

How Chinese Character Recognition Taught Through Character Formation Theory in Preschool? A Systematic Review

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Abstract

Since the revision of the curriculum in 2017, the social demand for Chinese Character Recognition (CCR) in preschool has continued to grow. However, the status quo of CCR in preschools has not changed. The introduction of the Character Formation Theory in Chinese teaching is in accordance with today's needs and is also widely used in current CCR teaching. The paper aims to investigate the general situation of Character Formation Theory and teaching materials currently used by the education departments of various cities and to discuss the problems existing in Character Formation Theory in preschools. This review was predicated on the steps indicated in the PRISMA criteria and new research that combined different research designs. The publications for this study were identified using three renowned databases: China National Knowledge Infrastructure (CNKI) Scopus, and Web of Science (WoS). This review's three major themes were derived from a thematic analysis, which includes (1) research area, (2) language, and (3) timeline. The teaching issues and challenges, type of teaching methods and configuration of each activity from the overall situation had been discussed. This paper expected the implementation of Character Formation Theory from the preschool context. This implementation is not reflected in preschools but teaching competence in Early reading areas as the topics of CCR pursued by the revised curriculum in 2017 had been discussed. Finally, this paper suggests: that we should call for the establishment of preschool CCR guidelines before teaching materials are developed.

Keywords: Character Formation Theory, Teaching, Chinese Character Recognition (CCR), Review, SLR

Introduction

The current research on CCR teaching in preschool needs to be deepened in the future. Many medias have reported on the achievements of preschool CCR teaching in some regions: and many preschools have begun to follow the suit. The development of CCR teaching has a great momentum. This seems to have convinced people conclusion that CCR teaching in early childhood is completely scientific and should be vigorously promoted. Considering the above

trends, the National Preschool Standard-Based Curriculum (revised 2017) (NPSC) aims to develop preliminary awareness of Chinese characters and cultivate interest in Chinese reading. Other than that, CCR is the foundation of reading, and it is also a focus of Chinese teaching in preschool education, which must be achieved.

The difference between Chinese characters and the words of other languages is that Chinese characters have an independent structure. Each Chinese character has its own unique character formation rules (Dong, 2015, P. 25-26). Second, it is an evolving language and character symbol system, that differs from Western languages (Jia, 1995). CCR is often the primary task, especially in teaching classrooms of younger age groups. It is related to the learners' future learning and development in reading acquisition. For example, the smoothness of Chinese text reading, the mastery of key knowledge, and the foundation for learners to further study the content of other subjects of Chinese and all other cultural subjects.

Theory of Liu Shu (六书)

Xu Shen (许慎), an Eastern Han Dynasty (25-220 CE) literature scholar raised *Shuo Wen Jie Zi* (说文解字), "explaining simple and analysing composite characters", the first character book analyses the appearance and origin of Chinese characters development systematically (Huang 黄亢美, 2014). It is also one of the oldest character dictionaries arranged by radicals in Chinese Language and literature history. Note that *Shuo Wen Jie Zi* covered 10516 characters and 540 radicals (部首).

In *Shuo Wen Jie Zi*, Xu gives a detailed explanation of the Chinese script development. It started when Cang Jie (仓颉), a minister of the Yellow Emperor (黄帝), saw traces of bird's feet on the soil. His simple characters are mainly illustrations of objects and ideas, with a simple appearance. Therefore, they are called "patterns" (文). The later stage is a combination of Ideographic (表意) and phonetic (发音). This type of composite characters is called "字" (zì). Today, these two terms are combined into the word (文字), which means "Chinese character" or "Chinese script".

Thus, Xu Shen formulated the six categories of character-formation into a theory of Liu Shu (六书) (Dong, 2015). Liu Shu includes Pictogram (象形), Ideogram (指事), Combined Ideograms (会意), Phonogram (形声), Synonymous Characters (转注) and Loan Characters (假借). From another perspective, the six categories are divided into configuration (Pictogram, Ideogram, Combined Ideograms, Phonogram) and borrowed form (Synonymous Characters, Loan Characters).

Character Formation Theory

Liu Shu is widely used in reading literature. Character Formation Theory is known as "字理识字" (zì lǐ shì zì), which is one of the character-centred approaches in reading literacy. The approach founder, GuoJun (1998), believes that the effectiveness of CCR depends on the student's understanding of the hierarchy of character-formation. Each character contains glyph, pronunciation and meaning (Huang, 2014). An example is shown in Figure 1:

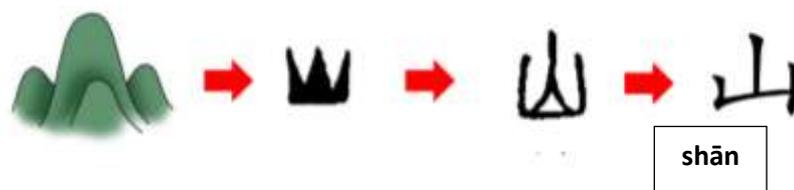


Figure 1

Pictorial origin of character 山 'mountain'

Principles of Character Formation Theory

As highlighted by Jia (1998) in Huang (2014), the principles of Character Formation Theory are first manifested in Chinese character, links between theory and practice, and its compatibility.

1. Principle of scientific nature. The principle of scientific nature is based on character-formation methods. It reasonably splits the structure and layout of Chinese characters and decompose the radicals so learners can understand and memorize easily. This approach practiced the character-formation methods (Pictogram, Ideogram, Combined Ideograms, Phonogram, Synonymous Characters, and Loan Characters). Through these practices, learners can classify Chinese characters effectively. According to the theories of children's cognitive development, children aged 7-11 are in the specific operation stage. Children in this stage will begin with preliminary computing and logical thinking abilities.

2. Principle of the linking between theory and practice. The analysis of Chinese characters should be in line with the reality of the evolution and simplification of modern Chinese characters. Most of the modern simplified characters are simplified according to the rules of Liu Shu. However, some Chinese characters have degenerated. For example, Loan characters have never been literate, so there is no need to explain their characteristics.

Word analysis should align with students' age characteristics and acceptance. In teaching character theory, we must first grasp the depth of word analysis: that is, we must selectively explain character analysis according to students' life experiences. In addition, it is necessary to grasp the breadth of character analysis. After understanding the character's original meaning, original meaning, comprehend the text's other meaning based on context. Finally, it is enough to read and recognize, or to use other methods to memorize.

3. Principle of compatibility. Literacy teaching is a teaching idea, in essence, not a very specific operation method. In practical teaching, various teaching literacies are used, such as centralized literacy, decentralized literacy, literacy of word family phonetic literacy, rhyme literacy, double-brain literacy, and others. Most of these methods or schools of thought are divided based on their standards, so there is a cross-relationship between them.

Strategies of Character Formation Theory

There are three main strategies of Character Formation Theory: traceability and comparison, decomposition and combination, as well as radical activation by features, explained by Huang (2014) in (Cui, 2015).

1/ Traceability and Comparison

Tracing the sources mainly refers to summarizing the production process of characters and the changes in appearance, pronunciation and meaning during their development, to achieve the role of research and in-depth analysis of Liu Shu and achieve better teaching results. On the other hand, comparison refers to showing a series of examples of character evolution. The teacher uses modern simplified Chinese characters and ancient Chinese characters to compare. Subsequently, the students observe the changes in the character's historical processes through the intuitive image. The purpose of the comparison strategy is to help students understand and master the meaning of the character. Therefore, Huang 黄亢美 (2014) suggested that Pictogram and Ideograms are appropriate in traceability and comparison strategy.

Pictogram. Pictograms depict a thing's outline and characteristics according to its appearance. A total of 264 pictographs are listed in Shuo Wen Jie Zi. In Shuo Wen Jie Zi, Pictograms occupied about 4 percent of the total number of Chinese characters. Although the total number of pictographs is small, it composes of the basis of Ideogram, Combined Ideogram and Phonogram. Generally, Pictographs mainly contain the human body, animals, plants, apparel and utensils, astronomy and Geography, and others. This is because pictographs are the most comprehensive form of reflecting the original meaning. Figure 2 shows examples of Pictograms.



Figure 2

Example of Pictogram (Source: <https://oec.xmu.edu.cn>)

Ideogram. Ideogram mean “pointing at matters”. This method primarily expressed abstraction and composed Ideograms by adding Ideogram symbols on the Pictographs and combining two abstract symbols. Figure 3 shows examples of Ideograms.



Figure 3

Example of Ideogram (Source: <https://oec.xmu.edu.cn>)

2/ Decomposition and Combination

The strategy of decomposition and combination is mainly to decompose the components of the composite characters. Since most composed characters are made up of independent characters, the radicals or other parts will be explained one by one. After explaining of the meaning and function of the different parts, the components will re-assembled. This strategy is suitable on combined Ideograms teaching. Integrating appearances, pronunciation, and meaning of the character thoroughly enables students to sense the history and culture behind the characters, understand the characters' meaning, and cultivate an interest in exploring, thereby improving learning efficiency.

