in Chinese, the word "I" or "me" is written as "我"; it is a simple one character word. Nevertheless, the character for "we" or "us" is written as "我们." In English, they are written totally differently, although you know the inherent connection between those words. In Chinese, instead of memorizing the different pronunciation on individual words like in English, the combinations of different characters are the key to the Chinese language both in its writing and speaking aspects.

Chinese would be an easy language if every word could be built by the characters you know. There are certain combinations of characters you may find bizarre, or that don't make sense based on your understanding. For example, the word "gasoline" in Chinese is written as

"汽油". The second character means "oil", which makes sense for its existence in the combination. But the first character means "steam", which makes learners confused about the combination. Another weird combination is the word "novel" translated into Chinese, which is the combination of the characters "little" (小) plus "talk" (说).

The category of three character combination words is the best representative of the building phenomenon I mentioned earlier. For example, the word "tricycle" in Chinese is combined with the characters: "three"(三), "wheel"(轮) and "vehicle"(车). And the word "radio" in Chinese is combined with three characters: "receive"(收), "sound"(音) and "machine"(机).

The commonly used four character words are mostly Chengyu, which came from historical stories. They are a type of traditional Chinese idiomatic expressions, used when expressing similarity between the current situation and a Chengyu story. Chengyu were widely used in classical Chinese and are still very common in Chinese writing. There are about 5,000 Chengyu in the Chinenese language, and usually only high level learners of Chinese are capable using them correctly. Also, for local speakers, people who use Chengyu often in their speech are considered well educated.

I have met many learners of Chinese who complain to me of how difficult this languages is. I think Chinese can be really challenging for starters, however, once you memorize the characters and combinations, middle level students will be surprised by their enhancement of Chinese level in a short time.

Interviews

Radical is more like a series of products other than pure scholarly research. That is why it is important to interview different people and ask their opinions about this project beforehand and after. I talked to two students of Chinese on different levels and a teacher of Chinese who introduced me the popular Chinese learning methods in classroom nowadays. Their inputs positively influence the project on the aspect of both being user-friendly and effective. I am very lucky to have the three interviewees who offered opinions in different directions so that their suggestions being helpful on the shape of this project overall.

In the process of creating this project, the three interviewee I talked to provided useful feedback on certain stages. Their profiles are below:

Anthony is a musician who has been teaching himself Chinese for about 3 years. He is an advanced learner and his level of Chinese is good enough to read through simple Chinese texts. He goes to China for teaching music related lessons often. That is his main motivation to learning this language. He is not only the first learner I talked to, but also an important interviewee who helped me define the project in its early stages overall.

Christopher is a beginning level self-taught learner. The main motivation for him to learn Chinese is that his girlfriend comes from mainland China and he is eager to understand the conversation between his girl friend and her other Chinese friends. He offered feedback when I showed him the first version of my posters. He confirmed what I was doing and reassure me of the effectiveness of this method.

Prof. Cai is the last interviewee for this project. She is an instructor of Chinese classes at Northeastern University. She saw the completed products, including posters and website. She offered feedback on the products for this idea.
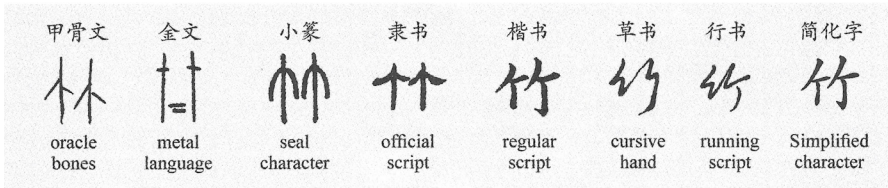
Anthony
Learner of Chinese, advanced level

I came to Anthony's office with the idea of creating a website just showing people the patterns in Chinese characters — nothing educational. I was too focus on the idea of broadening the target audience of this project, so that I wanted these patterns to be seen by anyone who is interested in Chinese or China. He helped me to re-frame my project from a without focus to a focus on the appropriate target audience.

In addition to helping to redefine the project, he also expressed his interest knowing more historical stories about Chinese characters. He showed me his Chinese textbooks, and especially the section that introduces the evolution of Chinese characters.

The examples shown on the next page are from *Learn Chinese characters by Radicals[7]*. They show the evolution of the characters transformed from oracle bone to simplified characters. Inspired by Anthony, this content will be embedded on the website under the title "Some history you want to know." This book has all the radicals' evolution throughout history which offers an historical background of those characters.

甲骨文	金文	小篆	隶书	楷书	草书	行书	简化字
oracle bones	metal language	seal character	official script	regular script	cursive hand	running script	Simplified character

Bamboo — The character bamboo kept its basic shape from beginning to nowadays. The essence of the meaning is well conveyed by the character.

| 甲骨文	金文	小篆	隶书	楷书	草书	行书	简化字
oracle bones	metal language	seal character	official script	regular script	cursive hand	running script	Simplified character

Tiger — Unlike the character bamboo, the character tiger experienced big changes throughout history. It is also very interesting to see the oracle bones tiger character literally looks like an animal horizontally. That is a perfect example of pictographic characters.

| 甲骨文	金文	小篆	隶书	楷书	草书	行书	简化字
oracle bones	metal language	seal character	official script	regular script	cursive hand	running script	Simplified character

Baby — The character baby is very like the form of baby at the stage of oracle bones. After thousands of years evolution, the basic form of the character has not been changed so much.

甲骨文	金文	小篆	隶书	楷书	草书	行书	简化字
oracle bones	metal language	seal character	official script	regular script	cursive hand	running script	Simplified character

Water — The character and radical of water is the primary source that has been applied in this project. Like the examples above, the character water also evolved from the original form of water.
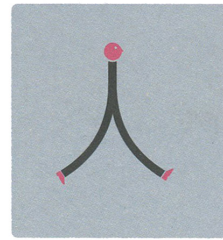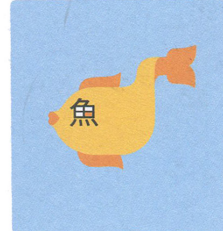
人 person (ren²)　16
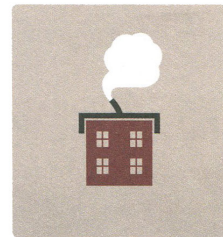
宀 roof (mian²)　92

虎 tiger (hu³)　64

虫 bug (chong²)　84

魚 fish (yu²)　25

Christopher
Learner of Chinese, beginning level

Christopher was the second interviewee I talked to. He is a really nice person and he mainly provided feedback on the revision of posters. His suggestions for posters were very detailed and they accomplished a good progression of the project as a whole.

