

**3 Dynamic nature of complex systems**

CDST theorists prefer to use the term *L2 development* rather than *L2 learning* because 'there is no goal or direction in development; there is only change. In language development two forces are at work constantly: interaction with the environment and internal self-organization' (De Bot & Larsen-Freeman, 2011, p. 13). When a learner discovers something new about the grammar of English, such as how to form the regular past tense in English by adding *-ed*, this information is incorporated into the learner's language and results in a restructuring of the entire system. For example, some irregular verbs that were previously used correctly are produced with *-ed* inflections. Earlier in this chapter, the same example was considered from a cognitive perspective with reference to information-processing theories (McLaughlin, 1990).

As with usage-based learning, CDST emphasizes frequency of exposure to language in the input and the connections that are made when language forms are associated with meanings in appropriate contexts. Research has shown that L2 learners need repeated exposure to consolidate and automatize language (Ellis 2009). A CDST approach to L2 instruction is designed to include multiple exposures to language in meaningful contexts.

Some of the methodological challenges facing CDST research include the difficulty of investigating a theory where everything is connected. Given the CDST position that simple linear cause-effect relationships do not exist, there are also questions about how predictions can be made with confidence. In recent years, innovative methodologies and statistical procedures have been proposed and implemented to carry out CDST-informed research in different domains of L2 learning (De Bot & Larsen-Freeman, 2011; Hiver & Al-Hoorie, 2019; MacIntyre et al., 2017).

***Second language applications: CDST***

In Chapter 3, we read about a study of L2 learner motivation that was inspired by CDST. In that research it was observed that learners' motivation levels changed over short periods of time and in relation to different types of pedagogical activities. It was also observed that even learners who had expressed high levels of motivation overall became demotivated at different times (Waninge, Dörnyei, & De Bot, 2014). These findings are consistent with CDST in that motivation is complex and changes depending on context. A related study measured changes in learners' willingness to communicate from moment to moment and documented their rationale for the changes (MacIntyre & Legatto, 2011). As new methodologies for carrying out CDST research continue to be developed, more empirical studies are investigating L2 development within a CDST framework.

Audrey Rousse-Malpat and Marjolijn Verspoor (2018) describe an instructional approach that combines insights from CDST and usage-based principles. They refer to it as a dynamic usage-based approach (DUB). Based on DUB, the researchers created the 'movie approach' (Verspoor & Hong, 2013). In a study carried out in university classes in Vietnam, students had multiple exposures to a movie in the L2. The focus of the activities was on input rather than output, and the input was designed to be authentic and to be made comprehensible through scaffolding and repetition. Consistent with CDST, learners were provided with repeated exposure to language in authentic contexts to promote connections between language forms and meanings. The L2 performance of students in the movie approach was compared with that of a group who received a task-based approach including reading and listening tasks, oral interaction activities, and grammar instruction. The learners in the movie approach made significantly more progress than the learners in the task-based classes on both the receptive and productive measures. The researchers interpret these findings as support for CDST and argue that the benefits for the movie approach are 'in the dynamics of processing of meaningful input. A dynamic perspective would argue that every time we hear the same input ... the input is different' (Rousse-Malpat & Verspoor, 2018, p. 65).

**Summary**

In the end, what all explanations of language acquisition are intended to account for is the ability of learners to acquire language within a variety of social and instructional environments. All of the theories discussed in this chapter and in Chapter 1 use metaphors to represent something that cannot be observed directly.

Linguists working from an innatist perspective draw much of their evidence from studies of the complexity that appears to underlie proficient speakers' knowledge of language and from analysis of their own intuitions about language. Cognitive and developmental psychologists argue that it is not enough to know what the final state of knowledge is and that more attention should be paid to a more complete analysis of the language that is available in the input, as well as to the developmental steps that learners pass through on their way to the achievement of higher levels of proficiency.

Research from the cognitive perspective has sometimes involved computer simulations or controlled laboratory experiments where people learn specific sets of carefully chosen linguistic features, often in an invented language. Linguists may argue that such tightly controlled environments do not adequately represent the environments in which human language development takes place. They question whether one can infer that this is how learners acquire the knowledge of the complex language that they eventually exhibit.

However, advances in technology now enable cognitive psychologists to draw on a growing body of research in less restricted learning environments, both in classrooms and in community-based learning. It is now possible to analyse vast amounts of data to track learners' access to language input and their use of language over time. This allows researchers to test hypotheses about learners' evolving language production and to provide more accurate descriptions of what the environment offers to the learner. Research from the cognitive perspective is designed to investigate the role of repeatedly using language in a variety of contexts and how this may result in the ability to access language knowledge rapidly and automatically—whether for comprehension or production.

Interactionists emphasize the role of negotiation for meaning in conversational interactions. This perspective and the sociocultural perspective provide insights into the ways in which learners can gain access to new knowledge about the language when they have support from an interlocutor. Some linguists challenge the interactionist position, arguing that much of what learners need to know is not available in the input, and so they put greater emphasis on innate principles of language that learners can draw on. However, researchers working from a usage-based perspective draw on the increasingly large databases to show how learners are able to acquire and use constructions (from words to complex syntax) following exposure in situations where they can infer the relationship between those constructions and the meanings they convey.

Sociocultural theorists remind us that learning always takes place in a social context that includes not only the interlocutors that a learner might have direct contact with but also the broader community environment that shapes motivation, emotion, identity, and opportunity, which in turn shape a learner's language development. From this perspective, the emphasis in understanding language development is not focused on what goes on inside the mind of the learner but rather on the myriad interactions and connections between the learner and the environment. Complex dynamic systems theory places language acquisition in an even larger context, one which has been drawn on to account for the development of many different systems (including linguistic, social, cultural) that interact with each other in complex ways.

