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Learning Chinese Characters: Academic vs Dynamic Approach

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Abstract. This study aims to study the comparative results of the application of the classical academic and modern dynamic types of studying Chinese writing in its pragmatic aspect. Chinese language and writing are among the most difficult to learn as a second language, requiring advanced teaching methods with wider use of elements of the digital environment and the student's independent active use of web services for active language learning. This aspect is also important when using more and more mass distance learning. The study involved 90 students aged 23 years old to 35 years old, who were equally divided into experimental and control groups. The experimental group used active learning methods and the control group used the usual academic methods of teaching Chinese writing, in accordance with the university course. The training was allocated four hours per week for remote training (using the Google Meet platform). The results demonstrated that the dynamic approach is effective in teaching hieroglyphics and pragmatic aspects of the language (reading, typing on a computer, listening comprehension, recognising words and written hieroglyphs). The academic classroom method is more suitable for the formation of correct pronunciation, taking into account the tonal type of Chinese phonetics.

Keywords and phrases: Chinese, ancient characters, dynamic learning, language teaching, memorisation

Introduction

The Chinese language belongs to the Tibetan-Burmese language family and has the most developed hieroglyphic script in the modern world, preserved from antiquity. This type of writing originates from Ancient China and was used earlier in all countries of Southeast Asia, but in many of them, it was eventually supplanted by their own original writing systems (Korea, Malaysia and Burma) or replaced by the Latin alphabet with the introduction of special characters reflecting the peculiarities of pronunciation (Vietnam). Chinese characters are characterised as

logograms and ideograms since they can act both as an independent significant element (lexeme) and as a significant part of a larger word (morpheme).

The oldest Chinese thesaurus contains 47,035 individual logograms (Kangxi dictionary [康熙字典, Zìdiǎn Kangxi], which was commissioned by the Kangxi Emperor of the Qing dynasty). According to Yang et al. (2017), the Chinese language covers more than two hundred languages belonging to several language families. Total urbanisation and the spread of dialects by speakers coming from different parts of China led to a linguistic collapse. Since 1094, Chinese authorities had been working on standardising the Chinese language. This led to the emergence of the country's official language, called Putonghua, "common language". Putonghua is based on the Beijing dialect. Putonghua is promoted by the Chinese government as a means of inter-ethnic and inter-regional communication in China and its literary language. This is due to the large linguistic distance between Chinese dialects and the large number of dialects (there are nine large dialect groups in China). Chinese writing consists of a series of elements separated from each other by equal spaces. The term most commonly used today for Chinese characters is "ideogram". According to this term, Chinese writing directly evokes ideas and associations. However, according to Van Reybroeck and Michiels (2018), no writing system fits this definition. Consequently, the term ideogram should be banned because it creates confusion.

Characters are independent graphic forms, materially isolated from each other by spaces and are unchanging in the sense that their strokes do not change, regardless of the surrounding forms. A character corresponds to a sound segment, a syllable and a meaning. If one hears a syllable out of context, one will not know which character to decode it with. For example, the syllable *hei*, when it means "core", is spelt a certain way and the same syllable, when it means "flow", is spelt any other way. There are about 1,300 syllables, compared to over 10,000 regular characters. Thus, a syllable corresponds on average to more than eight different characters and this can go up to several dozen (Yang and Li 2018).

Ancient Chinese is a monosyllabic language, where a character corresponds to the word in most cases. It was from the Han period (226 BC to AD 220) that the Chinese lexicon began its accelerated process of dissyllabisation (Guan and Wang 2017). Thus, compound words are replaced with simple terms, causing too many ambiguities due to homophones (Guan et al. 2020).

A character consists of a certain number of strokes (from one to more than 30), these strokes must be applied in a certain order. Most characters are divided into subsets (other characters or non-autonomous elements), which shall be called graphic components. There are a limited number of such elements (several hundred).

The order in which the strokes should be drawn, called decomposition, is quite strict; an order error is called a "spelling mistake". For each character, it is necessary to know the order of its characteristics. However, there are general principles, such as writing the left element first, then the right, top to bottom.

