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Cognitive-Psycholinguistic and Sociocultural Approaches to Second Language Acquisition in AI-Enhanced and Computer-Assisted Language Learning Environments: A Critical Comparison of Two Empirical Studies

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ABSTRACT

This paper critically compares the cognitive-psycholinguistic and sociocultural approaches in second language acquisition (SLA) by analysing two empirical studies which investigate second language (L2) learner development in AI-enhanced and computer-assisted language (CALL) learning environments. As digital technologies increasingly reshape the language learning landscape, it is vital to understand how different theoretical paradigms engage with these tools. While the cognitive-psycholinguistic and sociocultural approaches have often been positioned in opposition to one another, this paper argues for their complementarity, focusing on the cognitive-interactionist model and sociocultural theory (SCT) to highlight their convergences. Specifically, it examines how each framework conceptualises three core dimensions related to interaction in SLA: the role of others, the role of the learner, and the research site. The analysis reveals that the cognitive-interactionist model emphasises input, processing, and output, whereas SCT underscores social collaboration and co-constructing L2 learning knowledge. The findings suggest that both perspectives are needed to capture a more comprehensive account of the cognitive and social complexities involved in SLA, particularly in digital contexts. The paper concludes by advocating a transdisciplinary approach to L2 research that integrates theoretical insights from different perspectives to better understand and address the evolving role of technologies in language learning.

KEYWORDS

Cognitive-interactionist model, sociocultural theory, AI-enhanced language learning, computer-assisted language learning, second language acquisition

Introduction

On computer-assisted language learning (CALL), Stockwell (2012) writes, “there are no overarching theories in CALL” (p. 5). Instead, theoretical diversity marks research on second language acquisition (SLA) in rapidly evolving digital contexts, particularly given the advent of generative artificial intelligence (AI) in recent decades. In this paper, SLA is defined broadly as “[t]he process of learning a language other than one’s first language” for it encompasses the learning of a second language (L2), third language (L3), and so on, as well as a foreign language (FL) (Loewen & Reinders, 2011, p. 153). While congruence between theory and practice is crucial, how to approach SLA in AI-enhanced and CALL environments remains a key question. At the core of this concern is the need to account for the learning of the language and the interaction between the learner and the technology being used (Stockwell, 2012). For instance, AI language tutors offer extensive opportunities to personalise learning, but exactly how to conceptualise and operationalise their role is contested. On the one hand, they may be viewed as a source of input which facilitates linguistic interaction and enables the learner to produce more accurate output in the target language. On the other hand, they may

be understood as a teacher-like figure who promotes learner autonomy by gradually guiding an individual towards greater independence in the target language. These two positions reflect a major debate in SLA, particularly within digital contexts: whether to approach SLA through the cognitive-psycholinguistic or social lens.

The cognitive-psycholinguistic approach to SLA, concerned with a learner's internal mental processes in acquiring the target language, is often construed in opposition to social approaches, such as Vygotskian sociocultural theory (SCT), in which social context is central to and influences an individual's acquisition of the target language (Ellis, 2008). One key tension is how these approaches view the relationship between acquisition and language use: cognitive theories draw a strict divide between the two, whereas social approaches contend that acquisition occurs in language use (Zuengler & Miller, 2006). However, despite their ontological differences, both sides appear complementary; they emphasise different aspects of SLA which are necessary for a more holistic understanding of the field. In line with the broad sentiments calling for transdisciplinarity, conveyed by the Douglas Fir Group (2016), and the call for a sociocognitive perspective, made by Batstone (2010), this paper asserts the position that a more inclusive view of SLA, encompassing both cognitive-psycholinguistics and social approaches, is needed in our increasingly dynamic language learning landscape.

