A Study on Chincese Character Components and Transfer Learning in Literacy Instrution: A Case Study of Elementary School Students in Lower Grades

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Abstract. Currently, there is little research in academia on the application of Chinese character component teaching and transfer learning theory in literacy instruction for elementary school students in lower grades. At this stage, students are in a period of transitioning from pre-operational to operational thinking, where spatial and distance perception may be lacking or developing slowly, and students may even experience reading difficulties, which may lead to the reversal of Chinese characters when writing. If teachers can effectively combine Chinese character component teaching with transfer learning theory, it will undoubtedly enhance students' literacy efficiency and reduce instances of character reversal.

Keywords: Chinese characters; components; transfer learning; literacy instruction; elementary school

1   Introduction

Chinese characters are logographic (ideographic) characters with complex structural forms, often posing significant challenges for beginners in character recognition. To help students quickly grasp the structural composition of Chinese characters, teachers often utilize "Chinese character components" in their instruction. This teaching method is frequently applied in Chinese character instruction for beginners in international Chinese education (formerly known as Teaching Chinese as a Foreign Language) and is a key research focus in current academic studies on "Chinese character components" teaching. For instance, the article "Effect of Different Memorization Methods of Chinese Characters among Beginner-level Middle School Students in Australia" suggests: "Teachers should guide students to make good use of components-associative mnemonics, pay attention to the effectiveness of stroke mnemonics, and the diversity of memorization methods." [1] However, beginner-level primary school students may also encounter similar difficulties in recognizing Chinese characters, yet this issue has received relatively little attention. "Learning transfer," also known as "transfer learning",

"emphasize the impact of one type of learning on another." [2] The application of learning transfer theory in Chinese character literacy teaching has not yet garnered significant attention in the academic community. I propose that the concrete application of learning transfer theory to the teaching of Chinese character components could not only fill a gap in academic research but also enhance the efficiency of Chinese character literacy instruction for lower primary school students.

2   Definition of Chinese Character Components

There is currently considerable debate in academia regarding the definition of "Chinese character components", and no consensus has been reached, thus further clarification is necessary. From the perspective of Chinese character component literacy instruction, the author believes that Wang Ning's view in "Introduction to Chinese Character Construction" is the most thorough. He states, "The structural units of Chinese characters are components (also referred to as radicals in the general field). When a form is used to construct another character and becomes a part of the constructed character, we call it a component of the constructed character." [3]97 The "components" mentioned by Wang Ning are what is commonly referred to as "components" or "radicals". From this definition, any part that constitutes a character can be considered a component. Wang Ning further divides components into three types based on their hierarchical structure: "basic components", "direct components", and "transitional components" [3]98-100; and two types based on whether they form characters: "character components" and "non-character components" ; non-character components are further classified into four types: "single strokes or stroke groups used as signs or differentiators", "non-character ideographic symbols inherited from ancient writing", "writing variants that serve as radicals", and "symbols that have undergone variation, fusion, or loss of semantic function." [3]101-103

From the perspective of hierarchical construction, taking the character "诺" (nuò, promise) as an example: At the first level, "诺" (nuò, promise) can be divided into "言" (yán, speak, semantic component) and "若" (ruò, obey, phonetic component); at the second level, "若" (ruò, obey) can be further divided into "艹" (cǎo, grass) and "右" (yòu, right) ; at the third level, "右" (yòu, right) can be divided into "ナ" (Variant of "又", indicating the right hand) and "口" (kǒu, mouth). "言" (yán, speak) and "若" (ruò, obey) directly constitute the whole character, referred to as direct components; "言" (yán, speak), "艹" (cǎo, grass), "ナ" (variant of "又", indicating the right hand), and "口" (kǒu, mouth) are the most basic components that constitute the character "诺" (nuò, promise) and cannot be further divided. They are the smallest units of form, sound, and meaning—morphemes. "右" (yòu, right) is neither a component that constitutes the whole character nor the most basic component; it appears as a component in the process of composing the character "诺" (nuò, promise), hence it is called a transitional component.

"Character components" refer to components that can both independently form characters and participate in character construction to express meaning. In other words,

when they are not used as components of other characters, they are complete characters corresponding to certain words. "Non-character components" can only express meaning when attached to other components and cannot be used to independently record language.

