Applied Research on English Language

V. 13 N. 2 2024
pp: 31-56
http://jare.ui.ac.ir

DOI: 10.22108/are.2024.140705.2240
Document Type: Research Article

Trajectories of Multilingual Iranian Students' Speaking Skill Development from Complex Dynamic Systems Theory Perspective

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Received: 2024/02/24 **Accepted: 2024/04/06**

Abstract: Though applied linguistics has observed a rise in language acquisition investigations within the complex dynamic systems theory (CDST) paradigm, the majority of research endeavors have been centered on the development of learners' first language (L1) or second language (L2). Limited research exists on multilinguals' L3 acquisition/development, with even fewer studies considering the development of learners' speaking skill in L2, and L3. The present study aimed to address these gaps by adopting a CDST approach to analyze the development of fluency, accuracy, and complexity in L2 (English) and L3 (French) speaking skills among five undergraduate Iranian EFL junior students of Translation Studies at Jahrom University over one academic year. The students were at an intermediate level in English language and their French language proficiency was at the beginner level. The participants' speaking ability in both languages was closely examined and analyzed regarding their development of fluency, accuracy, and complexity within a quantitative design. Findings depicted that the aspects were developed in non-linear, chaotic, and emergent patterns in multilingual learners' L2 and L3 speaking skill. Moreover, the findings indicated that these elements in multilingual learners' speaking were interconnected and influenced each other over a period of time. The discoveries have some significant implications for L2 and L3 language teaching, such as creating flexible learning and teaching environments, fostering emergent behavior in language classrooms, encouraging learners to have a self-organizing and autonomous role in language learning, having sensitivity to the diverse needs of learners, and fostering a collaborative learning environment.

Keywords: Complex Dynamic Systems Theory, Speaking Skill, Complexity, Accuracy, Fluency.

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Introduction

Complex Dynamic Systems Theory (CDST) is a theoretical framework that explores the behavior and interactions of complex systems over time. This theory, applied across various disciplines, including language learning and cognitive science, considers how elements within a system dynamically interact, leading to emergent properties that cannot be predicted from the individual components alone (Larsen-Freeman, 2006; 2017; 2020).

In the field of applied linguistics, CDST offers a nuanced framework for understanding the intricate dynamics of language learning processes. At its core, CDST underscores the nonlinearity and emergence within complex systems, emphasizing how interactions among elements give rise to unpredictable and novel outcomes over time. This principle, as highlighted by Larsen-Freeman (2016), challenges the traditional linear views of language acquisition, portraying language learning as a multifaceted and evolving system where emergent properties drive the learning process.

Moreover, CDST illuminates the concept of self-organization and adaptability, a cornerstone of the theory articulated by Larsen-Freeman and Cameron (2008). Here, the notion that systems autonomously restructure and adapt to changing conditions underscores the capacity of language learners to dynamically respond to evolving linguistic challenges and environments. This adaptive nature not only demonstrates the system's inherent complexity but also emphasizes the learners' active role in shaping their language development.

Additionally, sensitivity to initial conditions, as discussed by Ellis (2008), points to the theory's acknowledgment of the profound impact that small variations in learning environments can have on language learning trajectories. These initial conditions play a crucial role in shaping the subsequent behaviors and outcomes in language acquisition, highlighting the intricate and sensitive nature of language learning systems. Lastly, the concept of feedback loops and dynamic interactions, as explored by Thornbury (2017), underscores the importance of continuous adjustments and responses within the system, showcasing the interconnected and iterative nature of language learning processes.

In essence, the tenets of CDST provide a comprehensive lens through which language educators and researchers can understand and navigate the complexities of language learning. By embracing the principles of nonlinearity, emergence, self-organization, sensitivity to initial conditions, and dynamic interactions, educators can tailor teaching approaches that cater to the intricacies of language systems, fostering adaptive and effective language learning environments.

On the other hand, CDST focuses on the evolution and transformation of language instead of simply studying its final form (Lowie & Verspoor, 2022). The process is frequently discussed in relation to the way things evolve over time, encompassing phases of increasing consistency, remaining unchanged and eventually becoming less reliable. A fundamental objective within complex dynamic systems theory (CDST) research is to analyze the interactive elements that shape human behavior and to understand the processes underlying human development and transformation. CDST studies aim to elucidate the complex web of multifaceted factors and relationships that contribute to behavioral patterns and changes over time. A core emphasis is examining how diverse influences at varying levels interact in dynamic ways to produce emergent outcomes. By adopting this perspective, CDST provides a lens to investigate the complexities of human developmental systems and to gain insight into the nonlinear processes that drive growth and adaptation. The focus is on comprehending the interconnectivity of contextual factors shaping development rather than isolating individual variables.