Both linguists and psychologists draw some of their evidence from neurological research. At present, most of the research on language representation in the brain and specific neurological activity during language processing is inconclusive. This is another area where advances in technology are changing what it is possible to observe. More sophisticated and less invasive brain scanning instruments have increased opportunities to observe brain activity more directly. Such research will eventually contribute to reinterpretations

of research that previously could examine only the observable behaviour of learners speaking or performing other language tasks. That is, in addition to observing what an individual says or seems to understand, scientists will be able to identify the types and locations of the brain activity that are associated with these behaviours.

Educators who are hoping that language acquisition theories will give them insight into language teaching practice are often frustrated by the lack of agreement among the 'experts'. The complexities of L2 acquisition, like those of L1 acquisition, represent puzzles that scientists will continue to work on for a long time. Research that has theory development as its goal has important long-term significance for language teaching and learning, but agreement on a 'complete' theory of language acquisition is probably, at best, a long way off. In this chapter, we have presented a number of different perspectives from which researchers have worked in trying to explain various aspects of L2 acquisition. Some readers may wonder how researchers can look at the same information and come up with different hypotheses about what underlying mental processes can be inferred from that information. Readers may look at these brief descriptions of different perspectives and notice that there are similarities between explanations that are presented as distinct or even competing views. We are left with the fact that, even though aspects of new theories may look similar to previous ones (for example, repetitive practice in behaviourism and usage-based learning, or restructuring in cognitive theories and non-linearity of development in CDST), they are situated within conceptual frameworks that are quite different.

This is not to say that researchers from different perspectives are not sharing ideas. In 2016, a paper entitled 'A Transdisciplinary Framework for SLA in a Multilingual World' was jointly authored by more than a dozen scholars who referred to themselves as the Douglas Fir Group. The framework, which reflects the authors' wide range of theoretical views, has ten interrelated themes that were identified as fundamental to the complex and multidimensional phenomena that are involved in language development (Douglas Fir Group, 2016). Such mutual respect and openness to different perspectives may lead to the design of research projects that ask a variety of questions and use a variety of methodologies. These are important first steps towards the development of language acquisition theories that are more comprehensive than those that grow out of a single discipline or research tradition.

Some teachers watch theory development with interest and enjoy the debates and discussions within and across the different perspectives. Meanwhile, however, they must continue to teach and plan lessons and assess students' development in the absence of a comprehensive theory of L2 learning. A growing body of applied research draws on a wide range of theoretical orientations, sometimes explicitly stated, sometimes merely implied. Such applied

research, which is often carried out in classrooms, may provide information that is more helpful in guiding teachers' reflections about pedagogy. In Chapters 5 and 6, we will examine language acquisition research that has focused on learning in the classroom.

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### Questions for reflection

- 1 Several theories for L2 learning have been described in this chapter. Is one of them more consistent with your own understanding of how languages are learned? If so, how have your experiences as a teacher or learner brought you to this view?
- 2 Schmidt's noticing hypothesis—that all L2 learning in adults involves awareness of what is being learned—is somewhat controversial. That is, it has been argued that it is also possible to learn *incidentally*, without any awareness or even an intention to learn. However, L2 learners certainly do have 'aha' moments when they suddenly understand something about how the target language works. Do you have any examples of *noticing* from your own language learning experiences, or from those of your students?
- 3 From the perspective of the interaction hypothesis, modified interaction is seen as an essential resource for L2 learners. This is distinguished from modified (or simplified) input. Can you think of some examples of each? What are some of the features of modified interaction that you think are especially helpful to learners? Are there some features that may not support learning? What are the contexts in which L2 learners are most likely to benefit from modified interaction? Do you think that simplified input is (also) important?

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### Suggestions for further reading

**Dörnyei, Z.** (2009). *The psychology of second language acquisition*. Oxford: Oxford University Press.

This overview of the theories that have been proposed to explain second language acquisition is both comprehensive and easy to read. Dörnyei provides detailed treatment of the theories that are discussed in this chapter, focusing particularly on those arising from research in cognitive psychology. In addition, the book introduces work in neurobiology that provides a new level of explanation for language acquisition and use.

**Swain, M., Kinnear, P., & Steinman, L.** (2015). *Sociocultural theory and second language education: An introduction through narratives* (2nd ed.). Bristol: Multilingual Matters.

The authors cover the key concepts of sociocultural theory (for example, mediation, zone of proximal development, private speech, collaborative

dialogue) through the use of narratives. The narratives come from the voices of language learners and teachers from different educational contexts. The book is of particular interest to readers motivated to understand how sociocultural theory relates to the teaching and learning of second languages.

**VanPatten, B., Keating, G. D., & Wulff, S.** (Eds.). (2020). *Theories in second language acquisition: An introduction* (3rd ed.). New York: Routledge.

The editors set out a list of observations that have arisen from research studies in second language acquisition. Then they asked well-known researcher-authors to discuss how the theoretical framework in which they have done their own research would explain these observations. Ten of the twelve chapters introduce specific theoretical perspectives, including universal grammar, sociocultural theory, skill acquisition, processability, input processing, complex dynamic systems theory, and usage-based approaches. The chapters are brief (about 20 pages, including discussion questions and readings) and written in a style that is accessible to those with a limited background in research and theory. In the final chapter, VanPatten specifically addresses the relationship between language learning theories and language teaching.