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English Language Learning Students' Second Language Acquisition: Cognitive Factors and Supporting Strategies

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Abstract: Second language acquisition is learning a second language after a first language is already established. Cognitive load means the amount of information that working memory can hold at one time. As working memory has limit capacity and could be influenced by various factors, instructional teaching should avoid overloading it. This paper analyzed three cognitive factors which significantly influence English language learning (ELL) students in the process of their Second language acquisition (SLA). Second language acquisition a highly influenced by negative language transfer between Chinese and English. Redundancy of unnecessary learning information and transiency of spoken information adding additional learning process in working memory that don't positive contribute to learning. Due to the three main factors, several strategies have been developed to support English language learner's second language acquisition. Teachers could create an English-learning friendly classroom by encouraging positive learning attitude and increasing the English language input. Provide a multimedia learning environment, reduce the unnecessary information, use dual-channel learning theory and choose appropriate approach based on individual needs are some other strategies that teachers could use to encourage student's second language acquisition in classroom setting. Therefore, this paper explained the cognitive learning process of second language acquisition and provide several suggestions of teaching strategies to encourage ELL students' language learning.

Keywords: Second language acquisition, cognitive load capacity, supporting strategy

1. Introduction

Second language acquisition (SLA) is the process of learning a second language in addition to one's original language (s).According to the National Education Association, the group of ELL learners has been a dramatically growing group these years. It is also estimated that by 2025, about a quarter of all students in public schools will be ELL students. For English Language Learners (ELL), learning English as a second language could be challenging, particularly if students are learning English outside of an English-speaking country. As students could be struggled with learning a second language, it is necessary to recognize the issues and provide practice support based on students' needs.

Instead of believing language learning is independent of other cognitive abilities, constructivist and behaviorist-based perspectives emphasized that general cognitive capacities and learning

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processes are necessary for developing language skills. Besides, language skills need general, nonlinguistic cognitive capacities such as cognitive load to support.

This paper will clarify the cognitive factors base on the cognitive load theory, and explain the influence of ELL students in the process of their Second language acquisition. Also, insights from these findings might support pedagogical approaches to teaching practices. Learning a new language is a time-taking process and therefore requires strategical approaches for students to accomplish the task. Therefore, this study will analyze some appropriate strategies to help ELL students close the achievement gap while becoming fluent in English.

2. Literature Review

The process of learning information through our ideas, experiences, and senses is referred to as cognition. Learning entails gaining information via experience, study, and instruction. Language learning cannot be achieved if the student is distracted and unsupported. Language learning occurs later in brain development and relies on prior knowledge. In other words, people begin to grasp concepts and distinguish between things and occurrences before they can define them with appropriate words. As a result, language acquisition happens as an acquired ability when people absorb what they're seeing and hearing around them. According to one study, newborns begin learning language by repeating words uttered by other people and comprehending the relationship between the words and the things or events depicted [1]. The information is put into memory in a cognitive process called storage. As individuals use their short-term memory and long-term memory to understand the new concept by finding the connection between the previous knowledge and new information, individuals' language acquisition could be influenced by the capacity of both memories.

Thus, language learning process is significantly influenced by children's brain maturation, cognitive development especially short-term and long-term memory.

2.1. Cognitive process of First Language Acquisition

First language acquisition refers to the way children learn their native language. When kids learn the first language, they expand on what they already know - conceptual knowledge that discriminates and supports in the creation of categories for the items, relationships, and events they encounter. Previous studies discussed language acquisition in the context of brain growth and maturation. According to a research, no matter how much instruction a newborn or a three to four month old infant receives, he will be unable to talk until his vocal cord and speech muscles are correctly formed [2]. Therefore, it showed that children begin to speak between 18th and 28th months, which suggest that maturation has a great impact on the language development. Lenneberg's study discovered a relationship between language and the brain. He believed that the brain is divided into two hemispheres, the right and left hemispheres. He also proposed that each area or subject of learning is preserved in a different hemisphere of the brain. Although the hemispheres are not similar in structure at birth, they operate as one. Initially, each hemisphere is equally able to support language development, according to this argument.

In order to know language acquisition process, we need to clarify how information process in our brain. The process that information is encoded into our memory is a cognitive process. This is a process in which our brain filters information. The information we pay attention to now is first recorded in our working memory or short-term and finally entered our long-term memory.