Christopher also brought me the book Chineasy[4]. It is a revolutionary book teaching Chinese traditional characters. The creative part is that this book has illustrations drawn around Chinese traditional characters that make the meanings of the characters easier to remember. For example, as shown on the right, the characters express their meanings through illustrations. This project was introduced through Kickstarter and became a huge success in a short time. The creator ShaoLan was also invited to give a TED talk about this project. This is definitely a new method worth exploring and investigating.

As the example shows on the right, Chineasy has some clear advantages based on teaching the characters which retain the features as pictographic characters like you would see in the top two characters & radicals. However, the character bug, tiger and fish have minimal relevance to the illustrations around them. They are complex characters and would be easier to remember within a group of similar characters.

Professor Cai
Teacher of Chinese at
Northeastern University

The meetings with Prof, Cai were very productive. She
mainly introduced the ways of Chinese Mandarin is
taught nowadays in the universities. She told me that
for all the beginning level classes, instructors all try
their best to keep the students progressing to the next
semester. If the students feel the class is boring or too
hard, their absence from higher level Chinese class
may lead to the class not being open due to the lack of
students. For that reason, teachers are using multiple
materials to teach beginning level classes for the most
efficient learning results. Some teachers use Chineasy[4]
or some other effective learning materials as their text
books.

Her reflection on the website product is highly positive.
She expresses that this tool could broaden learners'
vocabulary in a effective way.

Prof. Cai was also very helpful that she brought several
textbooks she used in her class: one for beginning
level and the other one is for medium level students.
That series is named New Practical Chinese Reader
Workbook[5,6](NPCRW). The contents for classes are
more intense than the Chinese textbook I learned back
in primary school, after all this series of textbook is
designed for adults and most learners hope to achieve
an efficient learning experience. There is an example of
learning characters from the second level NPCRW on
the next page.

Write the characters in the blanks, paying attention to the character components.

Pinyin	Components	Character					
guō	钅 + 口 + 内	锅					
yīn	口 + 大	因					
shuàn	氵 + 尸 + 巾 + 刂	涮					
ròu	冂 + 人 + 人	肉					
rè	扌 + 丸 + 灬	热					
jiāo	交 + 阝	郊					
qū	匚 + 乂	区					
huò	戈 + 口 + 一	或					
huà	亻 + 匕	化					
zhuāng	爿 + 女	妆					
zú	方 + 𠂉 + 矢	族					
qì	口 + 口 + 犬 + 口 + 口	器					
yǎn	氵 + 宀 + 一 + 由 + 八	演					
zòu	夫 + 天	奏					
guàn	忄 + 毌 + 贝	惯					
huā	艹 + 化	花					
xiàng	木 + 目	相					
páng	亠 + 方	旁					

The image above comes from one class exercise on the second level of the book New Practical Chinese Reader Workbook[6]. All the characters that have been studied are listed here for practicing. As you may see, unlike the *Radical*, there is no pattern in the characters can be followed in this chart. It would be extremely helpful to have a tool for categorizing the same radical characters.

The three interviews are helpful because their suggestion complete the project for a better communication with the target audience. The fact that they offer many options on Chinese language learning materials which I won't purchase as a native Chinese also aid the process of research of other methods of teaching Chinese language.

Radical project

The *Radical* project is a new Chinese learning system based on the function of radicals in Chinese Mandarin characters. Radicals are a necessary component in every character in Chinese. Also, for a considerable number of characters, they act as meaning indicators. Even if you just recognize the radical component of the character, it is very possible to guess the rough meaning of the character.

Target audience & Motivation

The target audience will be people who are willing to learn this language and have a basic foundation of Chinese Mandarin already. The ages roughly range from teenagers to adult learners. Also, this method could be applied to children who were born outside of China but the parents are native Chinese speakers and would like their offspring knowing their mother language. For those families, conversational communication won't be the most difficult part for them, because the tones and the grammar of Chinese Mandarin are rooted in their memories. The Chinese characters, on the other hand, are always the challenge for them, mainly because the language they use in schools is not Chinese. Because of that, this tool could expand their vocabulary based on their knowledge of Chinese.

The target audience of this project expanded from a narrow range to a more opened group. To attain the best learning experience from *Radical* system, fundamental knowledge of Chinese characters is required. Like knowing the rules of Pinyin, the types of strokes and some simple characters' compositions would be a benefit for the learning outcomes.

Moreover, according to the interviewees I have talked to, some of my Chinese friends asked me about the potential of considering Chinese children who are under the age of learning characters because there is still a lack of a proper assorting method for the

characters with same radicals.

I still remember when I was little, the way I realized that radicals are relative to the meaning of the characters was by teachers' continuously repeating. The first a couple times repeating won't be memorable at all, but by the time the vocabulary accumulates to certain amount, their existence becomes natural. On the other hand, I couldn't think of the full list of characters with singular radical without a dictionary while I did the visualizations, only because I learned them separately and they were not thought as a group of characters with similar attributes. Every time I think back to my learning experience, I wish there were some collections of characters with same radical which act as an inspirational tool of memorizing the new characters.

The initial motivation of creating this project was to share my personal knowledge with the learners who take Chinese as their second or even third language. As I mentioned earlier, I have some friends who complained a lot of their frustrating Chinese learning experience. Based on the feedback I received, I thought if I can use my knowledge of Chinese and combine it with my design skill to provide a solution for them to have an easier study experience, I can relieve them from the nightmare-study-experience even just a little. After all, Chinese is an extremely hard language for Latin language speakers.