This paper is a critical review aiming to compare and contrast the cognitive-psycholinguistic approach and a social approach to SLA, examining in particular the cognitive-interactionist model (Gass, 2017; Long, 1996; Schmidt, 1990; Swain, 1985) and SCT (Lantolf, 2000; Mitchell et al., 2019; Vygotsky, 1978). Other social approaches to SLA, such as language socialisation and situated learning, are not within the scope of this essay though they offer alternative perspectives, placing even greater emphasis on the role of social context (Duff & Talmy, 2011; Lave & Wenger, 1991; Schieffelin & Ochs, 1987). The cognitive-interactionist model can be defined as an approach to SLA which conceptualises second language (L2) development to be primarily learner-internal, driven by cognitive mechanisms but facilitated through social interaction. Crucially, such interaction provides necessary input and opportunities for output in the L2, as well as feedback which can help the learner refine their linguistic knowledge. In contrast, SCT in SLA can be defined as an approach which views L2 development as a mediated, collaborative, and situated process, wherein (guided) participation in social interaction is constitutive of learning itself. These specific positions were chosen as they both consider the roles of contextual and cognitive factors in SLA, though they interpret them differently. The focus of this paper is on interaction, which is important to cognitive-interactionist and sociocultural approaches, albeit in varying ways. It will evaluate the following three major dimensions related to interaction in SLA: the role of others, the role of the learner, and the research site.

The discussion concentrates on two L2 empirical studies investigating learner development in Chinese-as-a-foreign-language (CFL) and English-as-a-foreign-language (EFL): Divekar et al. (2022) situates itself in a cognitive-psycholinguistic framework and examines CFL, while Jeon (2023) locates itself in SCT and studies EFL. These two studies were selected as they both incorporate AI and other technologies, which our understanding of SLA must be able to account for, as CALL is on the rise. In this paper, the role of interaction is explored according to the three major dimensions outlined above and the implications of the technology they use in an ever-changing, increasingly digitised landscape of SLA. Throughout, the similarities and differences between the two approaches are highlighted: while the cognitive-interactionist approach provides more insight into the mental processes involved in SLA, SCT offers a more detailed understanding of social context in SLA, including how to enhance social collaboration to facilitate learning. This paper further proposes that these approaches are not necessarily in opposition, and research warrants investigation from both perspectives to gain a fuller understanding of SLA.

Proposition: The Two in Opposition?

Zuengler and Miller (2006) argued that cognitive and sociocultural perspectives exist in “two parallel SLA worlds” (p. 35), with the former focusing on learner-internal mental processes, whereas the latter prioritises language as a resource for participation in social contexts. Such a distinction applies to the cognitive-interactionist model and SCT, which are specific approaches under the cognitive-psycholinguistic

and social branches of SLA. Yet despite their differing emphases, these approaches seem to be two sides of the same SLA coin, as is highlighted when examining interaction within the arena of CALL.

According to a cognitive-interactionist framework of SLA, interaction is viewed in terms of input and output: input must be provided by outside sources for the learner to then process mentally, before producing output in the target language (Long, 1996; Swain, 1985). A learner can receive feedback on their output to assist them in noticing gaps between their utterance and a target-like utterance, in turn facilitating L2 development (Ćeman & Dubravac, 2019; Schmidt, 1990). Empirical studies adopting this approach in a digital SLA context often employ a quasi-experimental research design to examine the effect of various technologies in promoting aspects of second or foreign language learning, such as vocabulary knowledge (Montero Perez et al., 2018; Muñoz et al., 2024) or speaking and listening skills (Castañeda, 2021; Hassani et al., 2016). Processing interaction is also affected by factors like memory and attention (Skehan, 2021). However, the extent to which (different types of) memory impacts language learning remains contested (Montero Perez, 2020; Ruiz et al., 2021; Teng, 2025). Under this model, the learner's mind is conceptualised as “an abstract input-processing machine” (Ellis, 2015, p. 235).

This view differs from SCT, in which the learner's mind can be compared to a workshop, where knowledge of the L2 is co-constructed socially in collaboration with others. In the literature, learning is mediated socially through support from another, usually an ‘expert’ such as a teacher, who scaffolds the learner through their zone of proximal development (ZPD), defined by Ellis (2008) as a metaphor “to explain the difference between an individual's actual and potential levels of development” (p. 271). This then leads to internalisation of higher forms of mental activity (Lantolf, 2000; Mitchell et al., 2019). According to SCT, interaction is also important for feedback, notably in the form of dynamic assessment (DA) (Mitchell et al., 2019). Findings from empirical research suggest that computer-mediated DA, wherein feedback is scaffolded in response to the learner's ZPD using digital technologies, has significant potential to guide EFL and L2 English learners towards increased self-regulation in both academic writing (Vakili & Ebadi, 2022) and reading comprehension (Bakhoda & Shabani, 2019; Mehri Kamrood et al., 2021; Yang & Qian, 2020). Such studies also tend to adopt a quasi-experimental design wherein learners interact with the technology to examine the effect of computer-mediated DA in SLA. Therefore, unlike the cognitive-interactionist approach, “learning arises not *through* interaction but *in* interaction” (Ellis, 2000, p. 209). Interaction is therefore at the core of both the cognitive-interactionist approach and SCT. Both perspectives consider cognitive and social factors related to interaction in SLA, although in contrasting terms.