Language acquisition and working memory, especially language processing, are closely connected and thus it is important to understand related working memory mechanisms. Working memory is a skill that can process and store information at the same time [3], so it constitutes the

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basis of higher cognition, including cognition and learning. In addition, working memory offers a platform for language processing and language learning by remembering information and combining old and new information in the process of discourse processing [4], i.e., establishing new language representations. In the process of learning a new language, working memory provides a short additional space for data, and then sends the data to the extracted memory in a recorded structure [5]. When decoding a conversation, individuals need to do more than restore the meaning of a single word. In addition, individuals must determine the relationship between word meanings according to the syntactic structure of sentences. With respect to that, we need the working memory to store the words and afterward decode them based on the context, so we can understand the language appropriately including unknown dialects or expressions.

Long term memory refers to the unrestricted storage of information for long-term preservation or even lifelong preservation. There are two types of long-term memory: explicit memory and implicit memory. Explicit memory refers to information that can be consciously recalled. Implicit memory includes all unconscious memories, such as certain abilities or skills [5]. Initially, language input becomes intake or part of the working memory of the learner. This is consciously attended to and learned by the learner. When structures and vocabulary become uptake, it is considered subconscious and acquired. And the language skills and knowledge which students acquired is been storage as part of long-term memory. The language acquisition level determines the language proficiency level of the learner.

2.2. Cognitive Load of Second Language Acquisition

SLA refers to the process of learning another language after the acquisition of native language [6]. Not only the second language learning process, but also the third, fourth and fifth language learning process are all called SLA. People acquire the second language, not just learn them consciously. SLA is the process through which humans learn to perceive, generate, and employ vocabulary in order to comprehend and communicate. This process necessitates mastery of the entire spectrum of grammatical and communicative ability and is impacted by biology as well as socialization [7].
Penfield and Roberts' research on the existence of critical period of second language learning strongly demonstrates Lenneberg's theory [8]. They believe that older second language learners rarely achieve the native language fluency shown by younger learners. Because children can learn a second language faster, this is because children are still in a critical period. Consistent with this statement, some people believe that only before puberty can second language acquisition be as fast and successful as first language [9].

Working memory is connected with a variety of second language cognitive processes in the macro-SLA aptitude model, including input segmentation, noticing, pattern identification, structure adoption, and mistake avoidance [10]. Evidence from a recent large-scale meta-analysis reveals that executive working memory was correlated with phonemic coding ability [11]. This suggests that working memory, in particular, plays a role in an individual's ability to learn a second language.

Working memory storage capacity (cognitive load) is significant because cognitive activities, such as SLA, can only be accomplished if the ability to keep information as it is processed is sufficient. was John Sweller developed Cognitive Load Theory in 1988. He defined "cognitive load" as the quantity of information that working memory can handle at one time. [12]. The ability to repeat information depends on task demands as well as the working memory mechanism: a central memory store limited to 3 to 5 meaningful items in young adults [13]. Working memory is generally only available for a few seconds. Once information has been deleted from working memory, it cannot be recovered. If a learner "forgets" any of the steps for spoken guidance, he or she will be unable to recall the steps without repetition or some other sort of aid [14].

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A study researched the relationship between cognitive load, L1 interference and second language writing, indicating that Cognitive load theory could be effectively applied to the L2 writing environment, so as to find ways to minimize distraction and improve writing level [15]. Research showed that writing performance can be improved by reducing unnecessary cognitive load, such as not using dictionaries. Therefore, cognitive load theory explains how individuals process and remember information, and it also indicates that too much (or too complex) information is harmful to learning because of the limitation of the working memory capacity.

Paas and Sweller have stated that the goal of cognitive load theory is to anticipate learning outcomes by taking the capabilities and limits of the human cognitive architecture into account [16]. Therefore, cognitive load theory could be applied in the context of second language acquisition. SLA is a psychological process. Thinking in L1 and translating the thought into L2 may overload the capacity of learners' limited working memory, hinder the learning process and lead to poor language learning with relatively high errors rate. When a person learns new knowledge, his existing knowledge influences the process of learning new knowledge, and this impact is referred to as transfer. Therefore, in the process of second language acquisition, the transfer of L1 in L2 will significantly affect the learner's working memory storage capacity.

