A Cognitive-Interactive Approach to Chinese Characters Learning: System Design and Development

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Abstract. A solid knowledge of Chinese characters plays an important role in Chinese reading. Essentially, Chinese characters, a graphic- based orthographic rule, are much different from the words of an alphabetic language, such as English, French, etc. The uniqueness of Chinese characters make it is extremely difficult for most of the CFL/CSL learners no matter what their nationalities are. In this paper we developed a Chinese character learning system based on a cognitive-interactive perspective to help CFL/CSL learners learn Chinese characters. The results of a preliminary survey show that most of the surveyed CSL learners approved the learning system's design rationale as well as made positive comments on the system learning effect upon their Chinese character knowledge construction.

Keywords: Chinese character, romantic radicals, Chinese as a foreign/ second language (CFL/CSL), cognitive-interactive.

1 Introduction

Students' reading abilities play an important role in their academic achievement. Undoubtedly, reading is a key for anyone to acquire knowledge of the literature world, particularly for students. Moreover, there is a growing recognition that reading provides important opportunities for second language (L2) development [1], especially for learners in a language setting with limited L2 resources [2]. Many studies show that foreign language (FL) learners' metalinguistic awareness [3] which includes the awareness of phonological regularity, orthographic regularity [4], and morphological regularity [5] strongly affects FL learners' reading development. However, most of the related studies have been conducted with alphabetic language, such as English and French, "could those findings also apply to learning to read Chinese for a CFL learner?" is an issue worthy of further consideration and have drawn many researchers' attention.

Chinese characters, essentially a graphic- based orthographic rule, are much different from the words of an alphabetic language, such as English. Unlike the case of an English word in which the sound is encoded in all letters, an English reader can guess the pronunciation of an unknown English word via the relation between the letters and the corresponding sounds. Chinese characters are made up of strokes. Strokes are then combined in such a way as to form structure that can be called "radicals." The knowledge of the structure of a Chinese character is therefore important for beginning learners to identify the made up radicals of a Chinese character [6]. Furthermore, there are two kinds of radicals: semantic and phonological, the former gives a cue to the meaning of the character and the latter gives a cue to the pronunciation of the compound. For instance, in the character 清 [qing1] "pure, clear", 氵[shui3] "water" is the semantic radical, and 青 [qing1] "blue, green" is the phonetic radical. Based on Kang's study [7], about 80% to 90% of Chinese characters comprise a semantic radical and a phonological radical. According to Shu, Chen, Anderson, Wu, and Xuan [8], the semantic cueing function of the semantic radical in a Chinese character is stronger than the phonological cueing function of the phonetic radical. In addition, recent studies have shown that the radical is an important processing unit for children in processing Chinese characters [9] as well as for adult skilled readers in recognizing Chinese characters [10].

Because of the remarkable difference between Chinese and other alphabetic language, the uniqueness of Chinese characters makes it difficult for most of the CFL/CSL learners to recognize the written Chinese text no matter what their nationalities are [11]. To deal with the language barrier, some researchers emphasized the importance of explicit instruction on positional regularities of both semantic and phonetic radicals [9]. "Concentrated character learning method" is another popular new Chinese character teaching method in which characters with the same semantic radicals or phonetic radicals are taught together [12]. Lam, Ki, Law, Chung, Ko, Ho, and Pun [13] designed a computer-assisted Chinese character learning software based on the knowledge of the structure of Chinese characters as well as radicals (both semantic and phonological). Although Lam's software got supportive evidence on the feasibility, the results of classroom experiment also revealed the importance of contextual way of teaching Chinese characters. The problem found in Lam's study also can be found in other web-based Chinese character learning system. Based on Lan's study [14], most of the computer-assisted Chinese character learning system much focused on the instruction of radicals and stroke order rather than embedded the essential knowledge of Chinese character in meaningful context has led to less self-learning effect.

The deal with the problem of decontextualized Chinese character learning, this current study applied cognitive perspective to design a two-way interactive Chinese character learning system in which CFL beginning learners first learn the essential knowledge of Chinese character such as character structure and radicals and then apply the learned knowledge to comprehend a meaningful context. The following sections briefly describe the Chinese character learning system, and finally present conclusions.