After finishing several steps in the development of my

project, I showed the diagrams to various people and asked for their feedback, including Chinese learners at different levels, teachers of Chinese and even native Chinese people. The reactions vary in different respects. The learner of Chinese said multiple things they want embedded in the project. For example, some advanced learners want to have more historical stories to assist them better in understanding the characters, and the teachers of Chinese wanted a fully operational website like the explanations and pronunciation function. Some Chinese people asked me about the possibility of designing this project for Chinese children who suffer from the endless memorization of Chinese characters. That inspired me for further exploration of the Chinese market. Because after all, the most people who study Chinese are in China. Therefor, for the further development of this project, the products would be bilingual for the learners in China and English speaking countries.

The advantages of this series products are multiple based on the target audience and the interactions, and moreover, this method offers a short path of learning Chinese characters on gaining more characters in a short time. When people think of Chinese, they think it as "no rule" or "random language". However, by offering the combination together and also listing the components as individual units, this method reveals Chinese mandarin in a way of arranged in patterns. Students will find it is easy to memorize the characters

because the way they are shown help audience to understand the meanings of them.

Methodology

The key methodology of this project is to highlight radicals in the characters as anchors to categorize them for better memorization of their meanings and writing orders.

Before the project started, the domain of the characters needed to be defined, because audience and users deserve to know what level of Chinese characters were selected and what kind of dictionary it based on. As mentioned in the target audience section, the level of Chinese characters in this project is the medium level which means users are required to have basic knowledge of Chinese character composition for the best outcomes from this project. The selected characters with certain radicals are chosen from the Chinese Dictionary for Primary students. The characters in that dictionary are considered the characters people use more often than the others, and also known as the characters that children should know before entering middle school.

"Flores d' Arcais and his colleagues found that the pre-activation of the radicals might facilitate the naming of whole characters (Flores d' Arcais, 1992; Flores d' Arcais, Saito, & Kawakami, 1995)." After intensely scientific experiments, they have following conclusion: "Compared to the baseline condition, where a non-radical fragment of the target character was displayed first, the pre-exposure of either a left of a right radical increased the naming speed."[1] This paragraph was cited from *cognitive processing of Chinese and related Asian languages* on the page of 144.
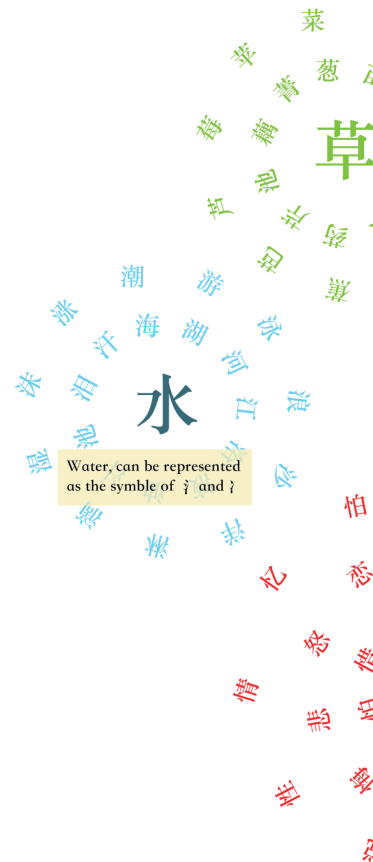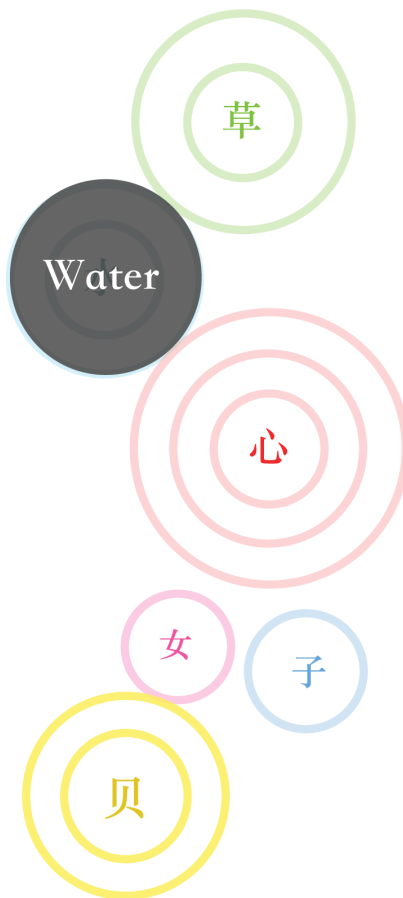
Considering their results, the existence of radicals can shorten the learning time of the characters and improve the understanding of characters. For that reason, it is a method that can be applied in Chinese language study.

In addition, the book *Second Language Vocabulary Acquisition* page 176 edited by James Coady and Thomas Huckin includes experiments investigating the topic "Vocabulary enhancement activities and reading for meaning in second language vocabulary acquisition." The results indicated that for reading a text in a second language, although the context of the texts influences readers' comprehension, reading for meaning appears to produce significant results in vocabulary acquisition.[2]