Since each language has its own rules and regularities, each L1 provides an independent foundation for the construction of a new language. However, there are some aspects shared between languages, and some behavioral patterns can be seen in various L1s. It was found that if there are many similarities between L1 and L2, learners will find it easier to learn an L2. This is positive transfer. If the structures of L1 and L2 are different, then a lot of errors occur in L2. Thus, this indicates an interference of first language on second language [17]. This kind of interference is called negative transfer. That is to say, the differences between L1 and L2 lead to difficulties and mistakes in SLA, while the similarities are conducive to it. This explains why, when French and Chinese students learn English, French students feel more at ease than Chinese students [18]. Because many vocabularies in English have been borrowed from French. When French students come upon certain words, they have no trouble recalling them. Chinese and English, on the other hand, are from separate linguistic systems. There are just a few words that are comparable in both languages. Therefore, it's more difficult for Chinese students to learn English than French students.

When they attempting to speak L2, learners tend to transfer the forms, meaning and culture from their L1 to L2. The habits of learning L1 are also transferred to the habits of learning L2, and then the mistakes occur [19]. Similarly, Derakhshan suggested that the interference of habits from L1 lead to the difficulties in learning phonology, vocabulary and grammar of L2. Therefore, L1 transfer has a great impact on overall SLA [18].

2.3. Dual-channel processing in second language learning

Paivio stated that there are two separate channels for humans, process auditory and visual information [20]. The cognition of people is a complicated process, which can deal with language input and nonverbal objects and events at the same time. Language system is directly related to the input and output of language. Meanwhile, it uses symbolic images to adapt to behaviors and events. Therefore, it has dual functions. According to the dual-channel processing model, the brain employs both visual and linguistic information to represent information, but this information is processed differently in the human brain along two separate channels, so as to create different representations for information processed by each channel. This dual channel hypothesis conforms to and integrates Baddeley's working memory model [21] and Paivio's dual coding theory [20]. Both models describe the ways information is managed when sensory organs detect it and suggest separate channels for processing visual and verbal information. The verbal system and the visual system are the two extant coding systems. These two coding systems interact, which leads in improved recall.

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According to this process, an individual may acquire new things using either verbal associations or visual images, but combining both is more effective [22].

This section discussed various ways in which cognitive growth is reflected in, and interacts with, language acquisition. When people try to transmit meaning in their second language, their second language processing is hampered not just by the limitations of their present language system, but also by their capacity to match new language to their current language abilities. All of the above-mentioned barriers to information access are related to language processing. Working memory is regarded to be the most essential construct to language processing in cognitive psychology research [21]. As a result, working memory should greatly constrain the language learner's access to information.

The knowledge of the existing language structures and rules in the first language (L1) are naturally included in the second language (L2) learning process. Previous studies indicated that the interference of L1 with L2 and the psychological shifting between languages may result in heavy cognitive load in second language acquisition. Therefore, second language acquisition could also be influenced by negative language transfer from L1. Also, as humans' verbal and visual information are processed by two separate channels, which provide a multimedia environment could be significantly effective in support learner's second language leaning. Besides, previous studies indicated that language learners are necessarily restricted by environmental factors to the quantity and quality of input they receive. Dual-channel theory support the necessary of using multimedia teaching environment in second language learning class. Multimedia environment could significantly influence the effectiveness of learner's second language acquisition [23].

Based on the previous studies, various cognitive factors could be identified which significantly influence English Language learning students during they learning second language. One of the factors related to cognitive load capacity is negative language transfer. Other factors could be caused by the limitation of dual channel processing.

3. Discussion

3.1. Negative Language Transfer of Chinese

Transfer is the influence resulting from the similarities and the differences between the target language and any other languages that have been previously (and perhaps imperfectly) acquired [24]. Because cognitive load is created by the energy and mental ability required for an L2 student to locate the L2 words required to communicate thoughts already present in one's mind in the L1. Miller claims that short-term memory has a finite capacity of 7 ± 2 'chunks' of information [25]. Also, the key aspect of learning a second language is the fact that at least one other language has previously been acquired, the L1 or mother tongue, and that language can provide a basis for acquiring the rules and structures of a new language. Languages with distant origins, such as English and Chinese, do not have many common features and structures because of their development roots. Negative language transfer between Chinese and English could be a cognitive factor which cause English Language learner struggle with the SLA.

