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The Forum

Interconnected Dynamic Components of Learner Language

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Second language development can be viewed as a complex and dynamic process in which learners follow non-linear trajectories and develop their language over a period of time (Larsen-Freeman, 2006). Intrinsic to the view of Complex Dynamic Systems Theory (CDST), a system is composed of hierarchical, interdependent subcomponents (learner, learner language, and environment) in dynamic relations as learners develop their interlanguage over time. This piece reviews the interactive and dynamic nature of the subcomponents illuminating the transitory nature or variability (in patterns of language development) that is inherently a characteristic of a complex dynamic system (Larsen-Freeman & Cameron, 2008). First, the forum piece describes how the growth of a subsystem can affect other parts of the system, followed by an explanation of the diverse interrelationships between the connecting subsystems. Next, three empirical studies on the varied relationships between the subsystems are presented. The article concludes with a critique of the current state of research on this topic, revealing some gaps that need to be addressed in future research.

The growth or development of language components in CDST-inspired studies (see de Bot et al., 2007; Yu & Lowie, 2020) has been conceptualized based on van Geert's (1991) cognitive growth model, which is described using a metaphor of an ecological system. Van Geert referred to elements such as vocabulary, grammatical knowledge, and other skills as species of an ecosystem or as growers. He posited that the development or growth of these species is dependent on interlinked resources (both internal, e.g., learners' learning capacities, learners' conceptual knowledge, and external, e.g., learning context, material resources, social factors), which are limited in their availability to growers or learners. As a result, growth is also constrained to some extent. Nonetheless, not all growers (or subsystems in a system) require the same number of resources to grow. Moreover, due to learners' limited information processing capacity, learners are unable to prioritize equally all aspects of language performance (see Skehan, 1998; Skehan & Foster, 1997), implying that learners can grow in one subsystem more than the other. Since all subsystems are interconnected, the growth in one component of a system or a change in a subsystem may affect other interdependent subsystems, resulting in such subsystems interacting in varied ways (de Bot, 2015; de Bot & Larsen-Freeman, 2011).

The subsystems may demonstrate different interrelationships, such as supportive, competitive, or pre-cursor relationships, depending on the cognitive resources available to learners (Caspi, 2010; van Geert, 2008). In a supportive model, a learner's growth in one subsystem may facilitate their growth in another area when there are adequate resources available for the development of both systems. Subsystems comprising such models are regarded as connected growers (Robinson & Mervis, 1998; van Geert & Steenbeek, 2005). Conversely, a competitive model in a language system may arise when two subsystems compete for the same resources. In such cases, the increase in growth in one subsystem may result in the deceleration of growth in the other subsystem. It is also possible that two subsystems may initially enter a competitive relationship and then a supportive relationship may evolve because the subsystems

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are no longer in need of the same resources. Additionally, a precursor relationship, proposed by van Geert (1995), can occur when one system needs to be developed before the emergence of another system. These relationships have been the central foci of investigation of burgeoning empirical research.

Several CDST studies have explored the interconnected relationship of the subsystems using a process-oriented model in which the development of learners is viewed longitudinally and observed continually at different time periods (de Bot et al., 2007; Lowie, 2017). Some researchers adopting the CDST perspective have considered complexity, accuracy, and fluency (CAF), the three main dimensions or measures of competency (Skehan & Foster, 1999), as subsystems of a language while exploring their interconnectedness (Yu & Lowie, 2020). To explore the relationship between various measures of complexity (syntactic complexity and lexical diversity) and accuracy, Yu and Lowie (2020) examined the oral language of two Chinese learners of English over four months. Interactions between the subcomponents were observed using moving correlations. The results revealed that for both the learners, in the beginning, the correlations on the scores of syntactic complexity and accuracy were negative, supporting the idea that they were competitive growers and indicating that learners' syntactic complexity improved at the expense of accuracy. However, the interacting components later evolved as connected growers, suggesting that with time, learners could produce complex utterances with accuracy. The relationship between lexical diversity and accuracy also showed similar variations in interactions between the subcomponents (fluctuating from competing to supporting relationships) though there were individual differences in the learners' developmental paths. Yu and Lowie explained that individual differences in the developmental paths indicate the possibility of other "internal or external factors" influencing the learners' language system (p. 872).