The term "systems" holds significance in concepts such as CDST. According to Larsen-Freeman (2006; 2017; 2020), a system consists of interconnected elements that operate collectively. The elements within CDST are known as subsystems. Systems can contain smaller subsystems that are also systems in their own right. The interaction between language, thought, and community dynamics plays a significant role in shaping individuals' identities
(Larsen-Freeman, 2020). The language system encompasses elements including phonology and lexicon, as well as aspects for multilingual individuals. All the components operate in conjunction, even if they are not intricately linked. The interconnectedness and dependence of different system components result in the intricate and constantly evolving nature of development. Development is like a circle. When one part of a system changes, it can affect other parts. So, each step in the development builds on what came before. The way in which components come together and function within each person varies, making their development process distinct and impossible to predict. This means that CDST-inspired studies usually look at how something changes over time, using individual cases as examples (Larsen-Freeman, 2006; 2017).

CDST-based research reveals that although language development follows a similar trajectory for learners, it is heavily influenced by individual differences and fluctuations in environmental influences. CDST studies track a person's learning progression through

extensive measurements. This allows us to comprehend the growth of each person, rather than only examining the collective knowledge gained at a particular moment (Hiver et al., 2022).

Within second language acquisition research, the majority of studies have examined how learners develop writing skills across various contexts and proficiency levels. Comparatively, only a limited number of studies have focused on the complex domain of second language speaking (Lowie & Verspoor, 2022). Speaking involves the coordination of multiple components and is less regulated than writing, as it occurs spontaneously in natural, real-world interactions. Given the paucity of research and the multifaceted nature of speaking skills, the present study specifically investigates the development of key aspects of second language speaking, namely complexity, accuracy, and fluency, through the lens of complex dynamic systems theory. Examining speaking development will provide enhanced insight into this critical, yet understudied area of second language acquisition. In fact, the application of complex dynamic systems theory offers a valuable framework for capturing the dynamic interplay of factors underlying the emergence of speaking abilities.

Moreover, research on CDST in language learning is essential to unravel the intricate nature of language acquisition. Larsen-Freeman (2006) highlights that traditional views of language learning often oversimplify the process, whereas CDST provides a framework to comprehend the dynamic, nonlinear interactions involved in language development. Furthermore, exploring CDST in language teaching can contribute to the development of innovative pedagogical approaches. Larsen-Freeman and Cameron (2008) argue that incorporating CDST principles can lead to more effective teaching strategies that cater to the diverse and evolving needs of learners, fostering a dynamic and adaptive learning environment. In addition, research on CDST in language education can promote learner autonomy and empowerment. By investigating how CDST principles impact language learning autonomy, educators can better support learners in taking ownership of their learning journey (Benson, 2013). This enhances motivation and engagement in the language learning process.

On the other hand, understanding CDST in language learning can help address individual differences among learners. Ellis (2008) suggests that by considering the dynamic and complex nature of language systems, educators can tailor instruction to accommodate diverse learning styles, preferences, and abilities, fostering inclusive learning environments. Finally, research on CDST in language teaching emphasizes the lifelong and evolving nature of language learning. Larsen-Freeman and Long (2014) highlight that adopting a dynamic

systems perspective encourages a view of language learning as a continuous and adaptive process, motivating individuals to engage in lifelong learning and skill development.

By conducting research on the application of CDST in language learning and teaching, educators and researchers can advance their understanding of the complexities inherent in language acquisition. In spite of the growing attention within the domain of applied linguistics towards language acquisition studies under the CDST framework, the primary focus of research has predominantly revolved around the progression of learners' proficiency in their initial language (L1) or secondary language (L2). There is a scarcity of research dedicated to the acquisition or advancement of multilingual individuals' tertiary language (L3), and furthermore, scant exploration has been conducted on the enhancement of learners' speaking abilities in both their second language (L2) and tertiary language (L3). As a result, this research can serve as a bridge for the existing gap in the literature.