Combined Ideograms. Combined Ideograms can be translated as “assembled meanings”, combining two or more characters to represent new meanings. The meaning should be displayed when the relationship between characters and character combinations. Figure 4 shows an example of combined Ideograms.

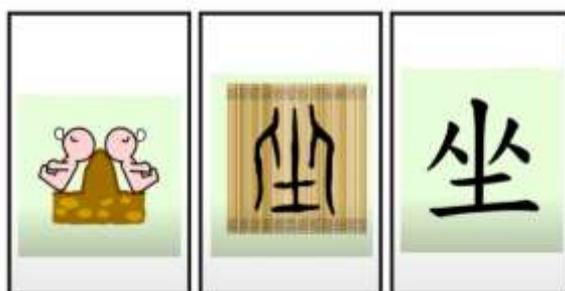


Figure 4

Example of Combined Ideograms (Source: <https://oec.xmu.edu.cn>)

Huang (2014) proposed the teaching method of combined Ideograms (Table 1):

Table 1

Teaching Method of Character Formation Theory

| Method | Explanation |
|---------------------------|--|
| Pattern (规律法) | Analyse character form by repeating the same appearance to enhance meaning. |
| Diagrammatic (图示法) | Memorize characters formation through drawings or illustrations combined with modern Chinese characters. |
| Demonstrate (演示法) | Stimulates thinking skills in conveying the appearance, pronunciation, and meaning of characters formation through body movements. |
| Associative (联想法) | Associate the appearance of characters formation with objects strengthens the memory and increases the student's imagination. |
| Narrative (故事法) | To learn the characters' formation through stories to strengthen children's understanding. |
| Comparative (比较法) | Classify and identify characters formation based on its characteristics, such as phonetic-semantic, radical. |
| Rhyme (歌谜法) | A rhythmic formula with neat sentences compiled according to the rules of Chinese character creation that can be sung. |
| Descriptive (描述法) | Using refined language to clarify the Principles of Chinese character configuration. |

c/ Radical activation by features

The strategy refers to mastering the knowledge or law of a character-formation and infers the knowledge or law of similar things. Commonly, Phonograms can be radical activation by features strategy.

Phonogram. Phonogram covers 84 percent of the total number of Chinese characters in Shuo Wen Jie Zi. It is a character composed of two parts: a part of defining the meaning of the character and a part of providing the sound. Phonogram also involves Polysemy and Polymorphism, the phonetic and original character, accents and suffixes of the component, combined Ideogram and Phonogram, and stages of Phonograms. Figure 5 shows examples of phonograms:

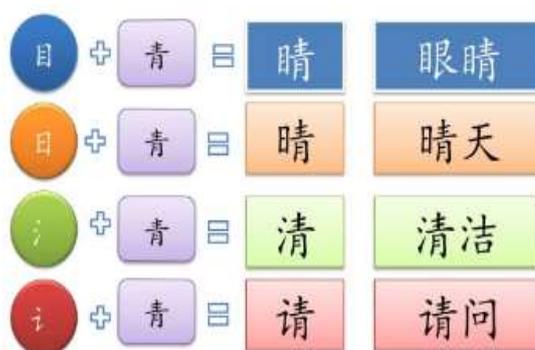


Figure 5

Example of Phonograms (Source: <https://oec.xmu.edu.cn>)

However, Synonymous characters and Loan characters are not highlighted in Character Formation Theory. According to Jia (1998), the Character Formation Theory is in line with the historical origin of how the characters were created in ancient times. It suggests teaching

independent characters combined with a picture of what the characters were originally created for and how they came to their present forms. Using this approach, learners can memorize the characteristics of Chinese characters precisely according to their appearance, pronunciation and meaning. This is supported by research on preschool by (Sun et al., 2014). Character analysis is the most fundamental foundation for literacy, reading and children's thinking training, and the best way to inherit culture.

In teaching characters, teachers play an important role in applying teaching strategies and method according to aptitude. They must comprehensively improve literacy teaching with more reasonable and appropriate teaching methods, take students' interest in learning Chinese characters as an important goal, and carry out spiral innovation and the combination of ladder-shaped innovation.

Early in 1996, Jia GuoJun performed experimental investigations on Primary student. Jia summarized that the theory is applicable to both urban and rural primary and secondary schools, Indigenous Education, adult Illiteracy teaching, and Chinese as Second Language (CSL) learners. However, past studies indicated that Character Formation Theory has the least implemented teaching practice widely as recommended in the Chinese curriculum.

In the current kindergarten literacy teaching, there are two things in common. First, the learning of glyph knowledge adopts the method of repeated rote memorization to achieve the purpose of familiarizing the glyph structure. Second, focus on pronunciation recognition, and make efforts in the combination of word pronunciation and glyph (Sun, Li & Wang, 2014). There is no reasonable basis of characters-based theory, the analysis of the principle of character formation and the structure of the characters is not accurate, and there is a lack of step-by-step teaching methods for character formation from root to independent characters, from easy to difficult. With a huge Chinese character system, the teaching of pronunciation and shape alone will inevitably lead to the phenomenon of little time and poor teaching. Moreover, because of their weak knowledge of philology, some teachers, take the literal meaning and wrongly explain the character's appearance. We can see that student remember the character's appearance but not the meaning.

Like Malaysia, a study towards lower grade Primary teachers indicates unscientific teaching of CCR (Yap & Ngoi, 2020). Teacher did not introduce and interpret Chinese character meanings. According to the results, teachers have paid little attention to explaining the characters' features yet focused on reading texts. Insufficient teaching practice leads to student writing problems and literacy ability. Furthermore, a study by Chong (2016) identifies that only a few characters were mastered by beginner during literacy class due to the uncondusive environment.

The early teaching of preschool has been paid more and more attention to the current theoretical research of preschool education. However, there are still many wrong understandings and practices. In response to this situation, this paper is important to implement systematic reviews related to the research of Character Formation Theory in early reading so that directions of research could be developed in the future. Systematic reviews reflect current research topics, provide updates on research developments, and guide the direction of future research. The result of this study will be able to attract the interest of

teachers and researchers. Accordingly, this review is guided by the following research questions:

1/ What are the methodological trends of CCR teaching based on Character Formation Theory in the Preschool?

2/ What activities of CCR teaching based on Character Formation Theory are embedded in the Preschool?

Material and Methods

i/ Identification

In choosing several appropriate papers for this report, the systematic review process consists of three main phases. The first step is keyword recognition and the quest for linked, similar terms based on the thesaurus, dictionaries, encyclopaedia, and previous studies. Accordingly, after all the relevant keywords were decided, search strings on CNKI, Scopus, and WoS (see Table 2) database have been created. In the first step of the systematic review process, the present research work successfully retrieved 247 papers from three databases.

Table 2

The search strings

| | |
|--------|--|
| CNKI | <p>(Title, Keyword and Abstract = 字理识字) Resources Range:General ; Cross-Language Search ; Dates:Publication Date:2011-01-01到2021-12-31 ; Date Of Update:All</p> |
| Scopus | <p>TITLE-ABS-KEY ((chinese AND character AND method*) AND (chinese AND word AND theory*) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012) OR LIMIT-TO (PUBYEAR , 2011)) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOC")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Chinese")) AND (LIMIT-TO (SRCTYPE , "j") OR LIMIT-TO (SRCTYPE , "p"))</p> |
| WoS | <p>AB=(chinese character method* or chinese word theory*) OR TI=(chinese character method* or chinese word theory*) OR KP=(chinese character method* or chinese word theory*) and Article (Document Types) and English or Chinese (Languages) and Education Educational Research or Asian Studies or Linguistics (Research Areas) and Article (Document Types)</p> |

ii/ Screening

Duplicate papers should be excluded during the first step of screening. The first phase omitted 247 articles, while the second phase screened 127 articles based on several inclusion and exclusion criteria developed by researchers. Literature (research articles) was the first

criterion because it is the primary source of practical information. It also includes the exclusion from the current study of publication in the form of systematic review, review, meta-analysis, meta synthesis, book series, books, chapters, and conference proceedings. Furthermore, the review concentrated exclusively on papers written in English and Chinese. It is essential to note that the schedule was chosen for a ten-year duration (2011-2021). Otherwise, only studies carried out in the Social Science and final publication stage have been selected to conform to the analysis objective. In all, 120 publications based on specific parameters were excluded. Table 3 lists the criteria for exclusion and inclusion.

Table 3

The selection criterion is searching

| Criterion | Inclusion | Exclusion |
|--------------------------|----------------------------------|---|
| Language | English, Chinese | Spanish, French, German |
| Timeline | 2011 - 2021 | < 2010 |
| Literature type | Journal (only research articles) | Journal (book chapter, conference proceeding) |
| Subject Area | SOCI | Besides CS, M, E |
| Publication Stage | Final | In Press |

iii/ Eligibility

For the third step, known as eligibility, a total of 79 articles have been prepared. All articles' titles and key content were thoroughly reviewed at this stage to ensure that the inclusion requirements were fulfilled and fit into the present study with the current research aims. Therefore, 118 reports were omitted because they were not pure science articles based on empirical evidence. Finally, 39 articles are available for review. The flow diagram for the investigation is depicted in Figure 5.