Likewise, Spoelman and Verspoor's (2010) longitudinal study examined the interaction between various complexity measures (at word, noun, and sentence levels) and accuracy (the total number of accurate cases) in a Dutch learner of Finnish. The written data comprised 54 texts collected over a period of three years. The relationship between accuracy and complexity was also investigated by comparing the total number of correct cases to word complexity. Moving correlations showed that throughout the study, word complexity and noun complexity were connected growers. The researchers observed a similar supportive relationship between word complexity and sentence complexity. By contrast, sentence complexity and noun complexity were competitive growers, suggesting that learners either use nominalizations or more dependent clauses in their sentences to create complex texts. That is, noun complexity either improved at the expense of sentence complexity or vice versa. Accuracy and word complexity did not show any meaningful relationship.

Besides the supportive and competitive relationships, a precursor relationship can emerge between subsystems, as illustrated by Robinson and Mervis's (1998) longitudinal study of a child's acquisition of lexical and grammatical growth while learning English. According to Larsen-Freeman (2006), this study "is important to understand not only static relations between variables, but also relations that change throughout the course of development" (p. 593). Robinson and Mervis examined the development of lexicon (vocabulary growth) and grammar (mastery of plural morphemes in obligatory cases) in the first language acquisition of a child (age: 10 months, at the beginning of the study), for 13 months and found that lexical growth preluded syntactic growth. After the lexical growth reached a certain threshold (represented by mastery in using plural morphemes in obligatory cases), the growth of plural morphemes and

vocabulary shared a supportive relationship. This implied that the grammatical growth was hindered for a certain time, because the resources that were needed for this subsystem to grow were used rapidly while attaining lexical growth. The relationships of these subsystems (lexical and grammatical growth) exemplify a precursor model in which two variables, the predecessor (lexical growth) and successor (grammatical acquisition of plural morphemes), interact such that the growth of the successor is suppressed until the predecessor reaches a threshold. Furthermore, by observing dynamic interactions, the researchers found that "the nature of the relation between lexical and plural growth actually changes in magnitude and direction during the course of early language development" (p. 374). Thus, this study not only unearthed the precursor relationship between subsystems but also unveiled the transitory nature of the development of subsystems throughout the development.

While studies using CDST as a framework have endeavored to highlight the interconnected and dynamic nature of the subsystems longitudinally, there are some gaps in the literature, as revealed by Han et al. (2022). As mentioned previously, the growth of the subsystems is dependent on external and internal factors. Nevertheless, CDST-inspired studies on the interrelated nature of subsystems have failed to explore the interactions between the internal and external resources available to learners, thus isolating the learner from the environment. These studies have discounted that with time, "the learner changes, the environment changes, and so does their interaction" (Han et al., 2022, p. 17). Furthermore, the idea of "what constitutes a system" remains ambiguous and varies per researchers' conceptions, which often lack "principled reasoning and an organic basis" (Han et al., 2022, p. 13). For instance, Yu and Lowie (2020) operationalized the three measures of proficiency (CAF) as the subsystems, while Spoelman and Verspoor (2010) conceptualized complexity measures and morphological accuracy as components of a system. Thus, while studies have demonstrated the interrelated nature of subsystems, they have mostly narrowly focused on measures of learner language. What represents a system has been vaguely defined and a complete picture of how the learner, time, and environment interact has been largely unexplored.

In sum, this forum piece highlights the dynamic path in language learning that learners follow depending upon the resources available to them and how the subcomponents of a system interact with each other, driving language acquisition. These subsystems may share a competitive or supporting relationship or may act as precursors in a competitive model. Some gaps have also been addressed, which may benefit future research in this direction.

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