To sum up, radicals are the key to learning Chinese characters at a fast speed; by accumulating their vocabulary, learners who study Chinese as their second language could enhance their reading performance in Chinese.
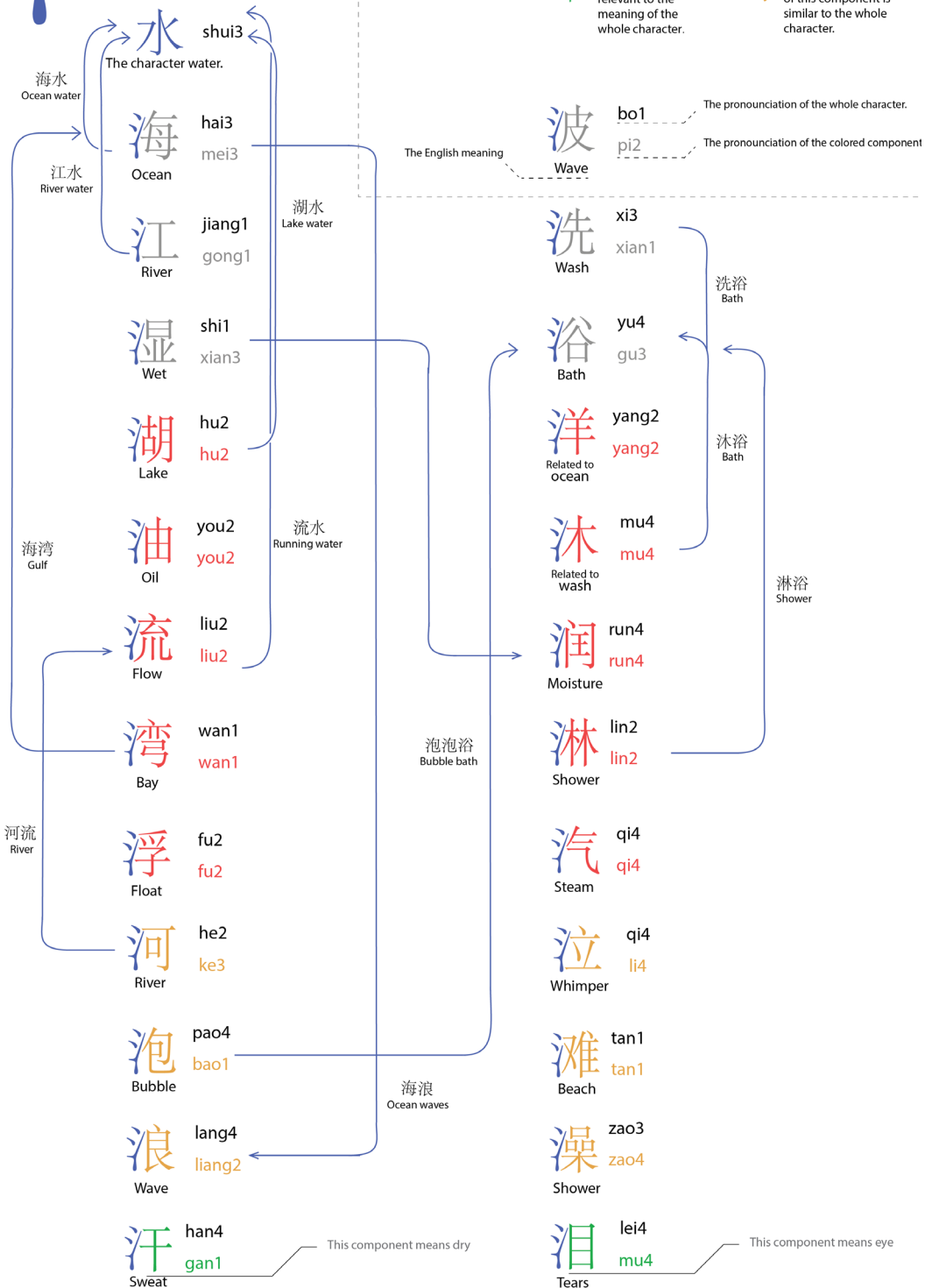
Visualizations & Explanation

This is my very first attempt of designing the interface flow of the website. I thought it would won't be hard at all because I am introducing the characters I have been used for over 25 years. However, the critics of the interface went bad. The main reason was I didn't start the design as a non-Chinese speaker. My peers had troubles to recognizing the radicals. From that moment, I decided to start from print media, really think about the audience needs and redo everything.

草

Water

心

女   子

贝

菜
葱
草

水

Water, can be represented
as the symble of 冫 and 氵

潮 游
泪 汗 海 湖 河
泳

怕
忆 恋
情

Pros:

The first left panel is the one that has been carried on to the final version of the website. And it is the only element that is consistent from the initial to the final version of design.

Cons:

It can be very confusing for people who don't have any Chinese language background because the radicals were not highlighted in this diagram. Although they are all characters with the same radical, the circular shapes made them very hard to recognize. Also this was designed for website interfaces. The interaction with the audience could be improved based on the chosen media platform.

Symble of water

When used in words
n. ocean

海洋
汪洋

Yang 2

洋

水

Relavant to ocean

淋 滴 湿 沫 河 涨 江 淼 潮 渗 淡 渔 泪 泉 洗 浅 油

Same pronunciation as the whole character.

海洋
汪洋

Yang 2

洋

Relavant to ocean

水 shui3
The character water.

氵 The radical symbol of
water

海 hai3
mei3
Ocean

海水
Ocean water

江 jiang1
gong1
River

江水
River water

湖水
Lake water

湿 shi1
xian3
Wet

湖 hu2
hu2
Lake

流水
Running water

油 you2
you2
Oil

海湾
Gulf

流 liu2
liu2
Flow

湾 wan1
wan1
Bay

浮 fu2
fu2
Float

河流
River

河 he2
ke3
River

泡 pao4
bao1
Bubble

浪 lang4
liang2
Wave

海浪
Ocean waves

汗 han4
gan1
Sweat

This component means dry

每 This component is
not relevant to the
whole character.

由 The pronounciation
of this component is
the same as the
whole character.

干 This component is
relevant to the
meaning of the
whole character.

可 The pronounciation
of this component is
similar to the whole
character.

波 bo1
pi2
Wave

The pronounciation of the whole character.

The pronounciation of the colored component

The English meaning

洗 xi3
xian1
Wash

洗浴
Bath

浴 yu4
gu3
Bath

沐浴
Bath

羊 yang2
yang2
Related to
ocean

沐 mu4
mu4
Related to
wash

淋浴
Shower

润 run4
run4
Moisture

淋 lin2
lin2
Shower

汽 qi4
qi4
Steam

泣 qi4
li4
Whimper

泡泡浴
Bubble bath

滩 tan1
tan1
Beach

澡 zao3
zao4
Shower

泪 lei4
mu4
Tears

This component means eye

The left diagram is the main result of this project. For the characters selections, they mainly came from the Dictionary for primary school students. They are very frequently used characters in Chinese mandarin language.