Interaction with Technology: A Comparative Analysis of Two L2 Empirical Studies

Overview of Studies

The following sections analyse and evaluate two L2 empirical studies on SLA, each incorporating technology to enhance language learning. Divekar et al. (2022) investigate interactive speaking of Mandarin Chinese through a study involving ten novice-low-level CFL learners from an American university, aged 18 to 22, in which AI and extended reality (XR) technologies combine to teach one lesson of a standard Chinese Level-2 textbook. Meanwhile, Jeon (2023) leverages Computerised Dynamic Assessment (CDA), incorporating AI and chatbot technologies, to mediate the acquisition of new vocabulary of 18 novice-level EFL students from a public primary school in South Korea. A total of 58 pupils, all aged 12, participated in Jeon's (2023) research, with two experimental groups, each composed of 18 learners and one control group of 17 learners. Both studies demonstrate the emergent roles of AI and other digital tools, allowing for more personalised and dynamic FL learning experiences. While technology is at the forefront of these studies, each one provides varying insights—whether more cognitive or social insights—into SLA. On the one hand, Divekar et al. (2022) align themselves with the cognitive-interactionist model, which facilitates their discussion that sheds light on the “*input -> process -> output*” schema of interactions (p. 2335). In contrast, Jeon (2023) uses SCT to show how interaction effectively scaffolds FL vocabulary learning. Nonetheless, when investigated side-by-side, both studies and their related perspectives provide a more holistic picture of SLA. In these studies, an examination of three major dimensions of interaction is presented to shed light on the similarities and differences between the cognitive-interactionist and sociocultural approaches.

The Role of Others

Both Divekar et al. (2022) and Jeon (2023) view others as playing a vital role in SLA given the importance of interaction in their respective approaches: without others, SLA cannot occur. However, the nature of the role of others bears contrasting emphases: the former figures others as input-providers, while the latter views them as mediators. Firstly, Divekar et al. (2022) clearly identify ‘others’ to be “[i]nteractive conversational AI agents (or chatbots)” (p. 2333); their purpose is to provide linguistic input to the learner in the target language, Chinese. Yet ‘others’ can be extended to encompass both AI agents and technology in a broader sense, such as the flashcards on screen for learning vocabulary. The students were consequently exposed to multimodal input, specifically written and oral Chinese. This corresponds to the cognitive-interactionist computational model, in which input is a prerequisite for SLA to take place (Krashen, 1982; Long, 1996).

Crucially, the input provided to learners must be comprehensible, meaning that the learner must be able to understand the message conveyed through the target language or else SLA will not take place (Krashen, 1982). This theory is reflected in the study by Divekar et al. (2022), as various aids were offered to participants to facilitate understanding of Chinese, including a running transcript of the interactions between students and AI agents which the students engaged with for clarification of the task. While the study does not specify how students knew when to refer to the transcript for help, it can be posited that this included instances when an AI agent did not respond to the student’s utterance to further the task. One example of this is found in the sample dialogue recorded in Table 1:

Table 1

Sample dialogue between two students and two AI agents in the virtual Chinese street market.

Speaker	Intended addressee	Utterance	Intended meaning of utterance
Student 1	Agent 1	我想卖西瓜	The student wants to say ‘I want to buy a watermelon’ but because the words ‘buy’ and ‘sell’ differ only in tone, the student ends up saying ‘I want to sell a watermelon’
Student 1	Student 2	Looks like I got that character wrong. Can you play the sound for it?	Student 1 asks for pronunciation help from Student 2 who holds the tablet UI
Student 2	Student 1	Here you go	The student has selected the right sentence and attribute on the UI. The sound of 我想买西瓜 plays on the speakers.
Student 1	Agent 1	我想买西瓜	The student gets it right. ^a Asks ‘I want to buy watermelon’
Agent 1		来看看我的西瓜, 很好吃, 10 块。	Since Agent 1 was looked at directly, it gets to respond first. It says ‘Here, look at this watermelon. It’s delicious. 10 kuai!’
Agent 2		他的西瓜不甜, 我的很甜, 只要8块。	Agent 2 jumps in opportunistically and says ‘His are not sweet. Mine are. Only 8 kuai!’