The sequence of strokes and their direction determine not only the appearance of characters and their balance but also the memorisation of the graphic symbol. When the decomposition of a character is respected during each repetition, the brain visualises the traces and forms a certain automatism on the graphic symbol. This process is very helpful in remembering the spelling of a character. There are hundreds of simple characters that are considered indecomposable in subsets of strokes and several tens of thousands of complex characters that can be analysed in two or more graphic elements. The ability to identify and name graphic elements plays a crucial role in their memorisation, especially active memorisation.

Literature Review

The peculiarities of studying the Chinese language as a foreign language attracted many researchers and provoked the creation of various approaches and methods for studying hieroglyphics and pronunciation. In the studies of psychologists Law and Caramazza (2017) and Snow (2017), the articulation of Chinese characters and the visual perception of the text during reading converge in the process of deepening learning. The development of neurolinguistic knowledge, as well as the characteristics of brain activity during reading, helped to create new techniques for memorising Chinese characters and contributed more information about how they are perceived (Xue et al. 2019). Earlier studies have found that there are differences in how the brain processes character and literal text. Guan et al. (2020) found that isolated characters are recognised earlier in the left visual field and right brain hemisphere. The two-syllable hieroglyphic words that are most common in modern Chinese are preferentially recognised by the right visual field and the left hemisphere. Further studies have shown that the modern auxiliary alphabetic notation of Chinese speech differs significantly in the brain's perception of hieroglyphs and does not correspond to the morphological structure of symbols (Guan et al. 2021).

Whatever the writing may be, the phonetic dimension of reading cannot be excluded. As far as visual perception is concerned, the mechanisms that allow humans to identify visually and memorise graphic signs show only minimal differences between Chinese writing and the alphabet (Eubanks et al. 2018). These facts support the position of linguists Palmis et al. (2021), who argue against descriptions of Chinese characters as small images from which meaning can

emanate. Characters correspond to words that are pronounced and read in texts in a grammatically articulated way (Van Reybroeck and Michiels 2018).

Teaching and learning Chinese characters often begin with strokes and radicals. Radicals play a decisive role in supporting older students in learning Chinese as a second language. Designating or indexing a radical in the dictionary will influence a student's visual perception and semantic understanding and bring the prevailing meaning of the radical to the forefront, while at the same time marginalising other meanings of the same radical. This type of naming and indexing sometimes omits the secondary meanings of the radical word or diminishes the meaning of the non-radical components of the Chinese character. At the moment, the learning of Chinese characters is mostly organised around the dominant meanings of radicals or bases (Neubauer 2020). More efforts should be made to go beyond the dominant meanings of the radical to better understand the marginal meanings of the radical as well as identify the meanings of the non-radical components in the character. Otherwise, learning Chinese characters will come to a plateau and the meanings of many components in the characters can be understood only partially and as a result, learning Chinese characters will sometimes become only memorising radicals, but not perceiving them.

In this context, works by Jegou (2018), where Chinese philosophy emphasises the integration of people into their environment, are of interest. The art of ancient China is examined, combining the skills associated with artificial or constructed as well as natural patterns. Chinese characters are a perfect example of this. The works by De Sousa (2018) describe the research on the relationship between Chinese calligraphy and architectural space, between the written and constructive environments. There are some experimental design studies aimed at developing new architectural typologies (based on the aforementioned basic research) that are contemporary, resonant and sensitive to the Chinese context.

The development of the ability to write meaningful characters was an important milestone in the development of human civilisation. Handwriting serves to link auditory and motor processes with visual text processing, which is a sign of successful reading (De Sousa 2018). Early processing of visual word forms is limited to interaction with auditory and motor areas (Guan and Wang 2017) and handwriting movement facilitates auditory and motor integration of visual word forms.

The author agrees with the work of Guan and Wang (2017) about handwriting Chinese characters using an alphabetic system such as the one used in English. When writing a handwritten text in Chinese, one must first extract the visual-

spatial features of the characters. On the contrary, phonological processing, such as depicting letters corresponding to phonemes, is more important for alphabetic words. The rejection of handwriting can affect how future generations learn to read. Restricting handwriting instruction and practice can make it much more difficult for students to develop reading and general writing skills in Chinese and Western languages.