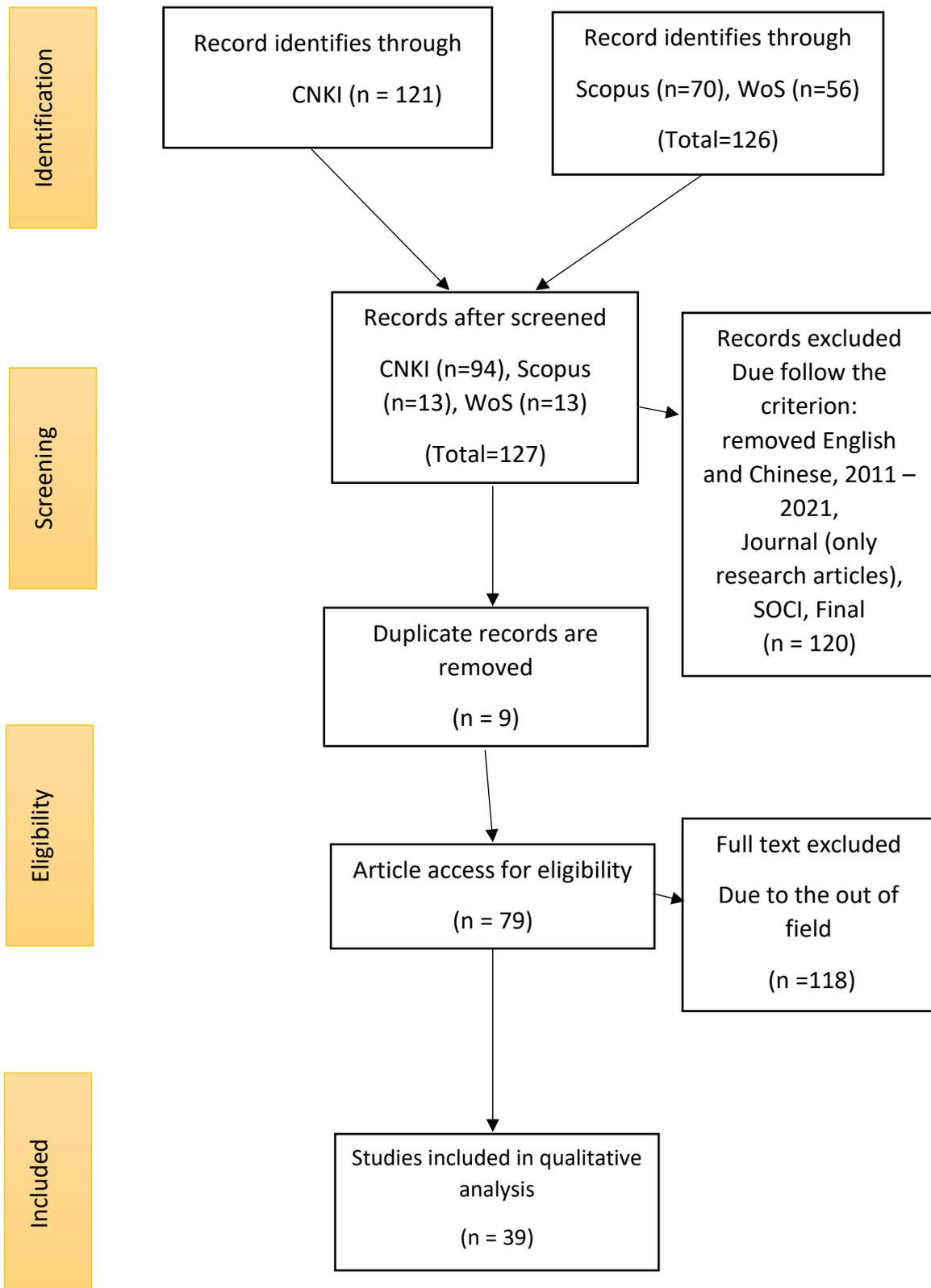


Figure 5. Flow Diagram of the proposed searching study (Moher *et al.*, 2009)

Result and Finding

Based on the searching technique, 39 articles were extracted and analysed. All articles were categorized into three groups: Issues and Challenges, Teaching Methods, and Teaching Activities (Table 4).

Table 4

The research article findings based on the proposed search criterion

| N o r | Autho r | Title | Source | CNKI | Scopus | WoS |
|-------------|-----------------|---|---|------|--------|-----|
| 1 | Wu (2016) | Appropriate use of word literacy* | Chinese Journal of Education | / | | |
| 2 | Song (2014) | Teaching analysis of the method of "word theory and literacy" in primary school Chinese* | Cathay Teacher | / | | |
| 3 | Yao (2020) | Chinese character literacy teaching in the first stage of elementary school based on the unified textbook* | Western China Quality Education | / | | |
| 4 | Kang (2017) | Optimizing primary school literacy teaching by using the teaching mode of characters* | Western China Quality Education | / | | |
| 5 | Li (2019) | Applied Strategies of Character Literacy Teaching in Lower Grades* | Sinogram Culture | / | | |
| 6 | Lin (2018) | Talk On How to Simplify the Teaching of Chinese Characters Using Character Literacy* | Western China Quality Education | / | | |
| 7 | Li (2017) | The Teaching of Character Literacy Should Follow the Scientific Theoretical Principles* | Journal of Hexi University | / | | |
| 8 | Guan (2016) | Strategies for Improving the Efficiency of Chinese Character Literacy Teaching in Primary Schools* | Modern Communication | / | | |
| 9 | Yu (2020) | Talk about Teaching Skills of Foreign Chinese Characters* | Literature Education | / | | |
| 10 | Zhu (2014) | A Brief Discussion on the Teaching of Characters in Chinese Teaching in the Lower Grades* | Popular Science | / | | |
| 11 | Ye (2011) | Skillful use of characters to help literacy* | Fujian Tribune | / | | |
| 12 | Wei (2021) | The ingenious design of characters makes students happy and literate* | Ethnic Education of China | / | | |
| 13 | Zhang (2018) | Appropriately use "character theory" to carry out literacy teaching in lower grades* | Basic Education Courses | / | | |
| 14 | Wu (2016) | Strategies for Improving the Efficiency of Chinese Character Literacy Teaching in Primary Schools* | Western China Quality Education | / | | |
| 15 | Lin (2014) | Talk On the "seven methods" of literacy in primary school Chinese teaching* | Outstanding Figures | / | | |
| 16 | Lin (2019) | Exploration and countermeasure for the teaching of character literacy and writing in Lower Grades* | Cathay Teacher | / | | |
| 17 | Yang (2012) | A Brief Discussion on the Application of Character Theory in Chinese Literacy Teaching in Primary Schools* | Theory Research | / | | |
| 18 | Ta (2016) | Exploration of character literacy in the lower grades of rural primary schools* | Ability and Wisdom | / | | |
| 19 | Chen (2019) | Developing Students' Language Abilities Using the Teaching Method of Literacy of Chinese* | Survey of Education | / | | |
| 20 | Lin (2018) | Improve the efficiency of literacy by relying on characters* | Journal of Fujian Institute of Education | / | | |
| 21 | Zhou (2020) | Character literacy, deduce the charm of Chinese characters—Talk about the teaching of Phonogram characters in the lower grades of primary school* | Bulletin of Chinese Language Teaching | / | | |
| 22 | Wu (2011) | Application of Character Theory in Literacy Teaching* | Journal of Inner Mongolia Normal University | / | | |
| 23 | You (2019) | Make literacy more interesting with the convenience of literacy—A study on the teaching of Chinese characters based on literacy* | Cathay Teacher | / | | |

