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Original Paper

An Overview of Cognitive Strategies in SLA of English in 21st Century

Xiaomeng Lin[1]

[1] School of Foreign Studies, Nankai University, Tianjin, China, 300071

Email: 13110928657@163.com

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Abstract

Cognitive linguistics scrutinizes the close relationship between the human brain, mind and SLA. Since the beginning of the 21st century, many new paradigms and approaches have emerged in this domain of SLA. Based on English as L2, this paper delves into the review in cognitive dimension from three main aspects: cognitive linguistics represented by constructional grammar, empirical cognitive science represented by neural-brain science and corpus research, as well as category and metaphor-related theories in cognitive semantics. These cognitive perspectives and strategies are interconnected and complementary, constituting a general and comprehensive sketch of new paradigms in cognitive SLA. This paper summarizes and analyzes how cognitive linguistics and cognitive science in the 21st century can provide coherent and appropriate theoretical guidance and methodological reference for the study of SLA, and meanwhile criticize and reflect on the shortcomings of the current research field and offers suggestions for future research directions.

Keywords

Cognitive Strategies, Second Language Acquisition, Psychological/mental Mechanisms, Cognitive Linguistics, Neural-Cognitive Science

1. Introduction

Cognitive linguistics stemmed from the reflection and innovation from precedent formal, structural linguistics, whose structural and mechanic standpoint of linguistic form and meaning demonstrates a desideratum in consideration of ever-changing humanistic and socio-cultural development. In the 1970s, the Summer Linguistics Seminar held at the University of California, Berkeley, USA published four papers on the role of human cognitive ability in language learning, which commenced the development of cognitive linguistics (Shu, 2009). From the mid-1980s to the 1990s, theories of conceptual metaphor

and metonymy, psycho-spatial and conceptual integration, cognitive semantics, cognitive syntax, and similarity rational cognition flourished, which in turn greatly inspired new academic paths for the study of L2 acquisition in the 21st century. Nowadays, the cognitive turn has proved tremendous explanatory power in disclosing inner mechanism of mind throughout SLA. Robinson (2001) has systematically explored the cognitive theory in L2 acquisition and the cognitive factors permeating L2 teaching, and proposed the cognitive orientation of L2 acquisition research to explain the rules of intelligence structure of L2 learners.

The continuative analysis of in SLA in the last two decades has witnessed great momentum.This article aims to provide a diachronic, systematic review and comments on the three major trends in cognitive research paradigm of SLA: cognitive linguistics represented by constructional grammar, empirical cognitive science represented by neural-psychological science and corpus research, as well as category and metaphor-related theories in cognitive semantics elaborates the practical significance of the cognitive orientations as well as some existing shortcomings, in order to put forward suggestions for future direction of the cognitively-guided research of SLA.

2. Review of Cognitive Perspectives & Cognitive Linguistics in SLA in 21st Century

2.1 Construction-Based Cognitive Perspectives In SLA

2.1.1 Basic Information of Linguistic View of Construction Grammar

Epistemologically speaking, the concept "*construction*" is deemed as an indispensable term derived from Frame Semantics by Fillmore around the 1980s, signifying a cognitive organization, a "coherent schematization of a specific and unified structural organization of knowledge or experience" (Fillmore, 1985, p. 223). This argument holds that the meaning of a sentence is not a simple combination of the meanings of its constituent parts (Fillmore et al., 1988), i.e., the idea of a construction grammar. Langacker (1987) proposed a "usage-based model" to refer to such constructive structure. Based on the concept of construction, Goldberg (1995) systematically elaborated the theory of construction grammar and gave an in-depth explication of the four categories in English, holding that constructs, as pairs of form and meaning, store semantic, syntactic and pragmatic knowledge, are the most natural base unit for the structural depiction of language. To comprehensively conclude, language is a system of constructions, so language acquisition (whether monolingual or bilingual) is the acquisition of constructions in essence.

The 21st century has witnessed the research methodology of cognitive linguistics in SLA has shown a gradual transition from the traditional focus on introspection as the qualitative "cognitive commitment" to the more empirical, scientific psychological experiments as more quantitative (Jin, 2011; Murphy et al., 2012; Taler et al., 2013), which formed a series of operationalized research paradigm. Technically generalized, those new sphere trends clarify the particulars involved in the mental process in a more accurate way.