2   Cognitive Chinese Character Learning System (CCCLS)

CCCLS was designed based on a cognitive-interactive perspective. Based on Carroll [15], a FL learner will effectively learn the target language (here means Chinese) in an interactive learning mode in which all the learning materials are divided into several small units, the FL learner first learn the lower level linguistic skills such as words and phonological rules and then is given a meaningful context to apply what has learned to comprehend the written text in the target language (Fig. 1 shows the interactive model). The beta version of CCCLS consists of 5 units and each unit includes 3 Chinese characters which all contain a common radical. At the beginning, the knowledge of Chinese character structure is introduced via animation and interactive manipulation (Fig. 2 shows an example). Then, the CFL learners learn the materials unit by unit. Besides, the learning flow of each unit is as the following: (1) radical; (2) characters related to the radical; (3) words and sentences related to the characters; (4) comprehension of a meaningful context. After the CFL learners finish all the learning activities of each unit. A summative assessment will be.
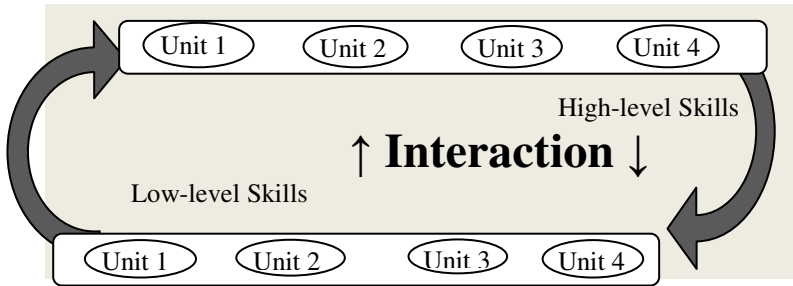

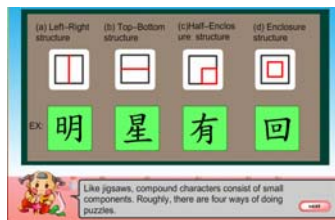**Fig. 1.** The interactive model of Chinese character learning system

Fig. 2. The instruction on the structure knowledge of Chinese characters

2.1   Radical Instruction

Each radical is introduced via sound, related characters with the radicals based on the approach of concentrated character learning method, and the animation of the radial. Fig. 3 shows an example of radical instruction.

Fig. 3. An instruction example of a semantic radical 人 [reng2] "person" with character origin animation

2.2 Character Instruction

The instruction followed the radical instruction is about 3 characters with the radical taught in the unit. For instance, the radical taught in unit 1 is人 [reng2] "person", and the 3 introduced characters are 來 [lai2] "to come", 他 [ta1] "he", and 你 [ni3] "you". In addition to the same functions as shown in radical instruction interface, "word" and "sentence" made up by the character will be also shown to depict how the target character used in context. Fig. 4 shows an example of the character instruction interface.

Fig. 4. An instruction example of a character來 [lai2] "to come" with the semantic radical 人 [reng2] "person"

2.3 Interactive Practice

After the CFL learners finish the character learning, CCCLS provides them with an interactive practice activity to strengthen the learning effect. The practice includes radical recognition, character meaning, and character usage. Fig. 5 shows an example of radical recognition. The screen will shown a learned character and ask the CFL learner to choose the correct radical of the character.

Fig. 5. An interactive practice on radial recognition

2.4 Meaningful Context

A meaningful context with the corresponding sentence will be shown to the CFL learners after they finish the learning activity of lower level Chinese skills such as radical, characters, and words. The CFL learners will be asked to apply what they have learned to comprehend the meaning of the context even some characters in the sentence are new to them. Fig. 6 shows an example of an authentic context of four friends having a picnic in a park.

Fig. 6. An authentic context of four friends having a picnic in a park to depict the usage of character来 [lai2] "to come"

2.5 Summative Assessment

After the CFL learner accomplishes the learning mission, a summative assessment is administered online. In the assessment, items on each activity (such as radical, character, and meaningful context) will be used to measure CFL learners' mastery of all the taught materials which are including radicals, characters and their usage in meaningful context. CCCLS will keep the learning and test records of each CFL learner. The information can help individual learner understand their learning status as well serve as a reference framework for CFL teachers to develop an adaptive teaching program for each individual CFL learner.

3   Conclusion

The Beta version of CCCLS was evaluated by four Americans with basic Chinese language skills. The evaluation focused on several dimensions which include the instruction flow, material introduction, teaching strategies, interactive practice, and individual learning effect. All of the reviewers represented their satisfaction with the learning effects of CCCLS, as well as gave positive comments about all the dimensions. However, all of them also suggested that CCCLS should expand its materials bank. They indicated that CCCLS will contribute more to CFL learners' Chinese reading development if there are more radicals and characters included. Based on the positive comment got from those American reviewers, the future work will focus on the development of learning materials of CCCLS as well as the conduction of a practical experiment to evaluate its learning effect on CFL learners' reading development.

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