For example, "刃" (rèn, blade) is composed of the components "刀" (dāo, knife) and "、" (non-character component), where "刀" (dāo, knife) is a character component, and "、" (non-character component) belongs to the type of "single strokes or stroke groups used as signs or differentiators" within non-character components. "果" (guǒ, fruit) is composed of the components "田" (tián, field, from the perspective of Chinese character semantics, it is non-radical component that share the same configuration as "田," symbolizing the abundant shape of fruit) and "木" (mù, tree), where "木" (mù, tree) is a character component, and "田" (tián, field) is a pictographic variation of the fruit, belonging to the type of "non-character ideographic symbols inherited from ancient writing". Writing variants that serve as radicals are also known as structural radicals, such as "水" (shuǐ, water) written on the left side as "氵" (shuǐ, three-dots water); "刀" (dāo, knife) written on the right side as "刂" (dāo, side-knife); "火" (huǒ, fire) written at the bottom as "灬" (huǒ, fire-dots). The small seal script form of the character "春" (chūn, spring) is "萅", originally composed of "艸" (cǎo, grass, semantic component) and "屯" (tún, to sprout, phonetic component), but fused into "夫" (the upper part of "春", a character non-formation components) after aggregation, belonging to the type of "symbols that have undergone variation, fusion, or loss of semantic function".

3   Application of Chinese Character Components in Literacy Instruction

Although Chinese language teachers must possess professional knowledge of Chinese characters when teaching students to recognize characters, considering that the subjects of this paper are elementary school students in lower grades learning modern Chinese characters, it is unnecessary to delve too deeply into theories unrelated to modern Chinese characters. Therefore, the various types of Chinese character components mentioned above do not need to be fully applied in literacy instruction, and teachers do not need to impart theoretical knowledge of Chinese characters to students; flexible application is sufficient.

For lower-grade elementary school students, the majority of characters causing literacy obstacles due to "Chinese character components" belong to the traditional six categories of characters—ideograms and phonetic compounds; rather than "independent characters"—pictograms and indicatives. Chinese characters are primarily composed of compound characters (90% are phonetic compounds.) [4] Therefore, teaching students how to master the combination techniques of Chinese characters is the best way to rapidly improve students' literacy skills.

The author believes that in literacy instruction for lower-grade elementary school students regarding "Chinese character components", as long as teachers can apply the

following three concepts of component combinations, students can master the combination techniques of Chinese characters:

3.1   The concept of Combination of "Direct Components" in the "Component Hierarchy"

"The characters formed by combining two or more components"[5], We call them compound characters. Compound characters are composed of direct components, directly reflecting the intention of character creation. For example, the character "诺" (nuò, promise) is composed of the direct components "言" (yán, speak, semantic component) and "若" (ruò, obey, phonetic component), where "言" (yán, speak) represents the category of meaning and "若" (ruò, obey) provides phonetic information.

3.2   The Concept of Combination of "Character Components"

Because compound characters are formed by combining two or more "characters", all of these "characters" are character components.

3.3   The Concept of Combination of "Writing Variants That Serve as Radicals" Within "Non-Character Components"

These radical characters, whether existing as independent characters or as components of other characters in the small seal script, have the same form, and it is only in the stage of development from small seal script to regular script that they undergo morphological variation to become "non-character components". From this perspective, they originally belong to "character components". Furthermore, in modern Chinese characters, many radical characters of compound characters are fulfilled by these "writing variants that serve as radicals" within "non-character components".

As long as these three concepts of Chinese character components are effectively applied, mastery of Chinese character combination techniques can be achieved, coupled with the theory of transfer learning, the teaching goal of improving literacy can be achieved.

4   Main Reasons for Literacy Obstacles Caused by "Chinese Character Components"

The main reason elementary school students in lower grades encounter literacy obstacles due to "Chinese character components" is their inability to distinguish the positions of components in compound characters—ideograms and phonetic compounds—and thus write components in a reversed order. Some students may even have difficulty recognizing characters or make spelling mistakes.