2.1.2 Further Cognitive Mechanism of Construction in SLA

Based on the previous foundational exploration of construction, the SLA process is the category-based acquisition of L2 constructions in essence (Xu, 2023). It holds the principle that first emphasizes constructed grammar as the basis for patterns of grammatical organization (Fillmore et al., 1988; Goldberg, 1995; 2006; Croft, 2001). Its appearance aroused the rethinking of the similarities between the L1 and L2 system, and consequently, the profound support for the cognitive and mental possibilities of L1's role in transfer in SLA.

The function of a "construction" inspired Xu to analyze the relationship that a certain construct play in L2, with the view that the closer the connection between the form of a construct and its meaning (or function), the easier the construct is to acquire (Xu, 2022). In this sense, the L2 learners' linguistic knowledge can be regarded as an ever-expanding repertoire of constructions, where each level of constructions has its own independent form, semantics, or function, varying in complexity and abstraction. Furthermore, different semantics or functions affect the intensity of the interaction between constructs in grouping or realizing, indirectly exerting influence on the acquisition of L2 usage mode, sequence, and scope. In this aspect, her viewpoints echo the view of L2 construction assemblage and compatibility by Goldberg. Different constructs can only be grouped if they are semantically or functionally compatible or at least temporarily compatible in a given context (Goldberg, 2006). This is closely related to the frequency of their co-occurrence in the L2 context; the higher the frequency of co-occurrence in the target language input, the stronger the grouping of this particular construction; consequently, the easier it is for the learners to acquire L2 constructions.

Indebted to the universal construction as a plausible model in terms of SLA, Ambridge (Ambridge et al.), through a host of operational experiments, found that in L2 acquisition, constructions are closely related to the subjective awareness, background knowledge, socio-cultural and other encyclopedic knowledge of the language users, and that this kind of functional organization re-construction plays an important role in SLA.

The orientation of construct-based cognitive mechanism has been a promising direction in SLA in the last two decades, with its research principally focusing on the following three aspects:

Firstly, the role of the L1 construction in SLA assumes importance without being ignored. As the early perspicuous domestic scholars of the construction in SLA as English, Xu and Zhang (2010) once reviewed the research of construction in SLA from its relationship with L2 lexicon, frequency with SLA and the transfer of mother tongue. Cadierno and Robinson (2009) pointed out that, since L2 is developed on the basis of native language conceptual patterns, native language constructions will inevitably have a certain transfer on L2 acquisition. Besides, They (2009) also analyzed the acquisition of expressive mobile L2 constructions from a linguistic psycho-typological perspective to examine the acquisition of lexicalization patterns close to the target language under different L1 backgrounds (Cadierno & Robinson, 2009). Hu (2007) studied the double-object and *have*-causative structure acquisition in English as L2 respectively, pointing out that L1's construction could intervene with the

L2's to some extent. Therefore, we are able to conclude that even though the construal processing mechanism will be optimized along with the learner's L2 proficiency, the L2 constructions will compete directly with the L1 constructions; hence, the negative transfer of the native language will be unavoidable, and the interlanguage developed is prone to be caught in fossilization or some form errors due to construction hybridization in this process.

Secondly, the construction acquisition can reveal the acquisition priority and optimal sequence in SLA. In terms of the trajectory of construction formation, It has been evidenced that the SLA actually follows the developmental path of "idioms- low domain patterns -constructions"in learners' cognitive capability (Bradovi-Harlig 2002). This major involves three steps: inception of idioms and unanalyzed lexical chunks that serve as creative constructions, formation of complex patterns in interaction acquisition context, as well as reconstruction and assemblages of old ones. As for its productivity and viability, the dependence on character frequency is confirmed by many domestic and abroad scholars (Li & Wang, 2006). Goldberg (2006) introduces indicators such as token frequency (实例频率), type frequency (类型频率), and coverage (覆盖度) to illustrate the frequency and variability of instances are important for children's generalization of constructions, which closely relates to the general category and intensified schemata engendered. But there is also controvertible that this frequency effect of construction(构式的频率效应) proposed still has not been downright proved lucid on account that the work done mostly is an error analysis of a given construction in the traditional sense (Xu & Gao, 2023).