On the top left, it shows the title of the poster, which is also the radical included in this poster. The key of reading this poster is on the top right. It introduces the color coding meanings of the other parts than the radical. It shows the relevance between the color coded components and the whole character. Many Chinese characters borrow the sound from one element in the characters, when readers' vocabulary reaches a certain point, they possibly could pronounce a new character correctly simply by recognizing the element's pronunciation of the new character.

For the individual character, there is the Pinyin of the whole character (on the top) and there is also the Pinyin of the other element of the character which is color coded corresponded to the color of the Pinyin (under the black Pinyin).

The arrows indicate the possible connections between characters with the water radical. As I mentioned earlier, the combinations of the words may not make sense at all, but that is how people use them in Chinese. For example, the word gasoline in Chinese is combined with "steam" (汽) and "oil"(油). But for the most of time, the combinations of words make sense for

normal logic. Like the word ocean wave combined with "ocean"(海) and "wave" (浪). The direction of the arrows indicate the first character to the second character in a word.

Besides explaining how to read the posters. Some design decisions are worth to mentioned. When the posters were designed, I tried my best to minimize the colors to avoid the confusions, and link the meaning of chosen radical to its color. For example, the radical water is represented by the color of blue; the radical female is red and the radical shell(money) is gold.

As for the color codings for the other component other than the radicals, their color choices are represented based on my personal understanding of their functions. As it said on posters, the gray color means "This component is not relevant to the whole character." This section represent the least connection of the component to their pronunciation. The color was borrowed from common language on the computer: when the choose of file is unavailable, computer shows the file in gray color. The red and orange color codings, on the other hand, are used in order to grab audience attention to emphasizing the connections to its pronunciation. The color of green indicated that: "This component is relevant to the meaning of the whole character." The color of green can represent accessibility, and the green color coding represent its relevance to the meaning, which is a perfect example for accessibility.

The arrows indicate the possible words combined. The tale of the arrow indicates the first character of the combined word and the head of arrow represents the last character in a word.

The radical symbol of
water

水 shui3
The character water.

海水
Ocean water

海 hai3
mei3
Ocean

The English meaning

江水
River water

湖水
Lake water

江 jiang1
gong1
River

濕 shi1
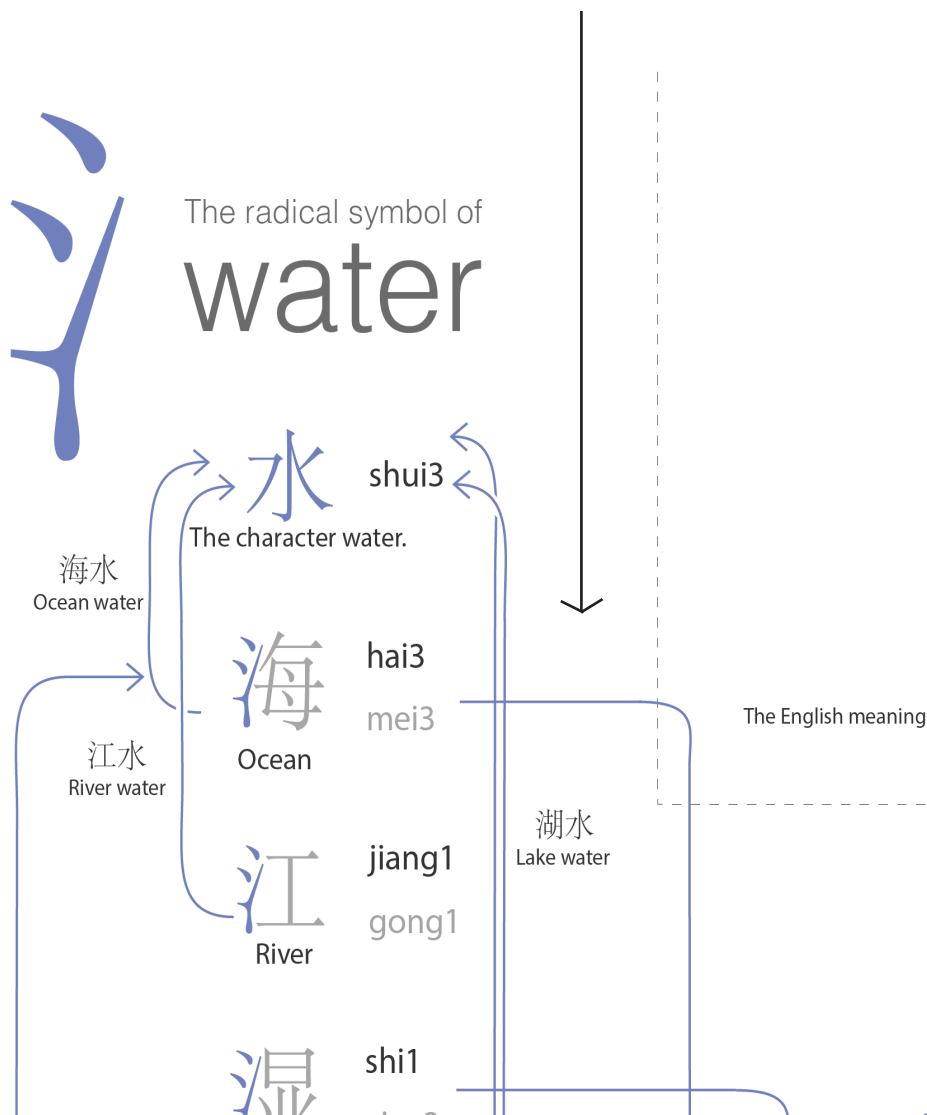
The key of the poster explains of pronunciation to relationship of the colored component and the whole character.

每 This component is not relevant to the whole character.

由 The pronounciation of this component is the same as the whole character.

干 This component is relevant to the meaning of the whole character.

可 The pronounciation of this component is similar to the whole character.

波
Wave

bo1 —— The pronounciation of the whole character.

pi2 —— The pronounciation of the colored component.