Note. From “Foreign language acquisition via artificial intelligence and extended reality: Design and evaluation,” by R. R. Divekar, J. Drozdal, S. Chabot, Y. Zhou, H. Su, Y. Chen, H. Zhu, J. A. Hendler, and J. Braasch, 2022, *Computer Assisted Language Learning*, 35(9), p. 2343 (<https://doi.org/10.1080/09588221.2021.1879162>). Copyright 2021 by Informa UK Limited, trading as Taylor & Francis Group.

In this dialogue, Student 1 converses with Agent 1 and incorrectly uses the word “sell” instead of “buy”—as the two words only differ in tone—and no response is recorded from Agent 1. This prompts Student 1 to seek assistance and find the correct, intended linguistic form given by the tablet UI, thereby providing input at the right level for the learner.

Interestingly, the interaction between Student 1 and Agent 1 was facilitated by another student. Divekar et al. (2022) integrated peer-to-peer communication in their study, as learners were paired together in the CILLE. This means that a human partner can also be identified as an input-providing ‘other’. Partners were expected to assist one another to complete tasks through conversational interaction which involved giving peer corrective feedback. Corrective feedback is thought to help increase the knowledge and acquisition of the target language by promoting more accurate output (Ćeman & Dubravac, 2019). Therefore, the various types of input provided by technologies and a human partner in the study by Divekar et al. (2022) generated a setting in which acquisition of CFL could occur. This also created a collaborative learning environment, in which student dyads conversed with each other and the AI agents to assist one another’s language learning. However, the dialogic dimension of such interactions in learning is viewed in distinct ways between a cognitive-interactionist and sociocultural approach: the former emphasises learning in terms of cognitive functions, where input from others is an object to be processed, whereas the latter focuses learning in terms of development, where providing input through supportive dialogue is a process, such as in scaffolding (Gass, 2017; Mitchell et al., 2019).

While Jeon’s (2023) study similarly made use of AI chatbots as interactants with the human participants, it differs from the study by Divekar et al. (2022) for the role of others was not focused on supplying input, but on scaffolding learning in interaction. AI chatbots were defined in his study as “an automated mediator that provides graduated mediation” to promote learners’ acquisition of the target vocabulary in English (Jeon, 2023, p. 1344). According to SCT, mediation from others through dialogic interaction facilitates SLA as a learner can receive more personalised feedback, enabling them to progress through their ZPD (Mitchell et al., 2019). While Lantolf (2000) proposes a distinction between mediation by other people and mediation by artefacts such as technology, such discrete categorisation may not be applicable when mediation by people overlaps with mediation by artefacts. For instance, mediation by others in which the ‘other’ is technology made to simulate humans is exemplified in Jeon’s (2023) use of AI chatbots.

By supplying varying levels of prompt, from most implicit to most explicit, the Chatbot-Assisted Dynamic Assessment (CA-DA) group received more personalised scaffolded learning. This practice seems to bear similarities to providing learners with comprehensible input in the cognitive-interactionist approach. This is because DA involves measuring a learner’s ability to draw on available resources to assist their language learning, allowing the chatbot to give more appropriate feedback, tailored to the learner. However, SCT differs from the cognitive-interactionist approach in that its strength lies in considering social context. This is seen in Jeon’s (2023) study which demonstrates how dynamically fine-tuning social collaboration between the other—the AI chatbot—and the learner can better facilitate SLA. For example, Jeon’s (2023) results showed that the CA-DA group statistically outperformed the Chatbot-Assisted Non-Dynamic Assessment (CA-NDA) group and control group in the receptive and productive vocabulary post-test and delayed post-test. These findings can be interpreted as evidence to support the concept that scaffolding from others in SCT, which takes place only in interaction, promotes SLA more effectively.

However, validity is important to consider when interpreting the findings. The intervals between the tests were only two weeks, and Jeon (2023) recognises that tests with an interval of three to six weeks would yield more valid results. An additional concern is how the images and prompts used in the post-test and delayed post-test could have influenced test results. For example, the visual cues may have led some learners to guess the word based on visual association, resulting in weakened construct validity as the tests in part could have measured learners’ recognition or inference abilities rather than active recall. To mitigate this issue, future studies could incorporate non-image-based productive vocabulary tests that require active retrieval.