The third focus as the argument structure also influences the intricate information processing in L2 learners. The domestic academia in English as L2 mainly discussed about the acquisition of different classes of words, semantics and sentences in English from the angle of argument. In 2004, Dong and Liang (2004) conducted experiments of the higher-level group of Chinese learners in English, showing a more advanced acquisition of L2 meaning through comprehension of verb argument construction compared with the lower group that learns through the verb itself, and their findings are later further refined and criticized by Sun in 2008. Similarly, Tang (2020), Bi and Li (2017) have verified that how can over-generalization of the English verb and directional argument structure be overcome while a relatively consummate acquisition can be attained from the correspondence between the semantic structure of the verb/directional structure and its argument construction, thus highlighting the importance of meaning-oriented pedagogy. These findings resonate with and move further based on those of Dong and Liang. Focusing on English mental vocabulary, Dai and Liu (2008) put forward that the argument structure and the complexity of sublinguistic features play a very important role in this kind of acquisition. It can be induced from this part that the English argument in construction is the pivotal underlying logic of a mature, smooth, thorough, and syncretic grasp of English words and sentences meaning in SLA.

To briefly summarize and review, argument construction perspectives, with a negation of Universal Grammar, depart from item-specific knowledge in a bottom-top sequence (Goldberg, 2006), offering insights to the cognitive rationale of L1 transfer, the concretization for some higher, complicated

argument abstraction of lingual code in in-depth SLA, as well as the influencing mechanism where construction parameters as frequency, cases and coverage condition the acquisition and comprehension of English meaning and syntactic structure. Just as Chinese scholar Sun put it, this perspective from construction breaks through the limitations of simple structural analysis, making the form-meaning-function relationship in English greatly improved, illustrating a descriptive and explanatory cognitive process in SLA. (Sun, 2008) Although constructive grammar denies the Language Innateness Hypothesis, it is worth deliberating whether it's a self-consistent and comprehensive method in SLA due to some limited studies scope at present. For example, there still be room for improvement in shortcomings as a lopsided focus on some particular construction structures in a certain studied group, and the predominant research methodology merely confined in Contrast Analysis, behavourial experiment and corpus-data way. (Xu & Zhang, 2010) As for a prospective study in this direction, more specific input and category drill should be performed in an proactive way to activate comprehension of construction essentially, and other more efficient, numerical measurement indicators can be introduced to regulate.

2.2 An Emphasis on Category and Metaphor in Cognitive Semantics

In recent years, researchers (Robinson & Ellis, 2008; Boer & Lindstromberg, 2009; Littlemore, 2010; Hustijn et al., 2014) have given original interpretations of many phenomena in SLA based on the core concepts of schema, category, and mental space. Lakoff (1987) argues that our thinking process is nothing more than category, while Talmy (1988) proposed the cognitive semantics that "language is a cognitive system" that highlights a variety of schematic systems such as configurational structures, attention, force dynamics, cognitive states, viewpoints, and event structure frameworks. All those above-mentioned are targeted to reveal the relationship of thinking essence and language and witnessed leaps and bounds in interpretation profundity and extensive application in SLA in this field by latecomers in the new century.

The experientialism of meaning in cognitive semantics assumes that the biological nature of human beings, their experiences, and the natural conditions of the environment in which they live has an impact on their thinking, and the pre-conceptual structures, which include the basic class structure and the image-schema structure, are mastered can enable humans to comprehend abstract conceptual structures. Its basic perspectives comprise metaphor and class categories. By spadework in this field, Littlemore holds that the relationship between linguistic form and meaning is not arbitrary, but intrinsically linked through metaphor. "metaphor pervades the whole process of language and communication" (Littlemore, 2002).

Firstly, in regard to the research from metaphor in SLA, Littlemore (2002; 2009) initially applied cognitive linguistics concepts to the study of L2 metaphor acquisition, proposing that metaphor processing is closely linked to learners' visual, auditory, and kinesthetic brain regions as well as their material culture world, and that the ability to utilize metaphors is the result of a game of learners' basic knowledge of language and life experiences. To complement, he utilizes the four-space network in

conceptual integration theories to present how the systematic reflection and inferential process are involved in pertinent social and cultural metaphors in SLA, inaugurating a new orientation in SLA. Jin (2011) conducted a series of lexical metaphorization extension studies on spatial concepts in both English and Chinese via comparative corpora, suggesting that SLA is inherently metaphorical and this competence helps learners process and recognize L2 words repertoire more effectively. Epsimari and Mouti (2022) also demonstrated the positive effect of conceptual metaphors on L2 vocabulary learning.