The primary reason for such occurrences lies in the incomplete development of spatial and distance perception. According to Piaget's theory, children aged 2 to 7 in the

preoperational stage exhibit characteristics of irreversible thinking. [6] The famous conservation experiments tell us that children's perception of space and distance is not yet fully developed, making them prone to confusion between left and right, up and down. Lower-grade elementary school students are generally 7 to 8 years old and are in the stage of transitioning from preoperational thinking. Generally, as they grow older, this phenomenon gradually improves, but for children with poor spatial and distance perception, slow development, or even reading difficulties, if not corrected promptly, they may continue to make the same mistakes. It is highly likely that they will write Chinese character components in a reversed order. Therefore, special attention should be paid to teaching students to recognize characters.

5   Literacy Instruction Strategies Combining Chinese Character Components with Transfer Learning

Taking "compound characters" as an example, the following literacy instruction strategies combining Chinese character components with transfer learning can be employed:

5.1   Familiarize Students with the Form, Pronunciation, and Meaning of Radical Characters.

During teaching, teachers can focus on high-frequency radical characters such as 刀 (dāo, knife), 口 (kǒu, mouth), 木 (mù, wood), 火 (huǒ, fire), 水 (shuǐ, water), 手 (shǒu, hand), 心 (xīn, heart), 玉 (yù, jade), 金 (jīn, gold), and explain their form, pronunciation, and meaning. For example:

1."刀" (dāo, Knife).
    As explained in the *Shuowen Jiezi*: "刀 (dāo, knife), a weapon. Pictographic. All characters related to knives are derived from 刀 (dāo, knife)." [7]85 With two strokes, pronounced "dāo", its original meaning is a type of weapon. Its most commonly used meaning is a tool for slaughter, cutting, and chopping.

2."心" (xīn, Heart).
    As explained in the *Shuowen Jiezi*: "心 (xīn, heart), the heart stored inside the human body. Pictographic. Scholars believe it represents burning fire. All characters related to the heart are derived from 心 (xīn, heart)." [7]216 With four strokes, pronounced "xīn", its original meaning is the heart of a person. Nowadays, it generally refers to the muscular organ that circulates blood in humans and vertebrates.

3."手" (shǒu, Hand).

As explained in the *Shuowen Jiezi*: "手 (shǒu, hand), a fist. Pictographic. All characters related to hands are derived from 手 (shǒu, hand)." [7]251 With four strokes, pronounced "shǒu", Xu Shen interpreted its original meaning as grasping with a fist, and Duan Yùcai's annotations state: "Nowadays, extending it becomes 手 (shǒu, hand), curling it becomes 拳 (quán, fist), which are essentially the same. Hence, 手 (shǒu, hand) and 拳 (quán, fist) are mutually interchangeable." [8] It refers to the human hand.

4."阜" (fù, Mound).

As explained in the *Shuowen Jiezi*: "阜 (fù, mound), a large landmass. When a mountain lacks stones, it is pictographically represented. All characters related to hills are derived from 阜 (fù, mound)." [7]306 With eight strokes, pronounced "fù", Xu Shen interpreted its original meaning as "large landmass", referring to the elevated land on the earth's surface, i.e., hills and mounds.

5."邑" (yì, City).

As explained in the *Shuowen Jiezi*: "邑 (yì, city), a country, derived from 囗 (wéi, surrounding or encircling, an ancient form of the character '围', now used as the radical '囗'), representing the king's system, distinguishing ranks of various sizes, derived from. All characters related to cities are derived from 邑 (yì, city)."[7]1127 With seven strokes, pronounced "yì", Xu Shen interpreted its original meaning as a country. It extends from this meaning to refer to regions and towns.

The explanations of the form, pronunciation, and meaning of 刀 (dāo, knife), 心 (xīn, heart), 手 (shǒu, hand), 阜 (fù, mound), and 邑 (yì, city) in the *Shuowen Jiezi* are essential basic knowledge of Chinese characters for language teachers. However, when teaching students to recognize these characters, it is unnecessary to cite or explain the content of the *Shuowen Jiezi*, simple application of character principles is sufficient.

5.2   Helping Students Understand the Position and Meaning of Radicals in Compound Characters

Compound characters are composed of components (radicals), one of which serves as the radical and can be used to classify the meaning of Chinese characters. Teachers must understand that "most radicals can be used as components, but not all components can be radicals." [9] For example, the character "娥" (é, pretty young woman) consists of two components, "女" (nǚ, woman or female, semantic component) and "我" (ě, phonetic component), but only "女" (nǚ, woman or female) is the radical. Our main focus is on mastering the component that can serve as a radical.