Moreover, Jeon (2023) investigates CA-DA on the premise that, as others scaffold learning, they can manage cognitive overload. In SCT, while sociocultural factors are of prime concern, cognitive factors are also important to account for when investigating SLA. This is reflected in Zuengler and Miller’s (2006) assertion that “[SCT] is fundamentally concerned with understanding the development of cognitive processes” (p. 38). Borrowing from psychology, Cognitive Load Theory (CLT) proposes that learning tasks are more effective if designed with consideration of learners’ cognitive architecture in which working memory has a limited capacity to hold information (Moreno and Park, 2010; Paas et al., 2003). This parallels the Limited Attention Capacity (LAC) Hypothesis in a cognitive-psycholinguistic approach to SLA, which similarly

suggests that working memory and attention are limited resources and can have constraining effects on language learning (Skehan, 2021). In Jeon's (2023) study, CLT is integrated into a sociocultural approach to SLA: when interacting in the target language, others—here, the AI chatbot—helps prevent a learner's cognitive overload by providing graduated prompts, to promote their linguistic development. Therefore, through an exploration of 'others' in interaction, Jeon (2023) focuses on others mediating and scaffolding learning, whereas Divekar et al. (2022) highlight that a necessary component of SLA is the role of others to supply comprehensible input.

The Role of the Learner

The role of the learner in interaction is central to both the work by Divekar et al. (2022) and Jeon (2023). In the study by Divekar et al. (2022) using a cognitive-interactionist framework, the learner must process input and produce output, whereas in Jeon's (2023) application of SCT, the learner co-constructs linguistic knowledge in interaction. By first examining the cognitive-interactionist study, input-processing on behalf of the learner requires active engagement, particularly by noticing gaps in their language production. Schmidt (1990) formulates the Noticing Hypothesis which proposes that learners must consciously notice input in order for it to become intake; attention is vital to this process, and subsequently to learning. According to this hypothesis, what is noticed is constrained by various factors, and a growing body of research investigates the factors influencing noticing, alongside its effects in SLA (Barrot, 2023; de la Fuente, 2014; Loewen & Sato, 2018). For Divekar et al. (2022), learners' noticing has an important function in their development of the target language; they use "a transcript of all utterances displayed next to the avatars ... with the hope of raising users' *noticing and awareness*" (p. 2339). This is linked to a learner's attention, as noticing falls under this broader category, and memory, as awareness facilitates the encoding of linguistic input into memory for learning (see Robinson, 2003 for more on attention and memory in SLA).

Returning to the data in Table 1 of the study by Divekar et al. (2022), Student 1 notices a gap—a pronunciation problem with the production of "buy"—in their knowledge of Chinese. This leads them to seek help in order to address and correct the problem with assistance from their partner and technology. This then pushes the learner to produce more accurate output—in this case, speech—in the target language, which alongside input, is vital for learning (Swain, 1985). Divekar et al. (2022) interpret more accurate output to indicate learning, evidenced by students' overall improvements on the four tests (vocabulary recognition, listening and transcription, listening comprehension, and conversation) when comparing the pre-test and post-test achievement scores. Two notable strengths of this study is how it tests across several metrics for language learning and how it minimises threats to internal validity, such as by using different items in the pre- and post-tests.

However, there are limits to the extent in which we can assume learning has taken place in the study by Divekar et al. (2022), as three of the four tests made use of multiple-choice answers; it is possible that some learners simply guessed correct answers. Multiple-choice formats can introduce construct-irrelevant variance as the tests may in part be measuring test-taking strategies, rather than evidence for language learning. Furthermore, the interval between the post-test and the delayed post-test was three weeks, during which was the spring break. Therefore, it may be that learners put in extra effort to consolidate the information they will be tested on. While the participants were requested to log entries into a digital diary/journal for any exposure to Chinese in this study, it is unclear if they were expected to continue to do so during the spring break, or if the request was faithfully and accurately fulfilled. These concerns raise questions about the internal and construct validity of the study for it becomes difficult to isolate the effect of the intervention from other potential learning experiences. Future studies similarly employing a multi-metric approach to language learning could strengthen construct validity by supplementing the vocabulary recognition test with productive vocabulary tasks which require active retrieval and usage. Considering alternative test timings and intervals may also help enhance validity of the research.