In SLA, the most common process is transfer from a person's L1 (or other L2s that they have acquired) to the target language [26]. Previous studies showed a clear correlation between Chinese and English in various language themes (phonological awareness, decoding, words and phrases, and morphological awareness), and a negative transfer in learning pronunciation and vocabulary. Besides, this development can be a conscious process; however, usually it occurs subconsciously.

A study pointed out there are correlations between Chinese and English learning from various language themes. This study also supported the idea that second language acquisition strongly

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influenced by L1 [27]. The study found there is a significant statistical correlation between Chinese and English in four domains including Chinese and English phonological awareness, Chinese and English decoding, Chinese and English vocabulary, and Chinese and English morphological awareness. Other potential moderator effects have been indicated are geographic location and grade level. Participants in Hong Kong demonstrated stronger cross-linguistic transfer between Chinese and English in terms of phonological awareness and decoding abilities than those in the United States or Canada. The amplitude of correlations between Chinese and English decoding was considerably affected by grade level, with younger students producing much stronger correlation than their older counterparts.

As language is made up of vocal signals, bad pronunciation frequently leads to communication failures. The impact of negative transfer from L1 is most visible at the level of pronunciation. Phonemes are structured differently in these two languages. Some phonemes are exclusively found in English and are completely foreign to Chinese learners. Because Chinese students have never heard these phonemes before, they prefer to locate a comparable Chinese sound to substitute the English sound when they first pronounce these sounds. According to one research, most Chinese pronounce "thanks" erroneously as /sæŋks/ rather than /θæŋks /, because there is no dental sound /θ/ in Chinese [28]. As a result, Chinese has a negative transfer with pronunciation.

Vocabulary is generally regarded as the important part of language learning. From the perspective of some beginners, if one can learn the vocabulary well, then he/she can be able to learn the language well. So, they work very hard on learning the vocabulary. Although they take great efforts, they still make mistakes in vocabulary. Many mistakes in vocabulary are resulted from the negative transfer of L1. The mistakes include negative transfer of word meaning, inappropriate collocations of words and literal translation of words from Chinese to English [29-30].

There is a negative transfer between Chinese and English in word meaning. Normally, people believe that every Chinese term has an English equivalent, and that words that refer to the same object in both languages occur in pairs. The fact, however, is that Chinese and English terms are not symmetric. In different contexts, one Chinese term may have many English equivalents.

Polysemy is widespread in several languages. In different contexts, a term may have several meanings. English language learners frequently think in Chinese and translate words literally, resulting in incorrect language use in English.

Thus, the overload caused by English language learners thinking in Chinese and using Chinese language knowledge while learning English will involve with language transfer, which in turn, will raise working memory load and cognitive load.

3.2. Multimedia environment and redundancy effect

Multimedia environment could influence the effectiveness of learners' second language acquisition, since humans process the auditory and visual information through two separate channels [20]. Voice, texts, figures, flashes, and videos are all examples of multimedia components that may be employed to improve learning. That is to say, course information may be delivered to learners in a variety of ways, and the combination of verbal and visual cues can improve learners' performance. Mayer offered a cognitive theory of multimodal learning [31] based on Paivio's dual-coding theory to explain the way that learners learn via verbal and visual material [32].

Jiang et al discovered that students from high school in the both read and listen group performed better than their peers in the only listen and only read learning groups on the listening comprehension and vocabulary acquisition tests [22]. Participants in the both read and listen group were discovered performed better than those in the only listen group on the phrase acquisition test. Therefore, when foreign language learners identify new words with sounds or visuals in both modes

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at the same time, they are more likely to acquire and remember the words than when they just utilize one mode.

Text messages are beneficial to second language acquisition, according to a research that focused on the effects of English competence (low vs. high) and content presentation method (single channel vs. dual channel) on English listening comprehension [33]. Because text messages allow knowledge or information to be kept in long-term memory for a longer period of time [34], and dual channel presentation mode results in an improved depth of processing, different input modalities will reinforce one another [35-36]. In other words, dual channel presentation mode enabled poor English language learners to absorb information in adequate time and to keep knowledge in long-term memory for a longer period of time, resulting in lesser unnecessary load. Dual channel processing is also ideally suited for vocabulary learning environments for English language learners, where text, audio, and video may all be utilised. Previous research has found that multimedia settings in which learners are exposed to several teaching models such as written texts, sounds, images, and/or videos create a language-learning environment that has a substantial influence on English vocabulary development [37].