Modern Chinese characters have fixed positions for components. After students become familiar with these high-frequency radical characters, teachers can use the theory of Chinese character components combined with transfer learning to teach students the composition skills of compound characters.

I'll use "刀部" (knife radical), "心部" (heart radical), "手部" (hand radical), "阜 (阝)部" (mound radical), and "邑 (阝)部" (city radical) as examples. Once students are familiar with these radicals, teachers can use transfer learning to facilitate students' learning of characters with these radicals as components.

1.刀部 (Knife Radical).

Students, after becoming familiar with the stroke order and meaning of the character "刀" (dāo, knife), can be informed about the two main types of positions where "刀" (dāo, knife) appears as a radical in compound characters:

a.Right Side in Left-right Structured Characters.

This can be further divided into two situations:

"刀" (dāo, knife) changes to " 刂" (dāo, side-knife):

This is the most common combination pattern for characters with the "刀" (dāo, knife) radical. Examples include 刊 (kān, to publish), 刑 (xíng, punishment), 刚 (gāng, firm), 利 (lì, benefit), 别 (bié, to differentiate), 刻 (kè, to carve), 刷 (shuā, to brush), and so on. In teaching students to recognize characters, teachers should first let students understand that " 刂" (dāo, side-knife) is a variant of "刀" (dāo, knife) and always appears on the right side of the character structure. This greatly reduces the occurrence of reversed writing of components. By guiding them to learn characters using transfer learning, students can easily grasp the meanings of various characters once they understand that characters with " 刂" (dāo, side-knife) are mostly related to knives. Learning one character with the knife radical facilitates learning other characters with the same radical, resulting in significantly improved learning efficiency. Students can also try to write these examples of characters to reinforce their memory.

(1)"刀" (dāo, Knife) Remains Unchanged in form:

Although the radical "刀" (dāo, knife) appears on the right side of the character structure, it remains in its original form as "刀" (dāo, knife) instead of changing to " 刂" (dāo, side-knife). Examples include the characters "切" (qiē, to cut) and "初" (chū, beginning). When teaching these characters, teachers should emphasize to students that although the radical "刀" (dāo, knife) appears on the right side of the character structure, it has not changed to " 刂" (dāo, side-knife), and its meaning is still related to "刀" (dāo, knife). For example, "切" (qiē, to cut) means "to cut with a knife", while "初" (chū, beginning) refers to the beginning of something, derived from the action of using a knife to cut cloth. These two characters are special cases.

b.Bottom in Top-bottom Structured Characters.

This is another combination pattern for characters with the "刀" (dāo, knife) radical. Examples include 分 (fēn, to divide), 券 (quàn, ticket), 剪 (jiǎn, to cut), and so on. All these characters have the radical "刀" (dāo, knife) at the bottom of their character structure. When teaching students to recognize characters, teachers should emphasize that "刀" (dāo, knife) always appears at the bottom of the character structure, which

significantly reduces the occurrence of reversed writing of components. Teachers can then guide students to learn new characters using transfer learning.

2.心部 (Heart Radical).

The radical "心" (xīn, heart) appears in compound characters in the following positions:

a.Left Side in Left-right Structured Characters.

In left-right structured characters, the radical "心" (xīn, heart) appears on the left side, with its form changed to "忄" (xīn, side-heart). There are many examples of such characters, including 忆 (yì, to remember), 怀 (huái, to cherish), 快 (kuài, fast), 怯 (què, timid), 性 (xìng, nature), 怕 (pà, to fear), 怡 (yí, joy), 怪 (guài, strange), 恨 (hèn, to hate), 怅 (chàng, sad), 情 (qíng, feeling), and 愤 (fèn, indignant).

b.Bottom in Top-bottom Structured Characters.

This can be further divided into two situations:

(1)"心" (xīn, Heart) Remains Unchanged in form:

Examples include 忍 (rěn, to endure), 忠 (zhōng, loyal), 念 (niàn, to think), 志 (zhì, aspiration), 思 (sī, to think), 怠 (dài, negligent), 急 (jí, urgent), 怒 (nù, angry), 恕 (shù, to forgive), 恩 (ēn, kindness), 恶 (è, evil), 息 (xí, to stop), 恐 (kǒng, to fear), 感 (gǎn, to feel), 想 (xiǎng, to think), and so on.