There is no doubt that handwriting influences the learning of characters by creating a network involving both the sensory and motor systems of the brain. It was also demonstrated that the motor system creates variability (in this case through handwriting) in our perceptual world, which improves behavioural performance and serves to link brain systems into functional networks (Van Reybroeck and Michiels 2018). In addition, a series of behavioural studies of handwriting in both adult English speakers and beginning Chinese readers have shown that handwriting of Chinese characters focuses attention on stroke components (Guan and Wang 2017) and promotes spelling recognition to aid in reading among Chinese students. It is even possible that handwriting contributes to the cognitive abilities of Chinese children in reading Chinese characters.

The practical significance of this study is that the dynamic method can be an important part of Chinese language courses to support students' active learning of speaking and writing.

Problem Statement

One of the most important problems in the study of Chinese characters is that only a small part of them are ideograms, the meaning of which is reflected in the outline of the symbol. Therefore, the semantic memorisation of the content of the lexeme by the content of the character can be applied very rarely and mainly to the radical most ancient hieroglyphs (Cao et al. 2018). For memorising other hieroglyphs, simple eidetic images that are associated with the primary ancient drawings underlying the basic hieroglyphs are inapplicable. As a rule, a hieroglyph contains an ideogram – a key ("radical") symbol indicating the semantic group to which the hieroglyph belongs in meaning; a phonogram – a radical symbol indicating the sound of a character (as a rule, this is a historical sound and now the word denoted by a character is pronounced completely differently, as a result of which a separate study or isolation of phonograms in modern language is meaningless); additional radical symbols, which can be up to six or more and which may or may not have a semantic load to reflect the meaning of the character (Su and Lee 2017). Based on the historically complex structure of Chinese writing, the best learning method and then memorising characters is repetition and active use in connection with other

hieroglyphs within polysyllabic words and practically applicable sentences (Poole 2015; Mason and Zhang 2017).

Better motivation and engagement can be expected to develop when practical interest arises and the ability to immediately apply their knowledge effectively in practice (Mayumi and Zheng 2021). Such motivation and involvement can be formed to a greater extent by a dynamic teaching method, in which a student constantly observes the emergence of hieroglyphs from their sound when typing on a computer keyboard using the pinyin method, recognising hieroglyphs simultaneously with listening to speech and subsequent self-recording of hieroglyphs. The dynamic teaching method studied in this study is more effective for mastering the pragmatics of language, communication skills and understanding of oral language and reading. It may be somewhat less effective in developing handwriting skills that require additional training in normative Chinese calligraphy (Xue et al. 2019).

It should be noted that the existing methods of writing Chinese characters by hand using purely mechanical memorisation are quite complicated and tedious, especially at the beginning of training. The method of "kinesthetics" activity applies to memorising characters (the brain connects the movement one makes to write them down in order, step by step, with the overall shape of the character), but it requires systematic effort, which is a huge challenge for our memory. Thus, it is necessary both to remember the writing of each character (number of components, sequence of strokes) and its meaning, phonetic features and tone.

The classical academic method for studying Chinese writing in universities is to arrange atomic symbols according to their semantic connections or frequency of use. Characters are often studied outside of contextually related categories that unite groups of characters. This approach does not allow developing the skill of using certain idioms or lexemes as a communication tool. The dynamic method (quasi-mechanical memorisation with repetition) helps acquire skills and accelerates language practice.

Teaching the pragmatics of communication in a second language is facilitated by actively developing dynamic teaching methods using digital technologies, which are focused on unsupported teaching of correct spelling through dynamic stops and constant correction of the student in a machine learning environment. An intelligent algorithm not only adapts the student's language skills to a specific language norm but also adapts itself to the student's characteristics, speeding up learning and contributing to its individualisation (Kindermans et al. 2014). There is a significant body of research focused on developing more dynamic approaches to

language learning as a transfer of language systems and language skills in specific environments (Hiver et al. 2021). These approaches are especially important when studying the Chinese language, the structure of which differs sharply from most of the widespread Indo-European languages. The present study seeks to put the dynamic method of teaching Chinese into practice in order to provide insight into second language teaching practices.