In Jeon's (2023) study, learners also actively engage with the AI chatbot, though through written interaction. This can be seen in Learner 2's interaction with the chatbot in Figures 1 and 2:

Figure 1

Excerpt of transcript data from Learner 2's interaction with the chatbot in session 1.

Excerpt 2

Session 1

1. Learner 2: kernel

2. Chatbot: What's the meaning of kernel? (initial question)

3. Learner 2: What is that?

4. Chatbot: Please, read the sentence again and try to guess the meaning of kernel. What is the meaning? (prompt 1)

5. Learner 2: I don't know.

6. Chatbot: Kernels were found in Peru that could still "be popped." Can you guess the meaning? (prompt 2)

7. Learner 2: Difficult.

8. Chatbot: Kernels can be "cooked" and popped. Can you tell me the meaning? (prompt 3)

9. Learner 2: What's that?

10. Chatbot: Read this sentence. "We bought some kernels to make popcorn at home" Can you guess the meaning? (prompt 4)

11. Learner 2: 씨앗 [Seed]

12. Chatbot: That's correct. The kernel of a nut is the part inside the shell. Please, continue reading. kernel은 견과류 종실에 있는 씨앗이나 알맹이를 뜻합니다. 계속 읽기를 진행해주세요!

[The Korean part is a translation of the English explanation]

Note. From "Chatbot-assisted dynamic assessment (CA-DA) for L2 vocabulary learning and diagnosis," by J. Jeon, 2023, *Computer Assisted Language Learning*, 36(7), pp. 1353–1354, (<https://doi.org/10.1080/09588221.2021.1987272>). Copyright 2021 by Informa UK Limited, trading as Taylor & Francis Group.

Figure 2

Excerpt of transcript data from Learner 2's interaction with the chatbot in session 2.

Excerpt 3

Session 2

1. Learner 2: kernel

2. Chatbot: What's the meaning of kernel?

3. Learner 2: popcorn

4. Chatbot: Please, read the sentence again and try to guess the meaning of kernel. What is the meaning? (prompt 1)

5. Learner 2: 모르겠음 [I don't know]

6. Chatbot: "When the kernel is heated, the core becomes bigger until it pops."

7. Learner 2: popcorn's seed.

8. Chatbot: That's correct. The kernel of a nut is the part inside the shell. Please, continue reading. kernel은 견과류 중심에 있는 씨앗이나 알맹이를 뜻합니다. 계속 읽기를 진행해주세요!

[The Korean part is a translation of the English explanation]

Note. From "Chatbot-assisted dynamic assessment (CA-DA) for L2 vocabulary learning and diagnosis," by J. Jeon, 2023, *Computer Assisted Language Learning*, 36(7), pp. 1354–1355, (<https://doi.org/10.1080/09588221.2021.1987272>). Copyright 2021 by Informa UK Limited, trading as Taylor & Francis Group.

In dialoguing with the chatbot, Learner 2 requires fewer prompts in session 2 (two prompts) compared to session 1 (four prompts) before providing the correct definition of 'kernel' in a new context. This is interpreted as evidence for development in the target language. In other words, in interaction via collaboration with the chatbot, the learner appropriates and internalises the vocabulary items in the study.

In SCT, the aim of a learner's active participation in language use is for the learner to progress from object-regulation (when they are controlled by objects in their environment), to other-regulation (when they are controlled by others in their environment), to self-regulation, which is when they can use the target language independently (Lantolf, 2000). This transition is mirrored in the development from an individual's social speech (externalised speech intended for communication with others), to private speech (externalised speech addressed to oneself), to inner speech, which is understood to be fully internalised, self-directed speech aimed at higher-order thinking and plays an important part in SLA (Lantolf, 2000). Yet, such distinctions can create challenges when applying these separate speech categories to interactional data. This is exemplified in Figure 3, where Learner 1 in Jeon's (2023) study uses two question marks in one turn when interacting with the chatbot to indicate their comprehension difficulties:

Figure 3

Excerpt of transcript data from Learner 1's interaction with the chatbot in session 1.

Excerpt 1

Session 1

1. Learner 1: kernel

2. Chatbot: What's the meaning of kernel? (initial question)

3. Learner 1: ??

4. Chatbot: Please, read the sentence again and try to guess the meaning of kernel. What is the meaning? (prompt 1)

5. Learner 1: More hint, please.

6. Chatbot: Kernels were found in Peru that could still "be popped." Can you guess the meaning of kernel? (prompt 2)

7. Learner 1: Seed!

8. Chatbot: That's correct. The kernel of a nut is the part inside the shell. Please, continue reading. kernel은 견과류 중심에 있는 씨앗이나 알맹이를 뜻합니다. 계속 읽기를 진행해주세요.