| | | | | | |
|--------|-------------------------------------|---|--|---|---|
| 2 4 | Gao (2020) | Analysis of teaching strategies for Chinese literacy and writing in primary schools based on the theory of characters* | Science and Technology Information | / | |
| 2 5 | Ji & Tian (2021) | Exploration on Improving Students' Pragmatic Ability with Scientific Character Literacy Teaching* | Journal of Jiangxi Vocational and Technical College of Electricity | / | |
| 2 6 | Huang & Huang (2021) | Reflection on Chinese Literacy Teaching* | Literature Education | / | |
| 2 7 | Du, Zhang & Wang (2021) | The Cultural Arrangement and Teaching Strategies of Chinese Characters in Chinese Textbooks for the Lower Stage of Primary Schools* | Sinogram Culture | / | |
| 2 8 | Chen & Zhao (2020) | On the Cultivation and Training of Students' Imagination Ability in the Teaching of Chinese Characters* | Journal of Qiqihar Junior Teachers' College | / | |
| 2 9 | Luo (2016) | The implementation of word Theory, teaching, highlighting the charm of the text* | Journal of Nanchang College of Education | / | |
| 3 0 | Fan (2016) | Clever Use of "Origin of Chinese Characters" * | The Guide of Science and Education | / | |
| 3 1 | Yu (2018) | Developing Chinese Character Literacy Teaching from the Perspective of Character Formation Theory* | Teaching and Administration | / | |
| 3 2 | Wu <i>et al.</i> (2018) | A Research on the Teacher Training of Elementary Education—On Chinese Literacy Teaching* | Journal of Hebei North University | / | |
| 3 3 | Dong (2012) | The Application of Grapheme Analytic Teaching Strategy to Bilingual Teaching* | Journal of Xinjiang Education Institute | / | |
| 3 4 | Zhao & Luo (2017) | Word motivation teaching and its role in elementary school Chinese literacy teaching-taking an example of Wanzai Primary school in the Xiangzhou district of Zhuhai* | Modern Communication | / | |
| 3 5 | Guo & Qi (2021) | A Survey on Literacy Teaching in the Guangdong-Hong Kong-Macao Greater Bay Area from the Perspective of Chinese Character Rational* | Sinogram Culture | / | |
| 3 6 | Lin (2018) | Optimizing the Quality of Lower-grade Students' Literacy Ability through Visualized Character Explanation Teaching: A Case Study on the Research Subject of Literacy Teaching Methods in Sanming Experimental Primary School* | The Science Education Article Collects | / | |
| 3 7 | Cheng , Hung & Yeh (2021) | The Effects of Multimedia Assisted Materials for Self-Learning Chinese Characters | Journal of Technology and Chinese Language Teaching | / | / |
| 3 8 | Zhou <i>et al.</i> (2017) | Reliance On Orthography and Phonology in Reading of Chinese: A Developmental Study | Journal of Research in Reading | / | / |
| 3 9 | Chen <i>et al.</i> (2013) | Using A Radical-derived Character E-learning Platform to Increase Learner Knowledge of Chinese Characters | Language Learning and Technology | / | |

* *Chinese Full Text*

Table 5

Issues and Challenges, Teaching Methods, and Teaching Activities

| No | Author | Terms | Subject | Issue and Challenge | Teaching Method | Teaching Activity |
|----|--------------|-------|---------------|--|--|--|
| 1 | Wu (2016) | - | Primary China | 1. Not considering student's level and receptivity 2. Teacher's language is not suitable | Diagrammatic, Associative, Categorize | 1. Pictogram 2. Ideogram 3. Combined Ideograms 4. Phonogram |
| 2 | Song (2014) | - | Primary China | Heavy teaching tasks | Diagrammatic, Associative, Categorize | 1. Pictogram 2. Ideogram 3. Combined Ideograms-decompose into independent characters 4. Phonogram |
| 3 | Yao (2020) | - | Primary China | - | Diagrammatic, Categorize, Comparative, Analyse | 1. Pictogram-synchronize pictures and words 2. Ideogram 3. Combined Ideograms 4. Phonogram-categorize meaning component |
| 4 | Kang (2017) | - | Primary China | - | Diagrammatic, Narrative, Comparative, Descriptive | - |
| 5 | Li (2019) | - | Primary China | - | Rhyme, Wordle | 1. Pictogram-compare picture and word 2. Ideogram-decompose and assemble character 3. Phonogram-compare Phonogram, meaning-based on component |
| 6 | Lin (2018) | - | Primary China | - | Diagrammatic, Associative | 1. Pictogram 2. Phonogram-increment and decrement of radicals, switch radical, composite structure |
| 7 | Li (2017) | - | Primary China | Wrongly analyse Phonogram | Categorize | 1. Combined Ideograms-categorize combined Ideograms 2. Phonogram-categorize Phonogram, categorize and analyse composite structure |
| 8 | Guan (2016) | - | Primary China | 1. Outdated teaching method 2. Learning pressure | Associative, Situational | - |
| 9 | Yu (2020) | - | China CSL | 1. Different language systems 2. Not understanding the appearance and meaning of characters | Diagrammatic, Demonstrate, Practice | 1. Pictogram 2. Character writing demonstration and practice |
| 10 | Zhu (2014) | - | Primary China | 1. Focused on appearance and pronunciation 2. Common mistakes-homophones, similar-shaped characters 3. Not understanding the meaning of characters | Categorize, Wordle | 1. Pictogram 2. Ideogram 3. Combined-Ideogram 4. Phonogram-categorize similar shaped character/ similar radical/ homophone, increment and decrement of radicals, switch radically |
| 11 | Ye (2011) | - | Primary China | Focused on pronunciation and appearance | Diagrammatic, Associative, Comparative, Descriptive | 1. Pictogram 2. Ideogram 3. Combined Ideograms 4. Phonogram |
| 12 | Wei (2021) | - | Primary China | - | Demonstrate, Narrative, Wordle | - |
| 13 | Zhang (2018) | - | Primary China | 1. Lack of awareness in selecting suitable words 2. Over-speak during an explanation 3. Incorrect introduction | Diagrammatic, Demonstrate, Associative, Narrative, Comparative, Rhyme, Descriptive | 1. Pictogram 2. Ideogram 3. Combined Ideograms 4. Phonogram- categorize radical |
| 14 | Wu (2016) | - | Primary China | 1. Outdated teaching method | Situational | - |

| 2. Learning pressure | | | | | | |
|----------------------|------------------|---|---------------|--|--|---|
| 15 | Lin (2018) | - | Primary China | 1. Lack of learning interest 2. Grammar mistakes due to relying on Pinyin | Diagrammatic, Associative, Descriptive, Comparative | 1. Pictogram 2. Ideogram 3. Combined Ideograms 4. Phonogram |
| 16 | Lin (2014) | - | Primary China | 1. Learning pressure 2. Difficulty in memorizing | Diagrammatic, Rhyme, Demonstrate, Narrative, Associative, Descriptive, Comparative | - |
| 17 | Lin (2019) | - | Primary China | - | Diagrammatic, Demonstrate, Associative | 1. Pictogram-introduce characters, Synchronize pictures and word 2. Ideogram 3. Combined Ideograms-decompose into independent characters |
| 18 | Yang (2012) | - | Primary China | - | - | 1. Pictogram 2. Ideogram 3. Combined Ideograms 4. Phonogram |
| 19 | Lin (2018) | - | Primary China | - | Diagrammatic, Narrative, Associative | 1. Pictogram-compare picture and text 2. Ideogram 3. Combined Ideograms 4. Phonogram-homophone, radical |
| 20 | Zhou (2020) | - | Primary China | - | Rhyme | Phonogram-identify grapheme and phoneme |
| 21 | Wu (2011) | - | Primary China | Ignore the errors in the approach | Demonstrate, Analyse, Comparative, Transferral | 1. Pictogram 2. Ideogram 3. Combined Ideograms-analyse combined Ideograms 4. Phonogram-compare character glyph/ character pronunciation/ based on radical meaning / similar-shaped radicals, analyse radical |
| 22 | You (2019) | - | Primary China | - | Diagrammatic, Demonstrate, Associative, Descriptive, Comparative, Situational | 1. Pictogram-demonstrate character structure and glyph 2. Ideogram-explain 3. Combined Ideograms 4. Phonogram-compare phoneme/ composite structure |
| 23 | Gao (2020) | - | Primary China | 1. "Indoctrination" teaching method 2. Mechanical memory method 3. Learning load damage enthusiasm | Diagrammatic, Wordle, Demonstrate, Narrative, Associative | 1. Pictogram-Synchronize picture and word 2. Ideogram 3. Combined Ideograms 4. Phonogram-identify component structure |
| 24 | Ta (2016) | - | Primary China | Chinese characters are abstract and difficult - by rote memorization - lose interest | Categorize, Comparative | 1. Combined Ideograms-increment and decrement of character (remember appearance) 2. Phonogram-categorize radicals, switch radicals -homophone, variety of pronunciation reading styles (remember pronunciation) |
| 25 | Chen (2019) | - | Primary China | - | Diagrammatic, Wordle, Demonstrate, Associative | Phonogram-analyse character, grasp the radicals and make key associations |
| 26 | Ji & Tian (2021) | - | Primary China | - | Diagrammatic, Demonstrate, Narrative, Associative, Descriptive | 1. Pictogram + Ideogram 2. Combined Ideograms-analyse appearance of a character 3. Phonogram-association of science diverges abstract thinking |