Methodology

The present study proposes a dynamic method (quasi-mechanical memorisation with repetition, which involves the use of auxiliary technical support. The text is processed on a computer using pinyin typing software, by far the easiest and most intuitive tool), which has proven to be far more effective and less pedantic than the academic approach for studying ancient Chinese characters 字 *tzu*.

The methodology was applied to 90 students in language courses in Guangzhou between September 2020 and April 2021. From the 90 students, 45 began to learn Chinese and were selected for testing. While the rest had studied Chinese for a year, 10 of them were beginners in Chinese. Therefore, all of the students were beginners in writing ancient Chinese characters. Fifteen students capable of completing the assignments (10 students wrote very slowly and could not complete the tests during the special session) were selected to be tested as part of this work. Among them, eight participants were bilingual (Arabic or African dialects). All of the students were new to Chinese writing, they were poorly trained in memorising characters and they formed a group of participants of relatively homogeneous writing levels. The first group, consisting of 45 students, was taught using the academic approach while the second group used the method of dynamic learning of Chinese characters. Students worked on tests and each method was described in detail for each test version. Two consecutive tests using the classical character memorisation approach and the dynamic approach were conducted to determine the effectiveness of the methods and their possible combinations. Students were informed that they took two comparative tests on character memorisation techniques. Ten unselected students also took the tests. As expected, their performance (character recall) was partial, they were not included in the analysis. The texts tested were unknown to the participants, otherwise, this would have distorted the results, as these were memory tests. On the test day, they were given oral characters in English and Chinese, and each participant tried to repeat the characters in writing, that is, they had already been introduced to the vocabulary. This study only describes in detail the actions of students using the dynamic learning method of Chinese characters, because academic methods have already been described in many academic papers. In the so-called analysis phase, Group 2 had to read the text in the target language

(L2), analyse each part of it (words, structures, etc.) in detail and then translate it into their native language (L1).

A limitation of this work is the different levels of initial knowledge of the participants (some of them already understood Chinese), so the results reflect a fuzzy reality. Besides, the partial remote work with participants due to the world pandemic slightly delayed the learning process. Therefore, in the future, it would be interesting to study participants placed in the same conditions (when everyone has the same level of knowledge) to get more relevant results.

Results and Discussion

The key phrase of dynamic learning is reading the text in L1 and translating it into L2. In the case of learning Chinese, the key technique is active work with the text, which includes character recognition, listening and typing in pinyin and the association of the character and its sound image. Using web services to automate and facilitate the acquisition of such pragmatic skills can not only speed up learning but also engage students. With the proposed approach, any adequate and interesting text in Chinese found on the Internet can be educational. This text can be converted into an alphabetic representation (pinyin), read out and get the meaning of each hieroglyphic character and the meaning of their combinations (two and three characters) using pop-up windows that do not break the perception of the text. With the help of services such as Mandarinspot, you can print hieroglyphic text and get a complete glossary for it in addition. Numerous speech synthesisers are available, with which you can hear the normal pronunciation of both a single hieroglyph and the whole text. Google Translate services provide an approximate and reasonably high-quality translation of the text. You cannot rely on such a translation as an accurate academic one, but it allows you to get a general idea of the content for a more accurate translation. The main feature of web services that should be used is avoiding the need to use dictionaries, the search which takes a lot of time and slows down the process of learning and even memorising new words. In the case of Chinese, vocabulary search is complicated by the fact that it can be carried out by “radical” and the number of strokes if the exact sound of the character is not known.

The first group worked with dictionaries and used the manual. In the case of the second group, they were advised to work using typing software to learn Chinese. For China, the easiest and most intuitive tool is undoubtedly Google Pinyin (http://www.google.com/intl/zh-CN/ime/pinyin/). One can also add a Chinese language panel in Windows (Control Panel > Language and Regional Standards > Languages tab > Data > Add). This allows one to write directly in Chinese in Microsoft Word

by typing in Latin letters, that is, pinyin. If one can pronounce characters, one can easily write Chinese text in a word processor. Performing this operation is very useful. By doing so, one will not only continue to learn the pronunciation of the characters (through numerous reading and listening sessions) but also distinguish and recognise the correct characters among the many corresponding homophones. These efforts allow the brain to form connections between sounds (pinyin) and related forms (*hanzi*) in a less stressful, much more efficient and natural way than rote memorisation out of context. After setting up the necessary tools, one just has to set up a practical routine, a cyclical and dynamic way of approaching the text in different ways, session by session. The stages (steps) of working with a given text can be performed as shown in Table 1.