[The Korean part is a translation of the English explanation]

Note. From "Chatbot-assisted dynamic assessment (CA-DA) for L2 vocabulary learning and diagnosis," by J. Jeon, 2023, *Computer Assisted Language Learning*, 36(7), p. 1353, (<https://doi.org/10.1080/09588221.2021.1987272>). Copyright 2021 by Informa UK Limited, trading as Taylor & Francis Group

This could be classified as social speech, given it is externalised and occurs in a communicative social setting, or private speech, as it may in part be self-directed to the learner. Other studies have explicitly examined the roles of inner speech and private speech in SLA, but it seems that these distinctions may not be so clear-cut, particularly given the new affordances offered by technology in communication (de Guerrero, 2018; Stafford, 2013). Rather than being discrete and static, these categories appear more fluid and dynamic.

While the concept of self-regulation situates itself within SCT, emphasising learner development in social interaction, the cognitive-interactionist approach views learning in terms of proceduralisation and automaticity, focusing on an individual's mental processes after receiving input. Proceduralisation deals with converting declarative knowledge (which is conscious and can often be articulated) to procedural knowledge (knowledge of how to do something without conscious thought), while automaticity is concerned with increasing autonomy and processing speed in the target language (Skehan, 2021; Walter, 2023). However, these two concepts are difficult to capture empirically. Focusing on automaticity, in the vocabulary acquisition element of their study, Divekar et al. (2022) intend to help learners develop towards automatic processing through the CILLE. However, they do not explicitly investigate automatic processing, but improvement in scores on the vocabulary pre-test and post-test as this permits more quantifiable gains. This presents an issue in clarity of construct validity. As Segalowitz and Lightbown (1999) comment, various definitions of automatic processing make it challenging to measure in practice, as automaticity could be understood as very

fast, non-automatic processing. While Segalowitz and Lightbown (1999) operationalise automaticity through “fluency”, defined as “rapid, smooth performance” (p. 52), there remains a lack of standardised, empirical clarity on how to measure this. Overall, the studies by Divekar et al. (2022) and Jeon (2023) highlight the active role of learners in SLA—whether it be in terms of input-processing, output-producing, or a combination of both under the broader idea of interaction and co-constructing knowledge. Technology is also found to support SLA by facilitating movement towards self-regulation according to SCT or towards proceduralisation and automaticity in a cognitive-interactionist approach.

The Research Site

Finally, where interaction takes place, the research site, according to the cognitive-interactionist and sociocultural approaches to SLA has differed historically. Over time, however, the two approaches have exhibited changes in this area. Larsen-Freeman (2007) proposed that both cognitive-psycholinguistic and social approaches to SLA have varied research sites, though with contrasting emphases: in the former, settings focus on “where data is elicited”, whereas the latter examines “contexts where language is used naturally and heterogeneously” (p. 780). Yet this binary distinction from Larsen-Freeman (2007) struggles to capture the increasingly complex and dynamic reality of language learning environments today, accentuated by advancements in technology in researching SLA. This is exemplified in the studies by Divekar et al. (2022) and Jeon (2023) which do not fit neatly into their paradigms described by Larsen-Freeman (2007). Divekar et al. (2022) created the CILLE as the site for CFL learning, innovating the conventional classroom space where students face a teacher located at the front. Using a large front-projecting panoramic screen, multimodal sensor technologies enabling the CILLE to see, hear, and speak to learners, and learner gesture controls, the researchers created “a naturalistic conversational/social immersion” setting (p. 2354). Such immersion was advanced by the inclusion of non-dyadic interaction, where a learner collaborates and converses with their partner, alongside one or multiple AI agents. The research site designed by Divekar et al. (2022) therefore provided more multimodal, culturally informed, “*fun*” and “*engaging*” linguistic input which facilitated learners’ SLA through interaction with their partner and technology (p. 2348), exemplifying more natural and heterogeneous language use.