| | | | | | | |
|----|--------------------------|-------------------------------------|----------------------------|---|--|--|
| 27 | Huang & Huang (2021) | - | Primary China | - | Diagrammatic, Rhyme and Wordle, Categorize, Demonstrate, Comparative | - |
| 28 | Du, Zhang & Wang (2021) | - | Primary China | - | Diagrammatic, Categorize, Wordle | 1. Pictogram 2. Ideogram 3. Combined Ideograms 4. Phonogram-categorize semantic radical and phonetic radical |
| 29 | Luo (2016) | - | Primary China | Adopt the demonstration and imitation method | Diagrammatic, Demonstrate, Associative, Categorize, Comparative | 1. Pictogram 2. Phonogram-compare similar-shaped character |
| 30 | Zhao & Luo (2017) | - | Primary China | 1. Negative learning attitude 2. Do not pay attention to research culture | Diagrammatic, Associative | 1. Pictogram-introduce character 2. Ideogram-intuitive image 3. Phonogram-identify radicals |
| 31 | Fan (2016) | Word Management Literacy Method | Primary China | 1. Parents' education level 2. Lack of teaching method knowledge 3. Lack of learning initiative | - | Phonogram-identify homophone/ similar-shaped character/ phonogram |
| 32 | Yu (2018) | Character Formation Theory | Primary China | - | Diagrammatic, Associative, Descriptive, Comparative | 1. Pictogram + Ideogram 2. Combined Ideogram-analyse characters 3. Phonogram-identify grapheme and phoneme |
| 33 | Wu et al. (2018) | The Rule of Literacy | Primary China | 1. Lack of cultural knowledge 2. Mechanicals memorize and pay little attention to the original meaning of character 3. Ineffective teaching materials | Diagrammatic, Analyse, Wordle | 1. Pictogram-synchronize picture and word 2. Phonogram-analyse between phonogram pronunciation and Phonetic component |
| 34 | Dong (2012) | Grapheme Analytic Teaching Strategy | - China Bilingual teaching | 1. Lack of cultural knowledge 2. Mislays of the culture 3. Low efficiency and rote memorizing | Diagrammatic, Comparative, Categorize | 1. Pictogram + Ideogram-synchronize picture and word 2. Combined Ideograms-categorize same component 3. Phonogram-categorize similar grapheme/ phoneme, compare similar-shaped character, identify homophone |
| 35 | Guo & Qi (2021) | Chinese Character Rational | Primary China | 1. Lack of understanding of the original formation of characters 2. Literacy errors-homophones, radical, stroke form, stroke increment and reducing | - | Phonogram-meaning-based radicals |
| 36 | Chen & Zhao (2020) | Word Theory | Primary China | 1. Weak self-control and restraint abilities 2. Boring traditional teaching mode and does not meet growth and cognitive laws | Diagrammatic, Rhyme, Demonstrate, Wordle | - |
| 37 | Cheng, Hung & Yeh (2021) | - | University College China | - | - | Phonogram-Pinyin, recognize radicals |
| 38 | Zhou et al. (2017) | - | Adults and children China | - | - | Phonogram-homophone, identical orthography, similar-orthographic |

| | | | | | | |
|----|--------------------|---|-------------------------|--|-------------------------|---|
| 39 | Chen et al. (2013) | - | Adults Taiwan CSL | 1. Memorizing characters and writing mechanically 2. Rarely use phonetic or semantic components | Diagrammatic, Narrative | Phonogram-radicals, recognize radicals/ grapheme/ phoneme |
|----|--------------------|---|-------------------------|--|-------------------------|---|

Terminology of Character Formation Theory

Table 6

Comparison of Terminology

| Terminology | Sources |
|---------------------------------|-------------------------|
| The Rule of Literacy | Wu <i>et al.</i> (2018) |
| Word theory | Chen & Zhao (2020) |
| Word Management Literacy Method | Fan (2016) |
| Chinese Character Rational | Guo & Qi (2021) |
| Character Formation Theory | Yu (2018) |
| Grapheme Analytic Strategy | Dong (2012) |

There can be many terms to identify Character Formation Theory. Through summarizing the existing research results, the Character Formation Theory can be defined as the word management literacy method (Fan, 2016), Chinese Character Rational (Guo & Qi, 2021), the rules of literacy (Wu *et al.*, 2018), word theory (Chen & Zhao, 2020), Character Formation Theory (Yu, 2018), and grapheme analytic teaching strategy (Dong, 2012).

Figure 4 presents 87 percent of the study examined on Primary school student (Song, 2014; Yao, 2020; Guan, 2016; Lin, 2014; Yang, 2012; Kang, 2017; Fan, 2016; Wu *et al.*, 2018; Ye, 2011; Wu, 2016; Zhu, 2014; Lin, 2019; Li, 2019; Du, Zhang & Wang, 2021; Zhou, 2020; You, 2019; Lin, 2018; Yu, 2018; Chen & Zhao, 2020; Li, 2017; Lin, 2018; Wu, 2011; Ji & Tian, 2021; Huang & Huang, 2021; Guo & Qi, 2021; Wei, 2021; Zhang, 2018; Wu, 2016; Lin, 2018; Gao, 2020; Ta, 2016; Chen, 2019; Luo, 2016; Zhao & Luo, 2017). Other 13 percent studies examined on university college student (Cheng, Hung & Yeh, 2021), adult (Chen *et al.*, 2013), adults and children (Zhou *et al.*, 2017), and unknown subject (Yu, 2020; Dong, 2012).

As shown in Figure 5, 92 percent of the research examined on native Chinese (Song, 2014; Yao, 2020; Guan, 2016; Lin, 2014; Yang, 2012; Kang, 2017; Fan, 2016; Wu *et al.*, 2018; Ye, 2011; Wu, 2016; Zhu, 2014; Lin, 2019; Li, 2019; Du, Zhang & Wang, 2021; Zhou, 2020; You, 2019; Lin, 2018; Zhou *et al.*, 2017; Chen *et al.*, 2013; Li, 2017; 2014; Lin, 2018; Wu, 2011; Cheng, Hung & Yeh, 2021; Ji & Tian, 2021; Huang & Huang, 2021; Yu, 2018; Dong, 2012; Chen & Zhao, 2020; Luo, 2016; Zhao & Luo, 2017; Chen, 2019; Ta, 2016; Gao, 2020; Lin, 2018; Wu, 2016; Zhang, 2018; Wei, 2021). Only 7 percent of the researchers studied on CSL learners (Chen *et al.*, 2013; Yu, 2020), and bilingual teaching (Dong, 2012).

Teaching Methods of Character Formation Theory (34 articles)

Previous studies have investigated the teaching methods of Character Formation Theory. For example, Kang (2017); Wu (2016); Song (2014); Yao (2020); Lin (2018); Yu (2020); Ye (2011); Zhang (2018); Lin (2018); You (2019); Gao (2020); Chen (2019); Lin (2014); Ji and Tian (2021); Du et al (2021); Huang and Huang (2021); Luo (2016); Zhao and Luo (2017); Yu (2018); Dong (2012); Chen and Zhao (2020); Lin (2018); Chen *et al* (2013); Lin (2019); Wu *et al* (2018) studied diagrammatic.

Meanwhile, Yu (2020); Wei (2021); Zhang (2018); Lin (2014); Lin (2019); Wu (2011); You (2019); Chen (2019); Ji and Tian (2021); Huang and Huang (2021); Luo (2016); Gao (2020);

Chen and Zhao (2020) studies presented on demonstrate method. In a different study, Wu (2016); Song (2014); Lin (2018); Ye (2011); Zhang (2018); Lin (2018); Lin (2014); You (2019); Gao (2020); Chen (2019); Ji and Tian (2021); Guan (2016); Lin (2018); Luo (2016); Zhao & Luo (2017); Yu (2018); Lin (2019) examined on associative method.

The study by Gao (2020); Zhang (2018); Wei (2021); Kang (2017); Lin (2014); Ji and Tian (2021); Lin (2018); Chen *et al* (2013) investigated narrative. Furthermore, Yao (2020); Kang (2017); Ye (2011); Lin (2018); Zhang (2018); Lin (2014); Wu (2011); You (2019); Ta (2016); Yu (2018); Luo (2016); Dong (2012); Huang and Huang (2021) primarily concentrated on comparative.

On the other hand, Kang (2017); Lin (2014); Yu (2018); Ye (2011); Li (2019); You (2019); Lin (2018); Zhang (2018); Ji and Tian (2021) presented on descriptive while Lin (2014), Zhang (2018), and Chen and Zhao (2020) investigated on rhymes. Findings also revealed other related methods conducted in Character Formation Theory such as wordle (Chen & Zhao, 2020; Du, Zhang & Wang, 2021; Chen, 2019; Gao, 2020; Zhu, 2014; Li, 2019; Wu *et al.*, 2018), rhyme and wordle (Huang & Huang, 2021), situational (Guan, 2016; You, 2019; Wu, 2016), practice (Yu, 2020), transferral (Wu, 2011), analyse (Wu, 2011; Yao, 2020; Wu *et al.*, 2018), and categorize (Huang & Huang, 2021; Wu, 2016; Yao, 2020; Li, 2017; Zhu, 2014; Du, Zhang & Wang, 2021; Ta, 2016; Luo, 2016; Dong, 2012).

Teaching Activities of Character Formation Theory (32 articles)

A large and growing body of literature has studied teaching activities. As Table 6 shows, we can see the various type of activities.

i/ Pictogram

With the traceability and comparison strategy, there is a consensus among social scientists suggests starting with Pictogram (Song, 2014; Wu, 2016; Lin, 2018; Zhu, 2014; Ye, 2011; Zhang, 2018; Lin, 2018; Wu, 2011; You, 2019; Ji & Tian, 2021; Zhao & Luo, 2017; Luo, 2016; Du, Zhang & Wang, 2021; Dong, 2012; Yu, 2018). This finding was later explained by You (2019) which demonstrated the characters' structure and appearance.