Table 1. Phase 1 of dynamic learning

Steps	Approaches
Step 1	Listening and reading (compared to L1 sentence translation)
Step 2	Analysis (phrase showing unknown structures and terms)
Step 3	Repetition (listening and reading, pinyin only)
Step 4	Translation L1 (thesis statement, without looking at the available translation)
Step 5	Repetition (listening and reading)
Step 6	L2 synthesis (translations, pinyin theses and final error checking)

Group 2 was advised to ignore Chinese characters during the first three to four months of training, focusing solely on phonetic writing (pinyin). The main goal, in the beginning, was to first learn the sound of a word (as well as its meaning) and then the character associated with it.

Thus, in the first months they translated only in pinyin, without using Google Pinyin, that is, they just designated the sounds with numbers (e.g., 我 是 意大利人: Wo3 shi4 yi4da4li4 ren2). After learning pinyin, it was possible to take the next step and use Google Pinyin and write real characters. At this stage, it was possible to check the old texts, this time look at the characters and translate them using Google Pinyin.

Finally, when it became necessary to improve handwriting input in Chinese (for testing), two more steps could be added to the above program (as shown in Table 2).

Table 2. Phase 2 of dynamic learning

Steps	Approaches
Step 1	Listening and reading (compared to L1 sentence translation)
Step 2	Analysis (phrase showing unknown structures and terms)
Step 3	Repetition (listening and reading, pinyin only)
Step 4	Translation L1 (theses, without looking at the available translation)
Step 5	Repetition (listening and reading)
Step 6	L2 synthesis (translations, pinyin theses and final error checking)
Step 7	Copy the text in characters
Step 8	Write text characters from the pinyin version

Finally, to understand the stroke order of a particular character, Arch Chinese (https://www.archchinese.com) was used, which provides animations of how to write it, as well as gives various information (compound words, expressions containing it, etc.). This online service is a universal reference guide for learners or actively using the Chinese language. The service is accessible from computers and any mobile devices since it is an optimised web application. The service offers comprehensive information on each Chinese lexeme, including sound, spelling, meanings, homonyms, homographs, antonyms, synonyms and homographs. Of particular value is the background information on all existing methods of typing using a computer keyboard for each hieroglyph using various methods. The service also provides an opportunity to listen to the normative sound of each lexeme both in the Mandarin Chinese literary dialect and in the most common Guangdong (Cantonese, or southern) dialect. Southern dialect is widely used in such significant regions as Hong Kong, Singapore and Taiwan, it is most widespread among the Chinese diaspora around the world and therefore considerable attention is paid to its study.

Table 3. Students' results as a percentage

Groups	Reading (%)	Translation (%)	Synthesis (%)	Writing new characters-glossary (%)
Group 1 (Academic method)	56	60	54	29
Group 2 (Dynamic method)	78	90	65	67

As a result of studying the effectiveness of the methods (as shown in Table 3), it is suggested that the method of dynamic study of Chinese characters was much more effective than the academic approach. Students who worked with this method showed better results compared to those who worked using the academic approach. The use of the Chinese language presupposes the use of a significant active dictionary of hieroglyphic signs. The Chinese writing system has historically been repeatedly structured and normalised by Chinese linguists, leading to the creation of a structured writing system in which each character carries its own meaning and can be combined with other characters to create new meanings. Each hieroglyph consists of the simplest hieroglyphs, the so-called radicals. Radicals, in turn, consist of separate features, the number and way of writing which are strictly normalised. The more characters a student learns, the easier it becomes for him to learn and memorise new characters since they are associated with numerous graphic, semantic and historical connections with the characters already studied (Su and Lee 2017; Cao et al. 2018). It is just a matter of practice, skill, having the right tools and motivation.