洗
Wash

xi3

xian1

洗浴
Bath

浴

yu4

This diagram is focus on the aspect of the connection between the characters which allows characters to combine into words. This diagram's existence is due to the nature of the radicals. In addition, the key chart of the diagram on the right has been revised for better comprehension.

The two other radicals posters are the radical female and radical shell (money). The reason that the shell stands for money is because that people used to use shell as currency in ancient China.

The thought of creating the word-connection diagram like this was initialed by my professors continuously asking the connections among individual characters. The original plan was to creating multiple diagrams of the word-combination like this in every radical. But soon I found out that not every same-radical characters have such many word connections like water radical did.

部首

Radical
A learning system for
Chinese Mandarin
characters.

The radical symbol of
water

- ● This component is not relevant to the whole character.
- ● The pronounciation of this component is the same as the whole character.
- ● The pronounciation of this component is similar to the whole character.
- ● This component is relevant to the meaning of the whole character.

波
bo1
The pronounciation of the whole character.
pi2
The pronounciation of the colored component.
Wave
The English meaning

洗 xi
xi
Wash

洗澡
Bath

澡
Related to bath

汽油
Gasoline

汽 qi4
qi4
Steam

汽水
Soda

汗水
Sweat

河 he2
ke3
River

河
Riv

汗 han4
gan1
Sweat

漂流
Rafting

漂 piao1
piao4
Float

洗浴
Bath

an1

沐浴
Bath

沐 mu4
mu4
Related to wash

淋 lin2
lin2
Shower

淋浴
Shower

浴 yu4
gu3
Bath

润 run4
run4
Moisture

浴池
Bath tub

池 chi2
ye3
Pool

湿润
Moisture

水池
pool/pond

电池
Battery

油 you2
you2
Oil

电
Electricity

潮湿
Moisture

湿 shi1
xian3
Wet

水
water

潮 chao2
chao2
Tide/moist

潮水
Tide water

浪 lang4
liang2
Wave

河水
ver water

海水
Sea water

海 hai3
mei3
Ocean

海浪
Wave

海湾
Gulf

湾 wan1
wan1
Bay

河流
River

流 liu2
liu2
Flow

流水
Running water

人海
Crowded people

人
Person

流血
Bleeding

流泪
Tears dropping

血
Blood

泪 lei4
mu4
Tears

37

女

The radical symbol of
Female
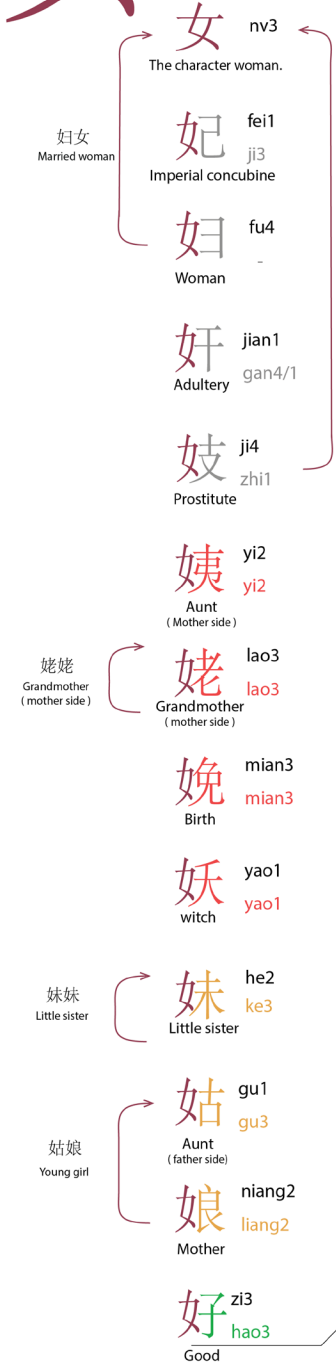
也 This component is not relevant to the whole character.

老 The pronounciation of this component is the same as the whole character.

子 This component is relevant to the meaning of the whole character.

马 The pronounciation of this component is similar to the whole character.

女 nv3
The character woman.

妇女
Married woman

妃 fei1
ji3
Imperial concubine

妇 fu4
-
Woman

奸 jian1
gan4/1
Adultery

妓 ji4
zhi1
Prostitute

姨 yi2
yi2
Aunt (Mother side)

姥姥
Grandmother (mother side)

姥 lao3
lao3
Grandmother (mother side)

娩 mian3
mian3
Birth

妖 yao1
yao1
witch

妹妹
Little sister

妹 he2
ke3
Little sister

姑娘
Young girl

姑 gu1
gu3
Aunt (father side)

娘 niang2
liang2
Mother

好 zi3
hao3
Good

The right component means son

她 ta1
ye3
She

The pronounciation of the whole character.
The pronounciation of the colored component.

The English meaning

妆 zhuang1
-
Make up

妻 qi1
gu3
wife

妾 qie4
li4
Concubine

奶 nai3
nai3
Grandmother (father side)

奶奶
Grandmother (father side)

娶 qu3
qu3
Marry

婊 biao3
biao3
Whore

婆 po2
po1
Mother- in- law

婆婆
Mother- in- law

妈 ma1
ma3
Mother

妈妈
Mother

娇 jiao1
qiao2
Delicate (for girls)

嫁 jia4
jia1
Marry

姐 jie3
qie3
Older sister

姐姐
Older sister

贝 The radical symbol of
Money (shell)

贝 bei4
The character shell.

赐 ci4 / yi4
Awarding

贯 guan4 _
String (related to money)

贱 jian4 _
Cheap

贪 tan1 jin1
Greedy

贼 zei2 jie4
Related to trade

贮 zhu4 _
Storage

赁 lin4 ren4
Rent

贵 gui4 _
Expensive

赌 du3 zhe3
Rent

赎 shu2 mai4
Redemption

败 bai4 _
Failure

赚 zhuan4 jian1
Earn

财 cai2 cai2
Money

贷 dai4 dai4
Birth

赊 she1 she1
Buy on Credit

费 yao1 yao1
witch

赠 zeng4 ceng2
Gifts

赝 yan4 yan4
Fake

贸 mao4 mao3
Related to trade

贡 gong1 gong4
Tribute

贷 dai4 dai4
Loan

账 zhang4 zhang3/chang2
Bill

赃 zang1 zhuang1
Marry

购 gou4 gou1
Purchase

Home page
offers radicals for selection

The default home page would be the radical map with all possible radicals in this project.