(2)"心" (xīn, heart) changes to "小" (xīn, heart):

Although the radical "心" (xīn, heart) appears at the bottom of the character structure, its form changes to "小" (xīn, heart). There are three characters in common use today, "慕" (mù, admire), "恭" (gōng, respectful), and "忝" (tiǎn, humble).

3.手部 (Hand Radical).

The radical "手" (shǒu, hand) appears in compound characters in the following positions:

a.Left SIde in Left-right Structured Characters.

This can be further divided into two situations:

(1)"手" (shǒu, Hand) Changes to "扌" (shǒu, Side-hand):

This is the most common combination pattern for characters with the "手" (shǒu, hand) radical. Examples include 扎 (zhā, to tie), 打 (dǎ, to hit), 扑 (pū, to pounce), 扔 (rēng, to throw), 扛 (gāng, to carry), 扣 (kòu, to fasten), 托 (tuō, to hold), 抓 (zhuā, to grab), 扶 (fú, to support), 技 (jì, skill), 扰 (to disturb), 拒 (jù, to refuse), 找 (zhǎo, to seek), 扮 (bàn, to disguise), 抗 (kàng, to resist), 把 (bǎ, to hold), 抱 (bào, to hug), and so on.

(2)"手" (shǒu, Hand) Remains Unchanged in form:

This is a special case. Two common characters in modern Chinese are "拜" (bài, bow) and "掰" (bāi, to break).

b.Bottom in Top-bottom Structured Characters.

In top-bottom structured characters, the radical "手" (shǒu, hand) appears at the bottom of the character structure, with its form unchanged. Examples include 挈 (qiè, to carry), 拿 (ná, to take), 拳 (quán, fist), 掌 (zhǎng, palm), 掣 (chè, to draw out), and 挚 (zhì. sincere). The teaching of characters with the "心" (xīn, heart) and "手" (shǒu, hand) radicals using the theory of Chinese character components combined with transfer learning can be similar to that of characters with the "刀" (dāo, knife) radical.

4.阜 (阝 , mound, Left Ear Radical) and 邑 (阝 , City, Right Ear Radical).

When used as standalone characters, 阜 (fù, mound) and 邑 (yì, city) have different forms, but as radicals in compound characters, they both transform into "阝 " (Chinese radical, left is fù, right is yì). Therefore, I'll discuss them together. However, 阜 (fù, mound) appears on the left side in left-right structured characters, while 邑 (yì, city) appears on the right side. When teaching students about the subordinate characters of these radicals, teachers should not simply tell students "left is 阜 (fù, mound), right is 邑 (yì, city)". This is because when these radicals appear in compound characters, they both transform into "阝 " (Chinese radical, left is fù, right is yì), and they can appear on either the left or right side of left-right structured characters. Consequently, students who have spatial or distance perception difficulties or reading barriers might be affected by transfer learning and may inadvertently write the components in reverse order. In such cases, it's necessary to specifically consider the meaning of the subordinate characters as an auxiliary criterion for judgment. Teachers should inform students that characters with the radical 阜 (fù, mound) are written with "阝 " (fù, "left ear radical") on the left side of left-right structured characters, while characters with the radical 邑 (yì, city) are written with "阝 " (yì, "right ear radical") on the right side. In terms of meaning, characters with the radical 阜 (fù, mound) usually relate to hills or mounds, and because climbing a mountain involves ascending from low to high, and climbing stairs follows a similar pattern, these characters often imply steps or ascent. Conversely, descending from a mountain or going downhill implies a downward movement, represented by characters with the 阜 (fù, mound) radical. Additionally, the rugged terrain encountered while climbing a mountain can signify danger or treacherousness. On the other hand, characters with the 邑 (yì, city) radical are mostly related to regions or cities. When determining whether "阝 " (Chinese radical, left fù right yì) should be written on the left or right side of a character, one must consider the specific meaning of the character. For example, "陵" (líng, hills) and "阿" (ā, mountain) both denote large mounds; "阴" (yīn, dark) refers to the north side of a mountain or the south side of water; "阻" (zǔ, obstacle) implies difficulty; and "除" (chú, to remove) signifies steps. Understanding the meanings of these characters and their connection to the meaning of the radical 阜 (fù, mound) helps students recognize that these characters are all subordinate to the 阜 (fù, mound) radical, and thus, "阝 " (fù, "left ear radical") should be written on the left side. Conversely, "邦" (bāng, state or nation) refers to ancient feudal states; "郭" (guō, outer wall of a city) denotes an outer city; "郊" (jiāo, outskirts) refers