Through the features of Chinese character, Yang (2012) proposed Pictogram for teaching CCR. Li (2019); Lin (2018) discussed the comparison of pictures and words. On the other hand, Lin (2019); Zhao and Luo (2017) study introduced characters through Pictograms. In contrast, the studies by Gao (2020); Yao (2020); Lin (2018); Lin (2019); Wu *et al* (2018); Dong (2012) found differences which recognize Chinese character through intuitive Image (Synchronize of picture and word). This is consistent with the study by Yu (2020), which highlights using pictures as a tool in teaching Pictograph characters.

ii/ Ideogram

In a different study, Li (2017); Yao (2020); Song (2014); Li (2019); Ye (2011); Zhu (2014); Zhang (2018); Lin (2018); Lin (2019); Yang (2012); Lin (2018); Wu (2011); Du et al (2021); Wu (2016) examined Ideogram. In teaching Ideograms, Gao (2020) suggested showing Pictograms and adopting the generalized abstract diagram method. A study by Zhao and Luo (2017) investigated intuitive images in Ideogram teaching. Alternatively, You (2019) demonstrated Ideogram through the descriptive method. Several studies have a consensus that applies the same activity to both Pictograms and Ideograms (Ji & Tian, 2021; Yu, 2018; Dong, 2012).

iii/ Combined Ideograms

Numerous studies have attempted to explain combined Ideograms (Wu, 2016; Yao, 2020; Zhang, 2018; Ye, 2011; Zhu, 2014; Lin, 2018; Lin, 2018; Yang, 2012; You, 2019; Gao, 2020; Ta, 2016; Du, Zhang & Wang, 2021). In this stage, Li (2019) study proposed the decomposition and assembly of the Chinese character activity. Moreover, Li (2017); Dong (2012) conducted an activity to categorize combined Ideograms, while Wu (2011) proposed the analysis of combined Ideogram activity. On the other hand, Ji and Tian (2021); Wu (2011); Yu (2018) analyse combined Ideograms. With the same objectives, Song (2014); Lin (2019) provides an in-depth analysis of the work of Chinese character learning rules, which discovered the decomposition of combined characters by independent characters.

iv/ Phonogram

According to Lin (2018), the Phonogram involves principles of association and imagination. Song (2014); Ji and Tian (2021); Ye (2011); Lin (2018) observed on Phonogram. Several study analyses have examined the relationship between Phonogram and CCR (Yang, 2012; Li, 2017; Li, 2019). This is supported by a study by Zhu (2014), which recommended character classify literacy teaching Phonograms. A study by Chen (2019) identifies phonogram analysis, and association by radicals.

The study by Lin (2018) proposed the “radicals say something” activity. Studies by Wu (2011) and Guo and Qi (2021) supported it, which highlighted radicals reflect character’s meaning. Du, Zhang and Wang (2021) also investigated semantic radical and phonetic radical. Early studies by Wu (2011) and Zhu (2014) carried out similar-shaped radicals. Studies by Zhu (2014), Zhao and Luo (2017), Chen *et al.* (2013), Zhang (2018), Chen (2019), Lin (2018), Cheng, Hung and Yeh (2021), Chen *et al.* (2013), and Ta (2016) focused on radicals’ area such as radical analysing, radical recognition, radical classification, increment and decrement of radicals, and radical switching in recognizing character’s appearance.

In a different study, Fan (2016); Luo (2016); Wu (2011); Dong (2012) investigated similar-shaped characters. Dong (2012); Zhou (2020); Yu (2018); You (2019); Wu (2011); Chen *et al.* (2013); Lin (2018) gave a comprehensive review on grapheme and phoneme. In contrast, Wu (2016); Lin (2018); Dong (2012); Yu (2018); Ta (2016); Zhu (2014); Zhou *et al.* (2017), and Fan (2016) studied on homophone. To remember pronunciation, Ta (2016) suggests using various pronunciation in reading style to remember the pronunciation.

Yao (2020); Li (2019) conducted meaning-based component activity. Furthermore, Wu (2016); Wu *et al.* (2018) research analysing meaning component and grouping the Phonetic component in CCR implementation. With the same objective, both Zhou (2020); Zhou *et al.* (2017) identify similar-orthographic characters. Zhou *et al.* (2017) added an investigation on identical sentences. Lin (2018); Li (2017); You (2019); Gao (2020) extended this work to examine composite structure.

The study by Cheng *et al.* (2021); Lin (2018) examined Pinyin in CCR teaching. Research findings by Yu (2020) suggested demonstrating and practicing written Chinese characters, which is consistent with the study of Kang (2017), stating that writing practice enhance Chinese character acquisition.

Issues and Challenges (23 articles)

Few studies on the relationship between issues and challenges of Character Formation Theory have been conducted owing to the importance of CCR. However, there have been several studies in the literature reporting that outdated teaching methods still happened in the classroom (Guan, 2016; Wu, 2016). In the same years, Fan (2016) found that teachers lack teaching method knowledge and cannot teach flexibly and diversely. This is supported by a recent study by Chen & Zhao (2020), which identified the traditional teaching mode is boring and does not meet the requirements of the growth and cognitive laws. Wu (2016) found similar results to those obtained by Chen & Zhao (2020), teachers do not consider the student's level and receptivity.

Furthermore, study by Luo (2016) demonstrated that most teachers adopt the demonstration and imitation method. In addition, a study by Gao (2020) showed that teachers adopt the "indoctrination" teaching method based on narration. The study also found that students memorize Chinese characters via mechanical memory methods. This is consistent with the study by Chen *et al* (2013); Wu *et al* (2018) which said that student memorize mechanically and pay only a little attention to the meaning of Chinese character. Similarly, memorizing abstract characters is even more difficult and may cause learners to lose learning interest (Ta, 2016; Lin, 2018; Fan, 2016).

According to Wu *et al* (2018); Dong (2012), teachers lack cultural knowledge of Chinese characters. The more surprising correlation is when Dong (2012) found it fundamentally forfeited due to the mislay of the culture. Early in 2011, a study by Wu revealed that teacher ignore the mistakes of Character Formation Theory in teaching CCR. Wu lists three mistakes that emphasize form over meanings, emphasis on fun over rationales, and emphasis on recognition over implementation. In addition, a study by Wu (2016) found teachers' language unsuitable.

The above findings are consistent with the study by Zhang (2018) revealed the incorrect introduction of Chinese characters. The study also found that teachers over-speak during an explanation and lack awareness in selecting suitable words. Due to insufficient practice, teachers only mention common Chinese characters' meanings and appearances (Li, 2017). This finding contradicts the study by Ye (2011), which presented that teacher focused on pronunciation and appearance. We can conclude that teachers do not apply the three elements of appearance, pronunciation and meaning according to character principles.

Later, Chen *et al* (2013) mentioned that teachers rarely used phonetic or semantic components during teaching. Another finding by Li (2017), indicated that educators wrongly analysed the Phonogram into comprehensible characters, and hierarchical structures were analysed into parallel structures. However, the situation of literacy in primary schools is not optimistic due to heavy teaching task on teachers, which was concluded by (Song, 2014).

There have been several studies in the literature that identified teaching resources issues. For example, Wu *et al* (2018) show the ineffectiveness of the teaching materials. In a different study, interestingly, Zhao and Luo (2017) revealed that teacher do not attach importance to research culture.

Several attempts have been made at student literacy abilities. For example, a study by Guo and Qi (2021) mentions student lack of understanding of the original formation of characters. Another study by Zhao and Luo (2017) posited that students' negative attitude towards literacy. Guan (2016); Wu (2016); Lin (2014) also show similar results of students having pressure in learning Chinese characters. A more recent study by Gao (2020) also summarized that student lose enthusiasm due to the learning load.

According to Lin (2014), the lower grade learner faced difficulties memorizing characters due to the huge number of Chinese characters. The result is in the lines of earlier literature by Dong (2012) which revealed the learner's low efficiency and inconsistency in practicing rote habits in memorizing new words. In addition, a study by Chen and Zhao (2020) mentions that students' self-control and restraint abilities are weak. However, Fan (2016) considered parents' education level as one of the factors. In 2020, Yu (2020) investigated CCR towards Chinese as Second Language (CSL) learners. The findings demonstrated another difficulty: Yu explained that the native language of foreigners is the alphabetic system. Note that Chinese characters are an Ideographic system. Therefore, international students cannot learn Chinese characters through their native language due to the two different language systems.

Furthermore, Yu also found the disabilities of international students in grasping the relationship between the appearance and meaning of Chinese characters. It is hard for them to memorize Chinese character's meanings. Interestingly, Guo and Qi (2021) provided detailed literacy errors in lower primary students, such as homophone, radical, stroke form, stroke increment and reduction due to unclear comprehension of the origin of Chinese characters. Similarly, Zhu (2014) revealed the mistake of homophones and similar-shaped characters, especially in teaching Phonograms. After few years, a study by Lin (2018) highlights that reliance on Pinyin may cause grammar mistakes.