Select a radical
under top menu or
on the main page

Select about
under top menu

Upload
Can be future developed for easier navigation of the tool.

Radicals
Offers the list of all radicals included in this project.

About
Offers a overall background of Chinese characters, and also the abstract of the project.

Select Key icon
under Radical page

The default
Primary flow

Secondary flow

Key
Offers a tutorial of the color coding meaning.

Radical Combination Mode

Character Diagram Mode
Cannot be designed for every radical based on the nature of each radical.

The left diagram is the primary flow of the final design of the *Radical* website. The home tab has multiple radicals you can choose from; the radicals has the lists of all the radicals; the about us will introduce the project developing and the posters; the upload tab is designed for future development that where users could upload their file for a customized analysis of the characters.

First mockup

部首

Radical
A learning system for Chinese Mandarin characters.

HOME   RADICALS   ABOUT   UPLOAD

Some History you may want to know

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut

可   verb: can   Show more

The radical symbol of

water

Second mockup

部首

Radical
A learning system for Chinese Mandarin characters.

HOME   RADICALS   ABOUT   UPLOAD

Some History you may want to know

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut
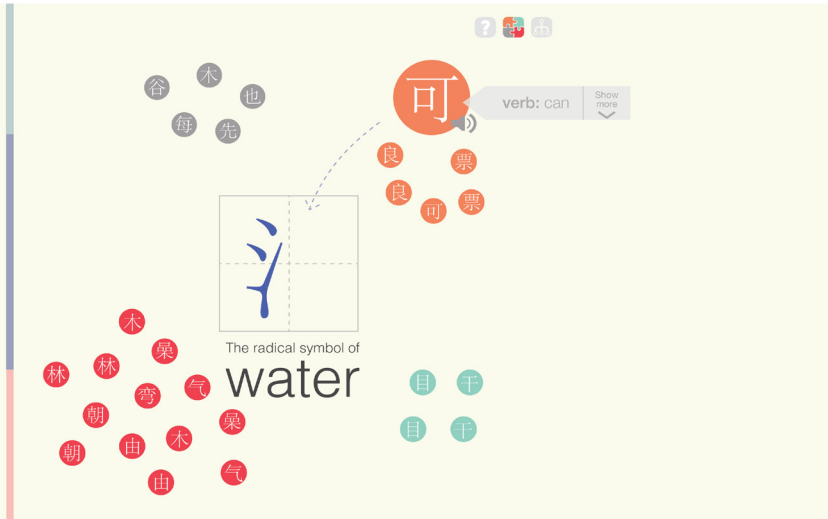
Show more   River   河

river
河流

river
河水

The radical symbol of

water

The two frames from the website on the left show the key interaction in the website.

After the user selects a radical, the screen moves to the top panel on the left where all the circles are in the same size unless they are hovered over. All the circles contain the possible components that could be combined with the water radical. The components' relevance to the whole character are color coded into different groups. When the user hovers on these circles, the meaning of individual components and the pronunciation icon shows next to it for the convenience while studying.

Users can physically hold the left key on their mouse and drag the components to the empty field in the center with the chosen radical. After users are done dragging, the meaning of the whole character, pronunciation icon and possible connection of words will display next to it.

The first screen users will see when entering this website is the moving bubbles contains different radicals. The radicals names are on the center of the circles.

On the home screen, once hover on the circles with radical names, they will show the radicals' in Chinese writing format.

部首

Radical
A learning system for
Chinese Mandarin
characters.

HOME RADICALS ABOUT UPLOAD

Water
Female
Male
Shell
Heart
Grass

Strokes, radicals, characters and words

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut

water · Female · Shell · Heart · Grass · Male

The other way to select the radicals is to go to the top menu, hover radicals, it shows all the radicals are currently analyzed in this website.

部首

Radical
A learning system for
Chinese Mandarin
characters.

HOME RADICALS ABOUT UPLOAD

Water · Female · Shell · Heart · Grass · Male

The left area introduces the appropriate historical stories corresponding to the content is showed on the right. It always can be hided for clearer view and more space to navigate.

45

Once users enter the radical pages, for example, the water radical, they will see something different. The field in the center of the page having the water radical fixed, and there are all the possible components which can form characters with the water radicals.

All the possible components are color coded into four colors based on their functions of pronunciation in new character and grouped together to become dynamic moving bubbles.

Users can hover on the moving bubble to see the detail information of that component. Sometimes the components are individual characters by themselves but sometimes they are only components. When they are characters themselves, the meanings and pronunciations will be available once hovering, there also will be a trace from the selected component to the center field for users to navigate.

After done dragging, the center field will show the new character just been created.

Once hovering on the center field, it will show the meanings, pronunciation and possible connections of combination of words on the right.

Media Platform Decision

The *Radical* learning system includes a set of posters and an interactive website. The creation of the posters required several steps and the interactive website was created by the similar principles but different layout design.

Why a website? That's the most frequent asked question I received when I propose this project to people. There are many platforms to choose from nowadays: posters, books, website and smart phone apps. Designers no longer need to stick with a single platform; they can choose the approach with the best fit design for the contents they want to present.

Websites can be viewed on multiple platforms, but mostly on computers. The first media platform that came to my mind is the website, because when people think of education, the tool mostly used would be computers. People always say: I need to bring my laptop to study at library; it is rarely to hear: where is my Iphone? I need to study on it.

I also need to convince my audience by not only showing my opinion but also surveying other potential users of my project. So I went to Northeastern University's Snell Library and distributed a questionnaire to 50 students. The questions and the result are on the top of the next page.