Review of the Literature

Since the initial application of complex dynamic systems theory (CDST) to language learning approximately three decades ago, CDST approaches have been increasingly adopted across diverse areas of language research. As demonstrated in recent work by Koopmans (2020) and Kretzschmar (2015), the use of CDST in language studies has grown rapidly, surpassing its implementation in education and theoretical linguistics. Current research reflects the substantial influence CDST has had on many subfields within applied linguistics, including language teaching, development, ecology, evolution, attrition, policy and planning, sociolinguistics, bilingualism and multilingualism, communication studies, and educational linguistics (Bastardas-Boada, 2013; Blommaert, 2014; Cowley, 2011; Han 2020; Herdina & Jessner, 2002; Hult, 2010; Ke & Holland, 2006; Kramsch & Whiteside, 2008; Larsen-Freeman, 2018; Levine, 2020; Massip-Bonet et al., 2019; Mufwene et al., 2017; Schmid et al., 2013). The proliferative application of CDST illustrates its value in furthering our understanding of language functioning and use across diverse contexts. In summary, CDST has become a widely utilized theoretical framework that continues to provide unique and insightful perspectives on central issues in applied linguistics.

The initial research conducted by developmental psychologists on DST has been influential in sparking interest among applied linguistics researchers. Several academic publications have extensively explored the field of language acquisition within the framework of Dynamic Systems Theory (DST) (de Bot & Larsen-Freeman, 2011; de Bot et

al., 2007; Han, 2020; Hiver & Al-Hoorie, 2016; Larsen-Freeman, 2011, 2012; Verspoor et al., 2011). These scholarly works and research articles suggest that language processes demonstrate characteristics typically associated with dynamic and complex systems. These attributes include sensitivity to initial conditions, adaptability, self-organization, interconnectivity, nonlinearity, and a degree of chaos throughout developmental stages. Language systems are shown to rely on internal and external resources and have the capacity to exhibit emergent properties (Larsen-Freeman, 2020; de Bot & Larsen-Freeman, 2011). Consequently, many facets related to language acquisition, particularly language development, can be conceptualized as dynamic systems (Spoelman & Verspoor, 2010), a perspective that applies to both first and second-language learning contexts (Larsen-Freeman, 2006).

Language learning is characterized by ongoing change and nonlinearity, rather than occurring in discrete, stable stages (Larsen-Freeman, 2006). From a complex dynamic systems perspective, language development involves dynamic fluctuations in patterns over time, rather than a strict progression through set developmental phases where learner abilities remain static. There is inherent variability and unpredictability in how learner language evolves. Therefore, the process of language acquisition can be seen as adaptive, complex, and marked by emergent shifts in the system, rather than conforming to neat, linear trajectories of growth. Examining language learning through a complex systems lens underscores the importance of attending to the complex interplay of factors underlying the turbulence and change inherent to developing language proficiency over time.

Moreover, language involves both our neurological functions and interaction with our surroundings, signifying its dual role as a cognitive tool and a means of social communication, highlighting that the cognitive processing and social context of language cannot be viewed as distinct entities. This comprehensive understanding of language characteristics explains that various factors such as the ability to remember, the drive to learn, the individual's sense of self, and the learning environment can all have significant and interconnected influences on the process of acquiring language (de Bot & Larsen-Freeman, 2011). In summary, the DST perspective offers a fundamentally different understanding of language and language acquisition compared to traditional theories prevalent in cognitive sciences and applied linguistics. These traditional theories have relied on static or linear assumptions, such as the information processing approach. However, an innovative theoretical and methodological framework like DST can bring valuable new perspectives to our understanding and study of language acquisition.

In recent years, there has been a noteworthy surge in scholarly research regarding third language acquisition or multilingualism, which can be attributed to the escalating number of individuals engaged in the pursuit of learning more than two languages. The proliferation of research on third language acquisition has illuminated important distinctions between the processes of acquiring a second versus a third language. Several influential studies have made significant contributions to this developing field of inquiry (Aronin & Hufeisen, 2009; Bui & Teng, 2021; Cenoz, 2013; De Angelis, 2007). In particular, Cenoz (2013) and De Angelis (2007) have critically examined the differences between second language acquisition (SLA) and third language acquisition (TLA). Although SLA research broadly encompasses foreign language acquisition, Cenoz (2013) highlights that it frequently overlooks key differentiating factors between SLA and TLA. While both fields investigate non-native language learning, each is associated with distinct learner characteristics, language combinations, and developmental patterns. Ongoing scholarly efforts have enhanced theoretical perspectives on the ways second and third language learning converge and diverge. Delineating the boundaries between SLA and TLA remains pivotal for developing nuanced models of additional language acquisition.