Discussion

The discussion of the results begins with terminology. Many words are used for the same thing. For example, "theory" (Chen & Zhao, 2020; Yu, 2018), "method" (Fan, 2016), "literacy" (Wu *et al.*, 2018), "strategy" (Dong, 2012). Other terms were also found such as using the Chinese Character Rational (Guo & Qi, 2021) as the title and keyword with the same objectives. However, "Chinese character" and "word" can be used interchangeably a comparison of terms used for Character Formation Theory seen in Table 1.

A careful study of the literature reveals that most studies focus on primary school. Hence, a clear understanding of Character Formation Theory is essential for teaching CCR. In addition, the research has focused on native Chinese rather than CSL learners. Based on the results, this study outlined the research topics between 2011-2021. It was observed that many publications discuss the teaching method in Character Formation Theory. In contrast, issues and challenges were the lowest research topic among all. After an analysis, the first theme was established from 39 articles. These predictors were organized into three groups as previously described: (a) Teaching methods, (b) Teaching activities, and (c) Issues and challenges.

Among the teaching methods of Character Formation Theory, the most popular was diagrammatic. The finding is in lines with Liu Shu in terms of explaining the origin of the Chinese characters. According to Eisenberg (2014), the response speed of the human brain in processing images is 60,000 times faster than text. Other than that, 90 percent of the visual's information can reach the brain. Character is the object's appearance, while language represents the object's name. Before text is generated, a human notes a picture. Since humans are inherently visual, intuitive information such as images or pictures play an important role in language teaching Chinese characters.

Demonstrate method enables students to acquire knowledge by displaying various objects and teaching aids, conducting demonstration experiments, or using modern teaching methods (Huang, 2015). This method is often used together with the teaching and conversation method. It plays an important role in improving students' interest in learning, developing observation and abstract thinking abilities, and reducing difficulties in learning. Commonly, researchers also investigated the associative method, narrative method, descriptive method, rhyme method and comparative method. Based on the analysis, the combination of rhyme and wordle methods seems to contradict the suggestion provides in Huang (2015), which rhyme and wordle methods implement in separately.

In the early stages of early childhood literacy, Sun et al (2014) describes wordles as an interesting method. Every word has an etymological meaning. The wordle are concise and figurative, has strong ideological clues. Besides to helps children to master the shape or meaning of Chinese characters, it achieves the effect of recognizing Chinese characters which fun and efficient.

Interestingly, the new methods such as situational method, transferral method, analyse method, practice method and categorization method were also presented during the review. In particular, the pattern method remains unexplored. This reflects a limitation in how learners have been exposed to how the character can be learned. Dong (2020) concluded that there is still an unsolved question in practicing the character-formation method, which is in good agreement with the results of the present study.

First, Li (2020) identifies that teacher applied some methods (diagrammatic, descriptive, and comparative). It is indicated that the teacher may have focused only on a very narrow band of character-formation methods for teaching the character. However, interestingly, this is contrary to a study by Lam (2008) on the comparison of CSL and native Chinese, which presented that they could use a diverse variety of methods to analyse new characters. Therefore, considerably work will need to be done to determine the various ways of teaching Chinese character.

As highlighted by Huang (2015), implementing the of Character Formation Theory must in line with the character's scientific nature, following the rules of literacy teaching. To master CCR, teaching should begin with Liu Shu: Pictogram, Ideogram, Combined Ideograms, and Phonogram. Based on the characteristics of Chinese pictographs, most teaching materials will use pictures and pictographs to assist teaching to help student memorize Chinese characters. This is consistent with the present finding by Yu (2020) that points towards the logograph as a starting point in introducing basic Chinese characters.

In the Pictogram stage, the findings suggest that the teacher introduce character through Pictogram, picture and character comparison, characters' structure, and appearance activity. In addition, a few studies investigated recognizing Chinese characters through intuitive images (Synchronizing pictures and words). The present finding also support the theory of Liu Shu which concluded that intuitive image meets the learners' cognitive law, memorizing the meaning of Chinese characters as stated in Huang (2015), "see character know the appearance, see appearance know the meaning".

Sun, Li and Wang (2014) suggest that visualized teaching of independent characters with pictures and texts can be adopted in kindergartens. Among the more than 7,000 Chinese characters, there are only more than 200 independent characters. Independent characters mainly come from pictographs, which are the earliest method of Chinese character formation. It describes the shape of things to create characters. For example, the pictograph of "日" (rì, sun) is a circle with a point in the centre of the circle, the pictograph of "月" (yuè, moon) is "half-moon, with a point in the centre".

National Preschool Standard-Based Curriculum (NPSC) is a comprehensive document focusing on content, learning standards, and learning components in teaching CCR. According to the guidelines, teachers instruct students to identify similar-shaped characters, homophones, or other easily confused characters (NPSC, 2017). The guidelines also suggest introducing the relationship between physical objects, graphics, and characters. For example: 山 (shān, mountain), 水 (shuǐ, water), 月 (yuè, moon). In this age, there is no need to introduce terminology such as "independent characters", "Composite characters", or "Pictograph" to the students.

Phonogram are divided into sound of character, phonetic, and orthographic properties. Orthographic properties included feature, shape, structure, position, and stroke (Xing, Shu & Li, 2004). From the above analysis, many studies mention Phonogram activity. For example, Phonograms, analyse Phonograms with the association of radicals, categorize grapheme and phoneme, identify a similar-shaped character, identify homophones, identify a meaning-based component, analyse meaning component and grouping of Phonetic components. Subsequently, we can identify a similar-orthographic character, identical sentences, meaning-based radicals, similar-shaped radicals, radical analysing, radical recognition, radical classification, increment and decrement of radicals, radical switching, semantic radical, phonetic radicals, and analyse of the composite structure.

Findings from the present study agrees relatively well with that from Zhu (2014), which Huang (2015) mentions decomposing the radical so that learners can understand and memorize easily. From this data, we can see that researchers conducted different ways of teaching activities. The result is in line with Liu Shu, which is the suggestion of meaning component and phonetic component, homophone unlike the learning standard of CCR outlined in the NPSC, which lacks clear definitions. Only a little detail explains each component (Table 7). Therefore, learning standard concepts need further clarification for teachers.

For the teaching of composite characters such as Phonogram, the purpose of the teaching of the word-type based method is to let children master the ideographic categories of radicals, and to deepen children's understanding of the characteristics of Chinese characters based on shape and meaning (Sun et al., 2014). According to Sun et al (2014), children's able to think logically and draw inferences about Chinese characters and understand them by analogy through word-type based teaching method. Similarly, this is similar with Huang (2015) which mentions decomposition of radicals enhance learners' comprehension and memory.

Furthermore, the teaching of complex characters can be taught by compiling wordle and using association ideas. As highlighted by Guo and Qi (20121) earlier, Chinese characters bring difficulties to children's understanding on meaning due to the complicated structures. To solve these problems, the physical structure of Chinese characters provides us with rich materials for compiling wordle (Sun, Li & Wang, 2014). The wordle made by the method of splitting characters reveal the shape of Chinese characters and imply the meaning of Chinese characters. For example, 月亮跟着太阳走 (The moon follows the sun), the answer 明 (míng). Through associative thinking, children can analyse the shapes according to the meanings, and judge and guess the answers.

Undeniable, Chinese characters are abstract. Doctor Isao Ishii (in Sun, Li & Wang, 2014), an expert of Japanese Kanji Education discovered it is easier for young children to combine Chinese character shapes and objects than to combine spoken phonetics with objects. In early literacy teaching, it is necessary to create a suitable Chinese character environment for children, so that they can naturally associate Chinese characters with real objects and recognize them intuitively and vividly. Through various forms of teaching mode, it will turn the original abstract symbols into vivid things. For example, "Knowing the Classroom" activity. Lead the student to recognize class name and location of the classroom. During introduction of the room such as kitchen, washroom and staff room, teacher show the characters of it. Other than that, teacher paste the objects name on the toys in the classroom. Students compare Chinese characters with real objects all day in associate with glyph memory. Accompany by the random literacy method, student learn literacy easily and happily.

From the above data, we can see that researchers conducted different ways of teaching activities. The result is in lined with Liu Shu which the suggestion of meaning component and phonetic component, homophone. Unlike the learning standard of CCR outlined in the NPSC lack clear definitions. Only little details to explain each component (Table 7). Learning standard concepts need the further clarifications for teachers.