Therefore, multimedia learning activities should be implemented into instruction to eliminate learning barriers encountered by Chinese students while learning English. The multimedia environment facilitates English language learning students' learning performance and reduces cognitive overload while learning English.

However, inappropriate use multimedia support could also cause cognitive overload while support Chinese students' English language learning. Same as overuse multimedia in learning, the redundancy effect arises when pupils are supplied with unnecessary information that they must handle in working memory. This will result in an additional cognitive stress. When various sources of teaching materials can be grasped independently without the requirement for mental integration, providing one source of material may be enough to ensure efficient learning. In this situation, excluding the redundant information rather than including it would result in a better learning outcome, which is referred as the redundancy effect.

In a study by Sweller and Chandler, they found that the participants who were not explicitly instructed to mentally integrate the two sources of information performed better than the participants who were explicitly instructed to integrate the text and diagrams [38]. According to their findings, processing duplicate information results in an excess cognitive burden since the processing consumes extra working memory resources. In the field of SLA, Plass, Chun et al studied the effect of different formats of vocabulary annotation on students' English language learning [39]. Participants received four types of lexical aids: no annotations, verbal annotations, visual annotations, and verbal-visual annotations. The results showed that students' comprehension ability was much poorer when they had to analyze the graphical annotations, indicating that the graphic information was superfluous for the development of English as an L2 learners' reading skills. Similarly, Diao and Sweller investigated reading comprehension learning in two conditions: reading with concurrent visual and verbal information and reading with written text only [40]. It was discovered that the learners who received written and spoken texts simultaneously had both a higher cognitive overload and a worse learning performance than the those who were exposed to written text only.

Even inappropriate use dual channel and provide redundant information can interrupt Chinses students' English language learning because of limited capacity [31]. The previous research suggested that appropriate use dual channel is necessary in avoiding redundant, because dual channel can help poor English proficiency learners reduce their unnecessary load if the learning activity is designed properly by an instructor or instructional designer [33].

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3.3. Transient Information Effect

The transient information effect is defined as is a lack of success in acquiring knowledge caused by information disappearing before learners can handle it in the working memory and integrate it with previously acquired schemas in their long-term memory [41]. The fleeting nature of some types of information is an underlying reason for the transient information effect. Therefore, in second language learning process, spoken material should be provided in short bits, or written form could be presented instead. Furthermore, having written material readily available for students to refer to may aid in lessening students' cognitive burden.

Furnham studied the effect of presentation mode on individuals' information recall [42]. The research participants, who were adult native English speakers, were presented a piece of fiction for television in three modes: read-only, listen-only, and audio-visual. The results confirmed that research subjects who were in the read-only condition recalled significantly higher amount of information than those in the listen-only condition and audio-visual condition. The series of studies done by Furnham and his collaborators indicated that printed material facilitated comprehension and information recall.

Similar results were reported in a study, three teaching styles (only read, only listen, and both read and listen) were provided for original Chinese students to improve English listening skills [27]. Research indicated that because of the transient information effect, expert learners may profit more from the only read strategy. The learners in the only listen group were unable to acquire meaning and comprehend the auditory discourse, but those in the both read and listen group were given the identical material in two different manners. In general, reading appeared to be a more effective and efficient approach in terms of information processing. Learners with several years of second language learning experience might have developed sufficient phonological and semantic knowledge of the foreign language enabling them to activate the phonological representation of the printed word. However, due to the transient nature of auditory information presentation, learners had to retain information in the working memory and combine the previously held information with the incoming novel information to enable effective information processing.

In addition, high element interactivity is another compounding factor. Yow and Li reported that auditory materials that are low in element interactivity can be easily retained and processed in working memory, thus not generating the transient information effect [43]. In contrast, lengthy discourse, particular those with high element interactivity, will result in the transient information effect because of a failure to retain auditory information long enough to be processed.