There exists a primary differentiation wherein individuals who engage in the acquisition of third or subsequent languages possess prior familiarity with two or more languages. This pre-existing multilingual competence may have diverse effects on their process of learning the new language (Cenoz, 2013; De Angelis, 2019). As a result, it is evident that individuals who engage in acquiring a third language or higher have access to a broader repertoire of linguistic resources, encompassing their native language, second language, and prior languages acquired. This advantage is not afforded to learners involved in second language acquisition or individuals with bilingual proficiency.

Language growth is an intricate and dynamic progression that evolves continuously. According to Jessner (2008), the expansion of multilingual language use corresponds to a rise in the intricacy and transformative nature of language acquisition processes. Viewed through a dynamic lens, the acquisition of multiple languages, particularly in terms of developmental stages, presents a complexity surpassing that of second language acquisition (SLA). This complexity is characterized by enduring and intricate transformations, nonlinearity, and reversibility in developmental trajectories, along with a dependency on interrelated language systems (Herdina & Jessner, 2013; Jessner, 2008; Jessner & Allgäuer-Hackl, 2022).

Jessner (2008) asserts that multilingual development is a perpetually shifting and intricate phenomenon. Multilingual individuals encounter ongoing fluctuations and variability across all their languages. While certain aspects of the multilingual system may solidify, they can still exert influence on the entire linguistic framework. Moreover, the nonlinearity and reversibility of developmental processes suggest that acquiring a new language might impede the maintenance or advancement of previously acquired languages, potentially resulting in language attrition or loss more frequently in multilingual individuals compared to bilingual individuals. In a multilingual context, each individual language is intricately interconnected and should be viewed as an integrated whole, rather than as separate and autonomous systems, owing to their mutual interdependence.

While applied linguistics has seen more language acquisition research in the DST framework, most studies focused on native speakers' L1 or L2 development. Limited research exists on multilinguals' L3 acquisition/development, with even fewer studies considering the development of learners' L2, and L3 (Kobayashi & Rinnert, 2013). This study aims to analyze the speaking of multilingual individuals in their second and third languages. It will use developmental metrics like complexity, accuracy, and fluency to understand how these languages develop and interact with each other in the participants' speaking.

Furthermore, despite certain position papers advocating for the dynamic model of multilingualism (Herdinan & Jessner, 2013; Jessner et al., 2021) and proposing an approach that shapes the exploration of multilingualism while opening avenues for multilingual research, there remains a paucity of empirical studies addressing the dynamism inherent in multilingual acquisition and development. Put simply, a disparity exists between the theoretical frameworks and empirical evidence within the realm of multilingual acquisition and development. The objective of the present study is to bridge this empirical void within the domain of multilingual research.

Moreover, contemporary scholarship underscores the significance of individual differences among multilingual learners, a departure from past research reliant on group data analysis to extrapolate insights regarding second/third language acquisition and oral proficiency (Biber et al., 2011; Sasaki, 2007). The question arises as to whether individual nuances can be broadly applicable. Yet, the issue of generalization remains contentious.

Finally, within the English as a Foreign Language (EFL) setting in Iran, where Persian serves as the primary language (L1) of participants, there is a noticeable absence of research focusing on the developmental trajectory of speaking skills among Iranian multilingual students from the vantage point of the Complex Dynamic Systems Theory. Building upon the

noted research gaps, the present study endeavors to provide a thorough examination of the advancements and structures of complexity, precision, and fluency in the spoken productions of individuals proficient in multiple languages, specifically their second (L2) and third (L3) languages.

Objectives of the Study

Similar to Larsen-Freeman's (2006) research, this study is also exploratory in its approach. It is intended to test a set of assumptions underlying CDST, including the following in particular:

1. When looking at multilingual learners as a whole, their oral development in the second language (L2) generally declines over time, whereas in the third language (L3), their oral development steadily and consistently improves, as analyzed by fluency, accuracy, and complexity.

2. Non-linear and dynamic developmental processes, along with significant variation, such as fluctuating language patterns that show both progress and setbacks, constant and evolving changes, and a mix of structured and unpredictable development, can be identified in *inter*-individual speaking when comparing their second, and third languages using complexity, accuracy and fluency analysis.