The problem of learning and memorising characters is not ground-breaking. Linguists Harrelson (2017) and Yang and Li (2018) describe different methods, but there is no whole structured methodology. Accordingly, each specialist in the field chooses his or her own method of teaching (Keevak 2016; Yang et al. 2017). Yet, in practice, the total abandonment of the study of national specificity in Chinese language teaching and the insufficient development of the methodological basis aggravate the process of teaching linguistics. Such conditions for the current system of linguodidactics lead to a deadlock in language teaching in general. For a long time, the methodology of teaching Chinese was dominated by simplification in memorising the characters, which was reduced to memorisation and repetition. Gradually, the concepts were supplemented with theses about associative relations and form and interference of what is being learned.

Mason and Zhang (2017) hypothesise that the method of memorising through conscious visualisation of a character will give better results than memorising through repetition. While Poole (2015) finds that images (or drawings) are more effective for memorisation. According to the available results, the best results are obtained by quasi-mechanical re-learning using the pinyin system. Thus, there is a difference in the effectiveness of the two methods used separately. Contrary to the hypothesis (Poole 2015), memorisation by quasi-mechanical repetition yields better results than conscious visualisation of a character. The author agrees with Maksymova (2020), Viberg and Grönlund (2017), who focused on the use of the repetition method that is more effective than a conscious visualisation of a character. Since the quasi-mechanical method of repetition is often rejected and not appreciated, an interesting hypothesis is given out by Xu and Peng (2017), where, comparing all methods, the author finds that the character 喜, consisting of 12 features, is remembered worse than the character with fewer features. The character 车, which is less complex than 果, was remembered by a large number of students. That is, for very complex characters, memorisation by quasi-mechanical repetition is most effective. This efficiency is relative because out of two students who used this method, only one memorised the character accurately. While for a simple character, it is the memorisation by conscious visualisation of the character that gives the best results, followed by memorisation by quasi-mechanical repetition.

According to Garces-Bacsal and Yeo (2017), regardless of the method or combination of methods used, memorisation by image recall might be more effective for beginners to learn Chinese. In contrast to Hu et al. (2018), traditional methods of memorising Chinese characters are practically obsolete and, in this perspective, alternative methods are those using computer technology for both learning and control purposes. Storing, processing, transmitting, receiving and synthesising information, with the help of new technologies allow one to optimise the learning process (Joshi et al. 2018; White 2017). Based on this, today, most Chinese teachers choose new methods, noting that with the use of technical aids, the problem of memorising characters is significantly eliminated. Using modern methods, students have access to global information space and they can easily learn and understand the necessary character. Thus, the need to use outdated, fewer progressive methods is eliminated. However, the world experience of teaching Chinese shows that it would be more productive to combine several methods without losing sight of the fundamental principles of learning a foreign language.

In any case, the traditional practices of Chinese educators, combined with the latest technologies and methods, would open up new perspectives for the global community to explore such a complex language.

Conclusion

The current study is compared the results of two approaches to the study of Chinese writing: academic and dynamic. Testing of the methodology was carried out with the involvement of 90 participants and the effectiveness of the methodology was determined during seven months of training, when the methods of dynamic memorisation were used. Based on the results, a more effective method and ways of combining both methods were identified to improve the overall effectiveness of teaching Chinese writing. The limited number of participants is due to low attendance at language courses during the pandemic. The use of a dynamic teaching method using reliance on the pragmatics of language in the field of communication and reliance on the alphabetic representation of reading characters (pinyin) is more productive than the conventional academic approach. A significant reason for this is the typological closeness of the representation of the Chinese language using the pinyin with the native languages of students (mainly using the Latin alphabet). This factor is of critical importance in improving the assimilation and memorisation of characters. The research contribution and novelty lie in the integration of traditional academic teaching methods more effective for staging pronunciation and handwritten calligraphy and a dynamic approach to learning using web services. The research results can be implemented in teaching the Chinese language and studying the Chinese writing, culture, history and civilisation of China.

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