to the area within a hundred miles of the capital; and "邵" (shào, ancient place name) was originally the capital of the Jin state. These characters are all related to regions or cities and are subordinate to the radical 邑 (yì, city), so "阝" (yì, right ear radical) should be written on the right side. This approach helps reduce instances of writing the components in reverse order.

5.3   Helping Students Pay Attention to Special Cases

The characters "切" (qiē, to cut), "初" (chū, beginning), "拜" (bài, bow), and "掰" (bāi, to break) are examples of special cases. Despite having the radical "刀" (dāo, knife) or "手" (shǒu, hand), these characters do not follow the typical pattern of transforming into " 刂" (dāo, side-knife) or "扌" (shǒu, side-hand) when used as radicals in compound characters. Instead, they retain their original forms as "刀" (dāo, knife) or "手" (shǒu, hand). These special cases often require additional memorization.

Another type of special case involves compound characters where both components can function as radicals, but in the character's composition, only one acts as a form component, while the other serves as a sound component. For instance, "吐" (tǔ, to vomit) is composed of "口" (kǒu, mouth) and "土" (tǔ, earth). Since both characters can serve as radicals, students might mistakenly write "口" (kǒu, mouth) on the right side instead of the left. In such cases, understanding the character's meaning is crucial for correct placement. For example, "吐" (tǔ, to vomit) means "to expel from the mouth", so it's related to the mouth and therefore "口" (kǒu, mouth) should be written on the left, while "土" (tǔ, earth) naturally goes on the right.

However, not all compound characters can be taught to recognize through the method of Chinese character components and learning transfer, effectively reducing the occurrence of component inversion in writing. For example, in the case of characters with components from the "wood" radical, there are instances where the radical appears at the bottom of the character's structure, such as 朵 (duǒ, flower), 果 (guǒ, fruit), 桌 (zhuō, table), 架 (jià, frame), and those where the radical appears at the top of the character's structure, such as 李 (lǐ, plum), 杰 (jié, outstanding), 查 (chá, to check), 漆 (qī, paint). Because the radical "木" (mù, wood) can appear at either the top or bottom in these two types; and when the "wood" radical combines with other radicals, such as with the "mouth" radical forming 杏 (xìng, apricot), 呆 (dāi, silly), or with the "sun" radical forming 杳 (yǎo, dark), 杲 (gǎo, bright), the position of the radical cannot be determined in advance, and can only be memorized through rote learning.

6   Conclusion

The positions of components in Chinese characters are fixed, with radicals typically appearing on the left side in a left-right structure. However, as demonstrated by the examples above, the combination structures of each radical in compound characters

vary. In the early grades of elementary school, students are in a crucial stage of transitioning from pre-operational thinking, where establishing spatial and distance perception is vital.

Teachers can utilize the theory of learning transfer in Chinese character recognition by familiarizing students with the form, sound, and meaning of radicals. This helps them understand the position and significance of radicals in compound characters and reminds them to pay attention to special cases. These methods assist students in better grasping Chinese character components, enhancing their recognition abilities, and promptly addressing issues such as spatial perception difficulties, slow development, or reading challenges, significantly reducing the occurrence of writing Chinese character components in reverse.

In practice, teachers can facilitate students' connection of existing knowledge with newly learned Chinese character components. They can design various exercises and activities for students to combine different components to form words, as well as recognize and understand the meanings and usages of different components through reading materials. Furthermore, teachers can demonstrate how to apply mastered Chinese character components to new character recognition, enabling students to better understand how to transfer their learned knowledge to new learning tasks. It has been shown that "semantic radical identification ability, semantic radical knowledge application, and Chinese character recognition improved with additional Chinese language study." [10] However, teachers should also be aware that, in some special cases, reinforcement memorization methods may be necessary to help students retain information. Addressing these challenges is currently a focus of the academic community.

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