3. Non-linear and dynamic developmental processes, along with significant variation, such as fluctuating language patterns that show both progress and setbacks, constant and evolving changes, and a mix of structured and unpredictable development, can be identified in *intra*-individual speaking when comparing their second, and third languages using complexity, accuracy and fluency analysis.

4. The development of complexity, accuracy, and fluency components does not occur in isolation as they can either collaborate or compete with one another. The collaboration and reliance on cross-linguistic academic fluency can be observed in the speaking of multilingual individuals in one language, as well as in their across different languages.

Methodology

Participants

Five Iranian undergraduate junior students, aged between 19 and 21, voluntarily consented to participate in the research investigation. Both male and female students from Jahrom University, Fars showed genuine interest in this research. For the sake of anonymity, the students will be labeled as P, N, L, S, and T. They were registered in a 10-credit French

Language Program at the undergraduate level. During the program, different skills of French language proficiency such as reading, listening, speaking, and writing were practiced, each consisting of 2 hours per week. These students were passing French 3 and 4.

Prior to starting their B.A. program, these individuals had not learned the French language and had completed an average of 6 years of mandatory English as a foreign language education at school. During their B.A. program, they were required to take the mandatory basic English language courses, which lasted for a period of two semesters. These courses, consisting of reading, writing, and speaking, were held for 6 hours per week. Furthermore, individuals have not had any previous exposure to studying abroad or acquiring proficiency in languages other than Persian, English, and French. Simply put, these individuals had acquired Persian as their first language, followed by English as their second language, and then French as their third language, in terms of the order in which they learned them. Furthermore, the students were at an intermediate level in the English language and their French language proficiency was at the beginner level.

Data Collection

The participants engaged in oral tasks without time limits at regular intervals over the course of an academic year, specifically from September 2021 to June 2022. The collection of data occurred during four distinct instances over a duration of nine months, specifically in October 2021, December 2021, February 2022, and April 2022. Whenever they were given the task of telling a story in L2 and L3, dictionary and reference books were both prohibited. Furthermore, the subject matter for speaking in L2 and L3 was identical. Overall, the participants completed storytelling tasks on 5 specific topics (such as a joyful event, an infuriating event, or a memorable life lesson) during each data collection period. The presence of a similar genre among various topics enabled the researcher to examine the long-term oral data and make comparisons with ease.

Data Analysis

In the analysis of the oral excerpts, the parameters of fluency, accuracy, lexical complexity, and grammatical complexity were scrutinized. Fluency was assessed through the calculation of the mean number of words per t-unit, defined as an independent clause in addition to any associated subordinate clauses and non-clausal structures. Accuracy was gauged by establishing the proportion of error-free t-units relative to the total t-unit count. Lexical complexity was determined utilizing Guiraud's index, which involves dividing word types by

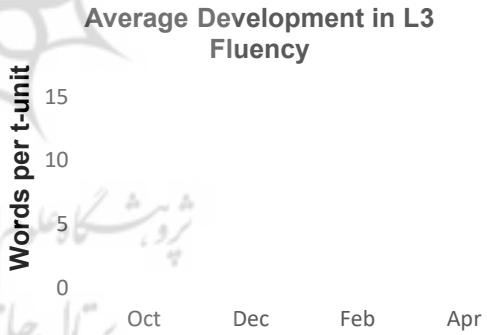
the square root of word tokens. Grammatical complexity was quantified by determining the average count of clauses per t-unit. These metrics are widely acknowledged as robust benchmarks of language advancement in both written and spoken contexts, as corroborated by previous scholarly investigations (Al-Hoorie & Hiver, 2020; Housen et al., 2012; Lowie & Verspoor, 2022).

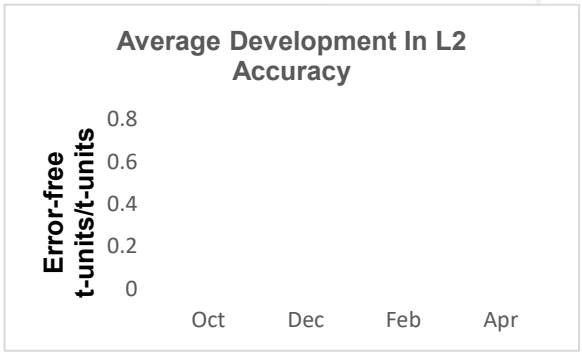
Two raters, including the researcher, coded the transcription of all oral samples. The interrater reliability was also calculated and an index of 0.91 was achieved. Next, the raters carefully reviewed each other's coding, talked about any differences found, and eventually reached a complete consensus. The intricate and dynamic progression of complexity, accuracy, and fluency in oral tasks among multilingual individuals was visually depicted by graphing the quantitative data using charts in Microsoft Excel.