Table 7

CCR Learning Standard (NPSC, 2017)

| CCR Learning Standard | Character Formation Types |
|---|---|
| BC2.3.1 认识汉字起源于图形 Recognize Chinese characters originate from graphics | Picture and text |
| BC 2.3.2 认识汉字一字一音 Recognize Chinese character by pronunciation | Independent characters |
| BC2.3.3 认识和说出基本笔画的名称 Recognize and say the names of basic strokes | Stroke |
| BC2.3.4 认识基本部首和偏旁 Recognize basic radicals and radicals | Radicals |
| BC2.4.1 认识自己的姓名 Recognize your own name | Characters |
| BC2.4.2 看图识字 Recognize Chinese characters through picture | Picture, independent characters, composite characters |
| BC2.4.3 认识字词 Recognize words | Independent characters, composite characters |
| BC2.4.4 从教材中认识生字 Recognize new words from reading materials | Independent characters, composite characters |
| BC2.5.1 认读单字 Recognize and read every single word | Independent characters |
| BC2.5.2 看图认读词语 Recognize and read words through picture | Picture, composite characters |
| BC2.5.3 认读词语 Recognize and read words | Composite characters |
| BC2.5.4 认读短语 Recognize and read phrases | Phrase |

Surprisingly, the findings also revealed several studies Pinyin studies (Cheng, Hung & Yeh, 2021; Lin, 2018). Unfortunately, the preschool curriculum in Malaysia does not deliver phonetic knowledge like Pinyin, neutral tone, and pitch switching (NPSC, 2017). This is consistent with the findings by Lin (2018), which found that the grammar mistakes maybe due to the reliance on *Pinyin*. Therefore, during the character reading, teachers should practice proper pronunciation during daily teaching.

Other findings related to CCR, such as writing in Chinese characters, were also found in the review. Literacy is easy, but writing is difficult (Jia, 1996). Previous studies highlight the Chinese characters' writing through demonstration and practice (Yu, 2020; Kang, 2017). In early reading literacy, CCR teaching should be more literate and less writing. Disruptions of CCR processes were due to the synchronization of CCR and writing. Note that CCR teaching can be implemented through activities to avoid boring and monotonous teaching. As NPSC (2017) stated, writing should not be considered as an activity for teaching CCR. Preschool teachers can choose or add or subtract new words they know according to the level of students and themes in the classroom.

In practicing Character Formation Theory, the level of teachers determines the quality of the educational effect (Jia, 1996). However, the level of teachers' level does not determine whether they can use the literacy teaching method. Since the teaching of character literacy

requires the use of philological knowledge. Therefore, many people have concerns about the knowledge level of teachers. This is consistent with the results of this review which demonstrated the lack of the corresponding theory in teaching Chinese characters, the weakness of the teacher's character theory knowledge, and the teacher's knowledge readiness and foundation.

Sun et al (2014) strongly mention that the teaching of character theory puts forward higher requirements for teachers' knowledge of philology and Chinese character culture. It requires preschool teachers to be interested in Chinese characters culture, a sense of teaching, and rich cultural accumulation. Efforts should be made to tap the potential of literacy and use it rationally, to truly reflect the value of literacy teaching. This is similar with Jia (1996) which suggests few solutions included teachers' training, provide materials that introduce the rationale for the structure of Chinese characters, compiled the philological knowledge into the content of teachers' continuing education, and Chinese teacher teaching materials. Over 20 years later, Wang (2019) mentions again the needs of literacy training.

Among the plausible explanations for these findings is teaching resources used for teaching the characters, which were often found in inconsistent character Formation theory supplementary books and teaching aids. There are various forms and types of teaching materials for overseas learners. One of the Chinese textbooks *You Er Han Yu* (幼儿汉语) for 4–6 years old Chinese children which compiled by Beijing Chinese Language and Culture College, commissioned by the Overseas Chinese Affairs Office of the State Council of the People's Republic of China and the China Overseas Exchange Association.

The textbook includes teacher's reference book which provides the use of textbooks, organically expands the content of the texts, and the effect is better when used together. Author presented a comprehensive review of the *You Er Han Yu* content. The uniqueness of teacher's reference book is it starts with the sequence of strokes, stroke order and components, and independent characters to composite characters. These materials accomplish the need of children which easy first and difficult then, in line with the characteristics of children's psychological and learning characteristics. In addition, content in *You Er Han Yu* demonstrates the characteristics of the combination of shape, sound and meaning of Chinese characters.

However, it has been confirmed that most of the teaching activity in *You Er Han Yu* did not simultaneously apply Character Formation Theory. According to the Malaysia Act. Circular Letter No. 1/2000 (in *Preschool Management Guidelines*, 2018), there is no workbook for early childhood education. There is also no high-frequency wordlist provided in the preschool curriculum handbook. Nevertheless, a handbook of thematic modules in the Chinese language provided by the Curriculum Development Division, Ministry of Education (MOE) Malaysia developed in 2011, was found outdated with insufficient content. Therefore, teachers should provide suitable Chinese reading materials and create a good reading environment (NPSC, 2017). The reading materials placed in the classroom must be suitable and interesting.

From the above data, we can see that the most adopted method. Diagrammatic is used for figurative characters and uses the strategy of traceability and comparison. Ideogram uses

demonstrate and associative method and strategy of “component knowledge”. For combined Ideograms, they mostly use the categorize, the strategy of decomposition and combination methods. Finally, the Phonogram uses comparative, analysis and descriptive methods and the strategy of radical activation by features. This is consistent with the comparative and descriptive suggestions, adopting combined-Ideograms and phonogram on similar-shaped characters.

In terms of teaching methods, findings revealed outdated teaching method, a lack of teaching method knowledge, and mechanical memory methods. As NPSC (2017) mentions, the teacher must wisely use a variety of pedagogies that suit students' development, needs, abilities, talents, and interests to make learning more effective and meaningful. In addition to focusing on preschool education, the curriculum specifically outlines several approaches and teaching strategies including child-centred learning, inquiry learning, learning through play, contextual learning, parental and community involvement, project-based learning, mastery learning, multi-intelligence learning, thematic and integrated approach (NPSC, 2017). According to Huang (2015), various teaching approaches and methods of Character Formation Theory allow the learner to embedded real situation independently. It also stimulates the learner's interest in literacy.

This data also reflects the correlation between student and literacy ability. This is interesting because this is the most studied topic among others. Based on the table, findings indicated less literacy awareness in students. Pedagogies must be varied to accommodate students with different qualifications in the class (NPSC, 2017). At preschool age, paying attention to nurturing and accumulate their cultural psychology in the learning of Chinese characters is necessary.

More research is needed for Ideogram to realize the gap in the extant literature. To our knowledge, it can be seen from the limited works on Ideogram activity, which is adopting the generalized abstract diagram method, descriptive method, and using intuitive imaging in Ideogram teaching. There are a quite a few research studies on Ideogram. However, studies on Ideogram activity such as accents and suffixes of components, polysemy and polymorphism, the hierarchy of Phonograms, the relationship between phonetic and base characters, and combined Ideograms with Phonogram activity, are rare to find in literature.

Considerably, more work might explore teaching resources, teachers' knowledge, and awareness. We can see that the developments in teaching resources have heightened the need for CCR. More broadly, research will also need to be done to determine on preschoolers. Although these investigations reported many interesting results, these studies exposed further gaps in our efforts to address issues such as, teaching methods and teaching activity. The main aim of the present study is to investigate how CCR is taught through Character Formation Theory. The contribution of this study is obvious as the resulting outcomes can be capitalized as guidelines to develop a teaching module on Chinese characters.

Conclusion

In conclusion, the current study unveils just the tip of the iceberg of the Character Formation Theory in CCR teaching. Important conclusions drawn from this work include: 1)

Teaching methods, 2) Teaching activities and 3) Issues and challenges. This project was undertaken to design a module on Character Formation Theory in CCR teaching. The present study, however, makes several noteworthy contributions to CCR teaching. Furthermore, this research will serve as a base for future studies in the Preschool context. Pre-school children refer to children aged 0-6 who have not yet entered primary school. In our country, in a narrow sense, it refers to children aged 3-6 in kindergarten. Children in this age group have efficient visual thinking, cognition has unique rules, understanding and memory of things are intuitive and vivid, and graphic memory plays an important role.

Visual teaching, which presents the hidden meaning behind Chinese characters in a figurative way and is perceived by children through vision. According to Vygotsky's "Nearest Neighbourhood Development Theory", "tasks that students cannot do independently can be done with support and help".

The current findings add to a growing literature on designing teaching activities. Several new methods of teaching Chinese characters have been presented related to CCR. More information on the Character Formation Theory in CCR teaching would help us to establish a greater degree of accuracy on this matter. Suppose the debate is to be moved forward. In this case, these findings provide the following insights for future research: 1) practice of teachers' awareness and knowledge, 2) account for the difference between CSL and native Chinese, 3) implementation of various teaching methods, and 4) development of appropriate teaching material.

Limitation

First, this systematic review is limited to CNKI, Scopus and WoS databases. Therefore, analysis and interpretation may be affected by such limitations. Second, only teaching issues and challenges, teaching method and configuration of each activity were reported based on the research topic. In contrast, some studies with the method, procedure, and result could not be included in the discussion.

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Notes

1 <https://oec.xmu.edu.cn/index.htm>

2 <https://www.t-sciences.com/news/humans-process-visual-data-better>

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