As a useful method, the concept integration theory is also employed to clarify the mental mechanisms and metaphorical pathways of semantic novelty and unpredictability by L2 learners. This term is initiated by Fauconnier and Tuner (2002). Wen (2010) empirically analyzed the the cognitive production of interlanguage in SLA from 4 types of conceptual integration, and concluded that interlanguage is the result of the learners' integration and processing in the emergent structure through the active combination, refinement and expansion of the psycho-cognitive process under both L1 and L2 system. Du (2009) Qi (2020) and Yan (2013) also explained the viability of conceptual integration in SLA vocabulary learning and semantic construal respectively. In 2011, Zhu and Xi (2011) once published a comprehensive overview of conceptual integration development and application in the first decade of this century, but didn’t cover the progress in the latest decade till now.

Secondly, as another priority from this perspective,the prototype category in SLA, mainly focus on vocabulary acquisition from categorization (Xu, 2023) in current academia. Category is an advanced human cognitive activity (Dirven & Verspoor, 1998, p. 108); humans are able to build various abstractions and conceptual networks through categorizing sensory experiences. Studies such as Ma (2010) and Maguire et al. (2010) have shown that the order in which the different lexical items are arranged in semantic category affects the speed and effectiveness L2 word acquisition with a prominence in expertness in typical-category learner compared with the atypical one; while, Peng (2010) explored the words category in SLA from the phonological, morphological, meaning, class and pragmatic dimension. Their findings provided supportive evidence for category applicability in English lexicon acquisition.

Ji et al. (2023) examined the cognitive economy of basic level categories through eye-movement of 31 Chinese learners of English while reading sentences with different levels of vocabulary, which expound the cognitive burden in a beyond-linguistic perspective.

Generally speaking, the metaphor and category view, along with its derivative epistemological and methodological ways, deconstructing the complicated thinking modes into clear, interpretable elements that can be reified and applicable, which infuse inspiring paradigms for the enhancement of SLA in terms of a psychological and abstract path.

2.3 Under the Framework of Experimental Study

Another research domain attributed to the development of sophisticated technology and biology is the study supported by experiments or data. This method bespeaks a more advanced and accurate measure of relevant ulterior elements to further corroborate the revelation of specific processing aspects in SLA.

Currently the academic instrumental approaches, majorly it's the empirical corpus-based research, neural-cognitive empirical ways, and some psychological-cognitive experiments represented by connectionist network that have occupied indispensable status. Among them. the neural-cognitive aspect contains avenues as event-related potentials (ERPs), eye movements, functional magnetic resonance imaging (fMRI), and, etc.

Neural-cognitive SLA has been flourishing in recent years. In domestic academia, the upsurge of neural-cognitive study was initiated as early as the onset of the 21st century. Xu (2001), from the angle of neurolinguistics, explored the significance of brain specialization and integration in muti-dimensionally perceptual L2 acquisition. Later, Zhang et al. (2016; 2017; 2019; 2021; 2023) conducted a spectrum of exhaustive, important research on the advantages, modalities, influencing factors, individual particularity, and cogent evidence of the neural-cognitive ways in SLA. He explored several aspects in the neural-cognitive processing mechanism of SLA: for example, through the *way-construction,* he found that the specific EEG (electroencephalogram) attention-driven component P3a and contrastive-memory driven component P3b matters in the understanding of construction in SLA (2019). Besides, the role of ERP (event-related points) in SLA is also pointed, whose deviation and vacancy are of significance in the identification of qualitative and quantitative differences between L2 learners and native speakers (Zhang, 2021). His themes also involve other routes of neural cognition. His comprehensive, in-depth studies facilitate the further neural-cognitive orientation of SLA at home.

Further, Xue and Pei (2014) verified the core semantic hypothesis by collecting EEG data from Chinese-English bilinguals, finding that there was a grade effect on the age with differences in the EEG activation intensity in different brain regions in terms of the sequence of acquisition in English words. What's more, Pei et al. (2014). comprehensively investigated the activation effects of left and right spatial imagery schemas in the English SLA process of time concepts by combining behavioral experiments and ERP studies, while Fan et al. (2017) examined the effect of the degree of Chinese lexicalization on English lexical reasoning by psychological experiments as the audible thought and introspection. Through the method of eye movements, Chen (2009) studied the impact of cognitive mechanisms and information clues on English metonymy comprehension. Jin et al. (2019) expiated the role and contribution of EEG and ERP data in SLA from the critique of the L2 learning experience, environment, age, and similarity to the structure of L1. All the listed researches are indicative of a more objective, accurate empirical shift in the new era.

