

Complex Dynamic Systems Theory in Second Language Acquisition: Exploring Concepts and Unpacking Constructs

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In January 2000, Stephen Hawking predicted, “the next century will be the century of complexity” (Sanders, 2003). Indeed, complexity science, or the study of the structure and behavior of complex dynamic systems, has become increasingly popular as researchers aim to understand the complexity that surrounds us – e.g., rainforests, immune systems, the global economy, and language (Sanders, 2003). In fact, at the time that Stephan Hawking made his prediction, complexity science and systems thinking had already permeated numerous disciplines, including, and of particular interest to the current forum, second language acquisition (SLA).

In 1997, Diane Larsen-Freeman published her seminal work *Chaos/Complexity Science and Second Language Acquisition*, triggering a line of research on the complex systems relevant to SLA, such as the second language (L2) learner, the L2 learner’s developing linguistic system, and the environment of the L2 learner, as well as the changes that these interacting complex systems undergo over time. Accordingly, complex dynamic systems theory (CDST) has served as a theoretical framework for numerous SLA studies in the past quarter century. For example, Larsen-Freeman (2006) employed CDST as a theoretical lens for exploring the emergence of complexity, fluency, and accuracy (CAF) in five Chinese learners’ oral and written production. Taking CDST as an overarching framework, Roehr-Brackin (2014) tracked an instructed learner’s development of German constructions for over three years to investigate the system adaptations of cognitive processing of explicit knowledge and schematic constructions. Evans and Larsen-Freeman (2020) adopted CDST as a conceptual lens to analyze an untutored adult French learner’s development of English syntax by collecting oral production samples for 30 weeks. Pfenninger (2021), through a CDST perspective, examined the relationship between young learners’ age of onset and use of L2 English in extracurricular activities.

Nevertheless, despite the climbing number of SLA studies conducted within a CDST framework, researchers’ engagement with constructs central to CDST has sometimes been superficial. Hiver et al. (2022) analyzed 158 empirical reports that were self-labeled as CDST studies and found noticeable ambiguity in the adoption of CDST concepts and terms. In particular, researchers sometimes claim CDST as significant to their study, while leaving opaque how CDST has informed their research questions, design, and methodology. Further, on several occasions, researchers have invoked CDST terminology, such as *adaptive* and *nonlinear*, without clearly defining those terms (Hiver et al., 2022). Han et al. (2022) articulated similar concerns about CDST-labeled studies that arbitrarily defined systems and the components comprising them and highlighted a grave consequence of this practice: overlooking the key elements of the system, namely, the learner and the environment.

Researchers’ ambiguous use of CDST terminology and arbitrary definition of systems and system components point to superficial engagement with the theory. Aimed at encouraging

deeper conceptual understanding of CDST, this forum explores and unpacks various concepts and constructs in CDST with a particular focus on SLA. First, Ashley Beccia contributes a piece on attractor states in L2 development. Following a definition of attractor state, she describes three types of attractor states, clarifies some potential misconceptions about attractor states, and provides examples of attractor states in SLA. Second, Shan An dissects the notion of self-organization by offering its definition, highlighting its relevance in studying language development, and reviewing three relevant empirical studies. Third, Zhizi Chen offers a piece on variability and fractality. After discussing the origin of the two seemingly contradictory concepts, she identifies similarities and differences between them. Fourth, Abby Massaro examines the concept of generalizability, and more specifically, the issue of generalizing results of group-level SLA studies given the idiosyncratic nature of L2 development espoused by the CDST paradigm. Fifth, Shamini Shetye explores the interconnectedness of complex systems, including learner language. She outlines the types of relationships that subsystems can assume, reviews select studies on the interconnected relationship of subsystems, and highlights some limitations of studies in this domain.

In short, the five pieces that comprise this forum seek to invite an in-depth consideration of select concepts and constructs important to L2 development from a CDST perspective. With each piece tapping into different notions and issues related to the theory, this forum is by no means a comprehensive review of CDST studies nor a critical appraisal of the theoretical development of CDST. Rather, it aims to promote more profound engagement with CDST as the theoretical framework continues to play an influential role in SLA research.

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