During the survey process, I met a Chinese student who spoke perfect English. He immigrated to this country when he was 10 years old. He asked me about the whole project and he suggested to me to develop a smart phone app for this project as a further attempt. He recalled his memory of the preparation for the SAT test when he memorized the vocabulary via his smart phone app. And for him, these characters are just like the new vocabulary in English. Although they are the characters with the same radical and have some interconnections, they still require much memorization from students.

I thought about his words and did some research about the current study method of Chinese Mandarin and found out that the surveys' questions could be more clear on the concentration of they study aspect. Expanding one's vocabulary in a foreign language could be the work done in the spare time using a smart phone, like on the subway or in line at restaurants.

So now when people ask me why a website? I am not going to show the convincing survey I did in the library. The answer will be open to all the potentials of media platforms. But there will be more designed input for the project for the application development, because there's a smaller screen, less control and many other limitations.

Between the time of defending my original idea to embracing multiple opinions from many other people much understanding was gained.

48

1. Which platform would you use more for browsing/reading educational materials?

89%   A.   Desktop/Laptop   B. Mobile Devices   C. Tablet

2. For learning a new language, which platform would you use most?

71%   A.   Desktop/Laptop   B. Mobile Devices   C. Tablet

Chapter 4

The Current Chinese Learning Method and Possibilities of *Radical* on Multimedia Platforms

One of most often asked question I received through the whole process of creating *Radical* is: How this method different from or better than the current ones? My answer is: this method is equally important as the current method but focuses on a different aspect of Chinese learning—the characters of Chinese Mandarin.

As the example showed, in current Chinese learning materials, conversation practice is the priority. Everything else including pronunciation, reading, listening and character recognizing are all centered on the conversations. Does it make sense? Yes, because the first thing people want to learn a new language is to communicate orally with people who speak it.

On the other hand, as the article demonstrated earlier, learning a new language has many methods. Not everyone finds a single method is efficient. Like when I study English, reading articles and talking to English speakers improves my English in certain ways, but building the vocabulary through TOEFL makes me able to understand more in the articles. Same as Chinese, no matter how good of your Chinese Mandarin accent, the Chinese characters recognition still going to be an obstacle to overcome.

We all know the convenience and effectiveness of gaining knowledge from information-visualization projects. Currently, the majority of well-designed information design projects are typically targeted towards adults. Would it be beneficial to make the knowledge more accessible and user friendly for kids in educational institutions? The goal of my project is apply the use of information design to students without a focus on age. A similar methodology could be used in other fields to enable the students to achieve better comprehension across all subjects.

The purpose of this project is not to replace the textbook. Instead of that, it will provide more accessible methods of learning the same content. From students' perspectives, the platforms of learning has become diversified. Beyond the Google search, knowledge can be presented in a form that is visualized, interactive and fun to play with for a better experience and more positive learning outcomes.

Credits

1
"Google trends results when people search the terms of China, Japan and Korea" Screen shots of the website Google trends(https://www.google.com/trends). Appearance on page 4.

2
"Some examples of Chinese characters evolution from oracle bones to simplified version" From the book *Learn Chinese Characters by Radicals.* by Hongru Yun. Appearance on page 20.

3
"Some examples from the book of Chineasy" From Internet. Originally from the book *Chineasy* by Hsueh, ShaoLan, and Noma Bar. Appearance on page 21.

4
"An example of current way of learning Chinese character" From the book of *New Practical Chinese Reader 2: Workbook* by Lin, Xun. Appearance on page 23.

Bibliography

1
Chen, Hsuan. Cognitive Processing of Chinese and Related Asian Languages. Hong Kong: Chinese University Press, 1997.
Hsuan's book offers a thorough comprehension of the structures of Asian characters. It introduces the background of Chinese characters, and furthermore, it analyzes the difficulties of learning this language. It is a fundemantal source used in the section methodology. It also defines the language from an academic perspective, which has become the backbone of my thesis project.

2
Coady, James, and Thomas N. Huckin.Second Language Vocabulary Acquisition: A Rationale for Pedagogy. New York: Cambridge University Press, 1997.
The main task of *Radical* project is to expand the learners' vocabulary. This book emphasizes the importance of building vocabulary when learning a second language which is the source for methodology section.

3
"How To Pass The HSK Test." Living A Dream In China. August 8, 2013. Accessed January 22, 2015. http://sarajaaksola.com/how-to-pass-the-hsk-test/.
HSK, as the official examination of Chinese Mandarin, is considered the standard of the Chinese Proficiency Test. This article introduces the importance of building vocabulary to pass the tests. My thesis project has focuses on expanding learners' vocabulary based on the elements they are familiar with.

4
Hsueh, ShaoLan, and Noma Bar. Chineasy: The New Way to Read Chinese.
Drawing illustrations around Chinese characters make them more lively and more memorable, that's the innovation created by ShaoLan and her team. Similar to her methodology, this project is also a way to capture the memorable anchors in the characters to make them easier to remember.

5
Liu, Xun. New Practical Chinese Reader 1 & 2: Workbook. Beijing: Beijing Language and Culture University Press, 2004.
These two books are the textbooks developed by Beijing language and Culture university. This series is the popular choice of Chinese textbooks for second language education. Also, they are the models I can compare to my method.

6
She, Ben, and Yi Ming. New Primary School Dictionary(Chinese Edition). People's Education Press Pub, 2010.
This Chinese dictionary offers limits for this project. Because Chinese has so many characters, so it is necessary to set a domain for this project. Choosing the dictionary for primary school is because the characters are most often used. The characters are also the vocabulary most needed to be studied for the learner of Chinese.

7
Yun, Hongru. Kan Bu Shou Xue Han Zi = Learn Chinese Characters by Radicals. Di 1 Ban. ed. Beijing: Hua Yu Jiao Xue Chu Ban She, 2009.
This book offers a background on the historical aspect of Chinese characters, including how the radicals' shapes changed over decades and why people adopted this shape of radicals instead of other ones.

9
AP Chinese 2010 Score Distribution.

10
AP Chinese 2011 Score Distribution.

11
AP Chinese 2012 Score Distribution.

12
AP Chinese 2013 Score Distribution.