Another research realm as connectionist networks and models are further deepened based on psychological-neural science. This paradigm depends on the premise of the theory that self-consistency and coherence of artificial lingual-neural systems can explain human intelligence capability. Modern connectivist theories can be traced back to the pioneering work of neuroscientists and computer scientists such as McCulloch and Pitts (1943) and Rosenblatt (1963) in the 1940s-1950s, who interpreted the inner object neural mechanism and induced activities of the human brain in cognition process. It is an integration of IT, AI, psychology and many other fields, and gradually forms a

multi-level and cross-field orientation, constructs a series of new network learning algorithms and uses them to study and apply them to appropriate fields.

Based on this, Wang conducted a series of works, established a connectionist network semiotic model to illustrate the legitimacy of theories and concrete performing process of connectionism in SLA (2004), and supports the accessibility of UG in SLA via connectionism. Her model involved the L1 and L2 dimensions along with non-linguistic elements, proposing a universal phenomenon of L1, whose extension and structure are closely related to the SLA process. This proposition echoes with the idea that the emphasis of L1 and SLA is the result of analogies with L1 of contemporaneous domestic scholar Wang (2001). Further, Teng (2006) probed into the language input, transfer, and interlanguage pragmatic ability from connectionism. Zhang and Liu (2009) reviewed the neo-connectionist epistemology to explain the three major hypotheses in SLA as the "monitoring model" input hypothesis, the CRH and the natural sequence hypothesis, concluding that the sociality as epistemological consistency in terms of cognitive theory and new orientations in SLA. Those connectionist views that are based on the psychological neural networks are helpful to establish an abstract, physical interpretation for phenomena in SLA such as transfer, the necessity for comprehensible input, and the clear dynamic process of L2 acquisition in the brain. In domestic academia, scholar Ye (2005) also conducted studies on the formation of the lingual nerve network and the L1 thought in SLA.

However, there is also inadequacy in the connectionist perspective. As Hulstijn (2002) cautions, existing connectionist simulation networks are mainly limited to modeling simple linguistic phenomena, which use a limited amount and scope of data (such as the past tense of verbs, noun grammatical gender, grammatical structure of German and Russian noun phrases, etc.) Therefore, it's unclear whether the inferential learning mechanisms has incontrovertibility to more nuanced, abstracted linguistic knowledge.

As for the quantitative research of corpus-based, methods could be categorized as corpus-based approach and corpus-driven approach,and the former can further utilise the Computer-Assisted Error Analysis and Contrastive Interlanguage Analysis (CIA) to conduct more accurately targeted pedagogical studies (Deng, 2007). For nearly two decades, the application of the corpora approach in cognitive perspective for SLA is mainly to verify some theory or rationalize certain cognitive phenomena with forceful scientific, documentary proof as a sound practical foundation. With different varieties of corpora, Wang and He (2005) verified the feasibility of the"chunking theory" and "attention hypothesis" with the impact of corpora index on attention and memory in SLA. While, Gao and Mei (2007) discussed the causes of fossilization in SLA with the assistance of Chomsky's Principles and Parameters and corpora data.

In general, the domestic focus in this area takes a wide range of L2 as an object, from Chinese, English to all other domestic minority languages or other languages, which indicates a relatively limited domain particularly for English as L2. Yet, on the other hand, there is still huge potential and patent utility value in English as the L2 thanks to the existing research of those languages, offering a prospect

for research further via bilingual corpora to improve English pedagogy in China.

3. Conclusion

Through the overview of how cognitive linguistics, the development of cognitive linguistics theory and its further application in practice are enriched and testified to be productive,bring the cross-fertilization of the two disciplines. On the one hand, the theoretical and methodological feasibility and diversity from such perspective boasts great attention in SLA, but, in general, it seems that this direction is still in the initial stages, requiring it to be further broadened in scope and validated in more ways. One of the deficiencies lies in that although some complicated, particular English linguistic acquisition can be interpreted on a more qualitative, scientific way, some other general linguistic phenomena still lack related adequate proof. On the other hand, the new perspective can explain the dynamic and developmental issues that traditional linguistic theories cannot solve, which not only greatly deepens our understanding of how the brain processes L2 learning tasks, but also shows that L2 pedagogy is a complex system featured with non-linearity, emergence, and indeterminacy (Gui, 2005). Based on the groundwork, those new trends develop and extend cognitive perspective in SLA in a deeper sophisticated, interdisciplinary way, which conversely will further facilitate the progress of cognitive linguistics and science. For better development in the future, it is recommended that this direction should be conducted in wide, overall range of language aspects, and more perspicuous,clear scientific evidence should be gathered to corroborate its physical rationale.

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