In contrast, by using CA-DA, enhanced by Google’s open-source chatbot builder, Dialogflow, Jeon’s (2023) study adds to the growing body of research on CDA which allows learners to receive more individualised, graduated feedback for more effective learning of the target language (Bakhoda & Shabhani, 2019; Mehri Kamrood et al., 2021; Yang & Qian, 2020). Alongside automatic transcripts of student interaction with the chatbot, Jeon (2023) examined elicited data through receptive and productive vocabulary tests. This is an example of how a sociocultural study of SLA can investigate social dimensions through close analysis of transcript data, alongside cognitive aspects by examining statistical differences in learner performance through elicited data in receptive and productive pre-tests, post-tests, and delayed post-tests. In both studies by Divekar et al. (2022) and Jeon (2023), technology is pervasive—assuming the role of others, facilitating learner development, and being integrated into the language learning landscape itself.

Echoing the words of Stockwell (2022), “theory needs to take into consideration multiple perspectives, ranging from the design of the artefacts, the learning environment, and the research itself” (p. 14). Indeed, SLA benefits from research into how both the cognitive-interactionist and sociocultural perspectives utilise technology in diverse ways to examine and promote SLA, in turn better accounting for psychological and social aspects to L2 learning. In digital contexts particularly, such aspects to L2 learning appear to blur, calling for the need for a more transdisciplinary approach. However, blending cognitive and sociocultural paradigms comes with epistemological implications.

Batstone (2010) outlines another avenue to explore SLA which draws notable intrigue in digital contexts: sociocognition. One form of the sociocognitive perspective is ‘holistic sociocognition’ which argues for the inseparability of social and cognitive aspects at all levels of language teaching and learning; hence the centrality of the ‘mind-body-world ecology’ (Atkinson, 2014). This alternative view to language learning reconceptualises human cognition as adaptive intelligence which is highly sensitive to our ecosocial environment. It is particularly appealing to consider in SLA given the claim of increased personalisation to

learner needs made by many AI-enhanced learning environments and tools, as exemplified in the studies by Divekar et al. (2022) and Jeon (2023). However, holistic sociocognition faces epistemological challenges. For instance, the definition of knowledge according to this approach is contested, and the emphasis on the situatedness of language learning raises questions for the generalisability of its findings. ‘Analytic sociocognition’ seems to offer a solution to this issue for the social and cognitive are construed to be interdependent in action but can be analysed separately at a theoretical level (Batstone, 2010). Yet, this perspective predates recent rapid expansion of AI-enhanced and CALL environments in which such analysis becomes increasingly complex with more elements to examine. Furthermore, both sociocognitive perspectives have been criticised for ambiguous definitions and their subsequent operationalisation in empirical work, such as how cross-contextual knowledge is developed and transferred in different settings (Batstone, 2010). While rich in potential, current sociocognitive approaches reveal the need for greater conceptual clarity, demanding further theorisation and more rigorous empirical studies.

Conclusion

Through an analysis of the studies by Divekar et al. (2022) and Jeon (2023), this paper has highlighted how research in the cognitive-interactionist and sociocultural approaches contribute to creating a more comprehensive picture of SLA, accounting for how mental processes and social factors impact learning. As shown for both perspectives, interaction is essential to SLA. By evaluating three major dimensions related to interaction, this paper has argued the following: the role of others is vital; the learner must actively engage with the language in interaction; and the research site is diversifying, becoming more dynamic and multifaceted. However, the cognitive-interactionist approach emphasises input, processing, and output, exemplified by Divekar et al. (2022), whereas SCT focuses on social collaboration and co-constructing L2 knowledge, exemplified by Jeon (2023).

Both L2 empirical studies in this paper also highlight digital innovation in SLA, using AI and other technologies. As technologies are increasingly integrated into the language learning landscape, whether to facilitate learning or functioning as research tools, cognitive-interactionist and sociocultural approaches complement one another even more as they reveal greater insight into different features of SLA. Indeed, SLA may be envisioned as a coin, on which one side is the cognitive-interactionist approach (or the cognitive-psycholinguistic approach more generally) and the other is SCT (or social approaches more generally). Rather than being in opposition, it seems that cognitive-interactionist and sociocultural approaches offer complementary insights into SLA. Each perspective highlights distinct yet valuable aspects of learning which, when critically examined together, underscore the need for transdisciplinarity in L2 research that becomes all the more critical given the rapid expansion of digital contexts in SLA. While sociocognitive perspectives offer a more inclusive view to SLA, further work is required to address the epistemological and empirical implications of blending these paradigms.

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