3.4. Supporting strategies

Previous studies shouted that negative language transfer is occurred when Chinese students' learning English as a second language, therefore, appropriate strategies should be provided to reduce the negative effect. Teachers should help students through contrastive analysis during the English learning process to comprehend the differences in thought patterns between China and Western nations [44]. Teachers should master correct learning techniques, reduce negative transfer of Chinese, pick words, phrases, and stylistic guidelines in accordance with the English way of thinking, and develop the basic abilities of learning English. The two languages differ in many ways, including pronunciation, vocabulary, grammar, and pragmatics. Failure to recognize these distinctions in second language learning, as well as applying the law and attitude of the Chinese, will certainly cause negative interference. Several strategies could be:

1) Instill a positive attitude for students acquiring scientific learning strategies. The scientific approach to language transfer is critical for resolving second language acquisition challenges in

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translation. Learning, according to cognitive psychology, is an active cognitive process that involves the acquisition and transfer of new knowledge. The mother tongue represents the majority of the accessible knowledge for authors of second language studies, and access to the information stored in the brains of second language writers is limited. Tolerating "Chinglish" to some extent is one of the learning tactics. Learners are advised to strive to pay more attention to English, to not expect perfection, and to progressively diminish their reliance on the mother tongue.

2) Increasing the quantity of original authentic English language input, reading, and setting up an actual writing environment. It takes a great deal of studying to get rid of Chinese influence, and it helps pupils enhance their English sensibility. To assist students understand the contrasts between English and Chinese discourse, teachers should focus on teaching discourse through deliberate writing practice.

Provide a multimedia learning environment could also encourage students' second language learning. Paivio argued that comprehension would be facilitated when learners made referential connections between the verbal codes and pictorial codes during learning [45]. As students could absorb information through dual channel-visual and verbal, information could be provided in both ways to encourage students' understanding of the new information. Therefore, teaching strategy could be:

1) Redundancy Principle. To avoid cognitive overload among learners, there should be either text or voice narration. When dealing with kids who are just starting to acquire a second language, it may be beneficial to provide both text and voice narration.

Sometimes a read-only method is preferable than a read-and-listen strategy. If learners can easily convert written content to spoken text, giving the spoken text is superfluous. It is redundant, and needing to absorb duplicate information imposes an unnecessary cognitive load, explaining why reading is preferable than reading and listening at the same time.

2) Coherence Principle. When unnecessary words, visuals, and media are removed from the classroom, students learn best. Teachers should restrict the instructional content in online courses or presentations to only the most important information.

Furthermore, spoken text is ephemeral; what is heard now vanishes, to be replaced by following text. Listeners must keep huge volumes of information in working memory when learning to listen, resulting in a creates an additional cognitive load. Diao and Sweller claimed that presenting written and spoken information concurrently was ineffective in teaching English reading skills to first-year undergraduates who had developed relatively higher proficiency [40].

1) Provide read and listen approach. Contrary to the transient information associated with the listen-only approach, the printed text in the read-only approach can provide learners with permanent access to the material, helping them identify the boundaries of words and sentences and complete the sound-word-meaning mapping.

2) Provide support base on individual expertise level. Before delivering an appropriate supporting strategy, teachers should clarify students' needs and understand their abilities to avoid the negative effects. For example, read-only instruction is effective for more expert learners' second language listening skills but ineffective for novice learners.

4. Conclusions

According to the information process theory, cognitive load capacity significantly influences second language acquisition as working memory related with memory storage and knowledge processing components. Among all factors that contribute to the acquisition process of second language learners, this study particularly focuses on cognitive factors such as language transfer, redundancy effect, transient information effect, which impact the second language acquisition during the

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learning period. Previous studies identified that negative language transfer between Chinese and English could significantly influence Chinese students' English language learning within several areas, such as vocabulary and pronunciation. Redundancy effect and transient information effect could cause cognitive overload and more particular, produce negative effect in second language acquisition. The redundancy effect will result in superfluous cognitive burden since it occurs when pupils are given with knowledge that is not required. And the transient information effect occurs when explanatory information disappears before it can be adequately processed in working memory, which happened more with spoken information because of its lack of permanency.

This study provides a review of several cognitive factors that could influence students' second language acquisition. It explains the cognition learning process and develops several practical strategies to support students' second language acquisition. As the current study's findings are generated based on various theories and previous research, more experimental research is needed to support the idea. In addition, in order to provide a more efficient approach, further research could examine the effectiveness of various supporting strategies.

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