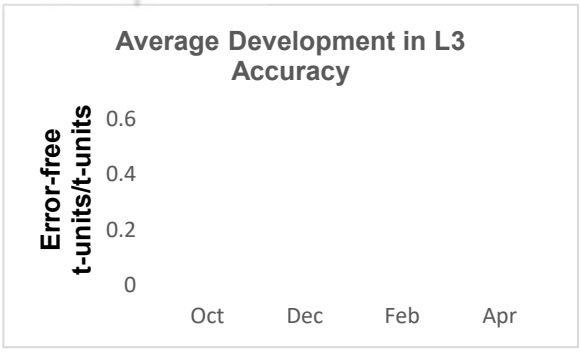
Results

Group Average Development

As illustrated in Figure 1, the collective means for the four speech metrics in the second (L2) and third (L3) languages displayed markedly distinct developmental paths.







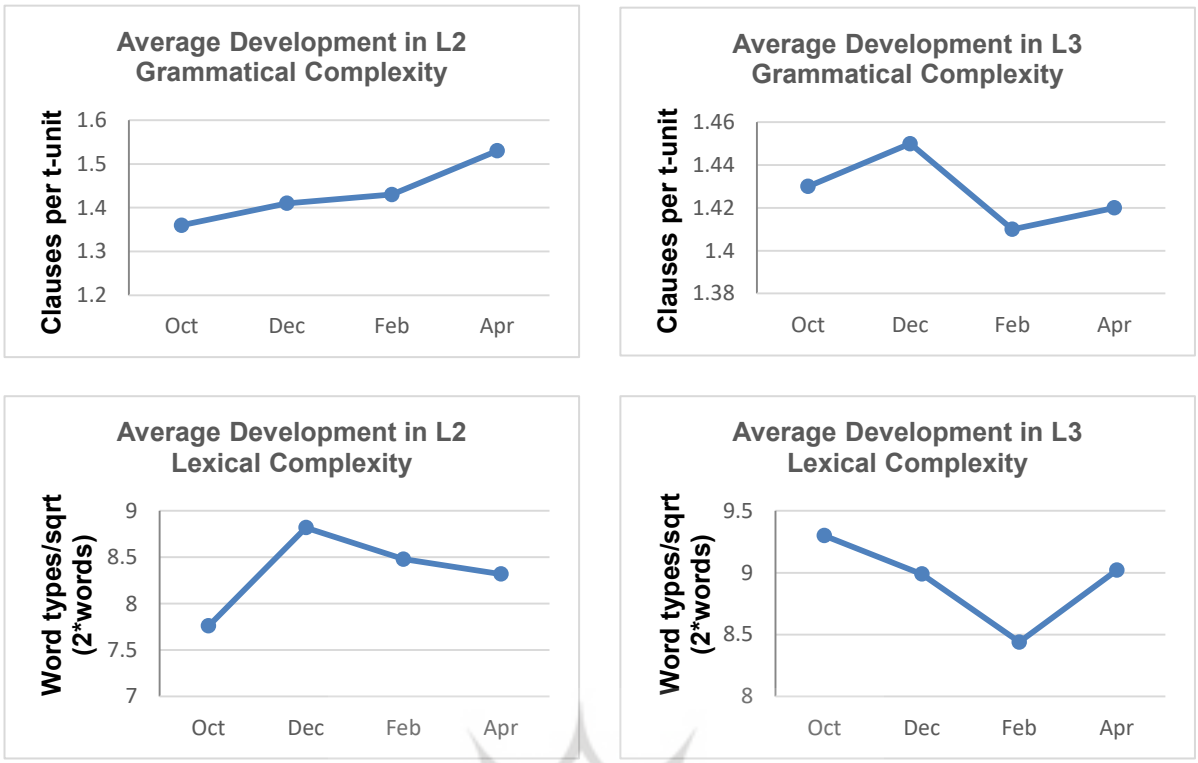


Figure 1. Group Average Development of Fluency, Accuracy, and Complexity in L2 and L3

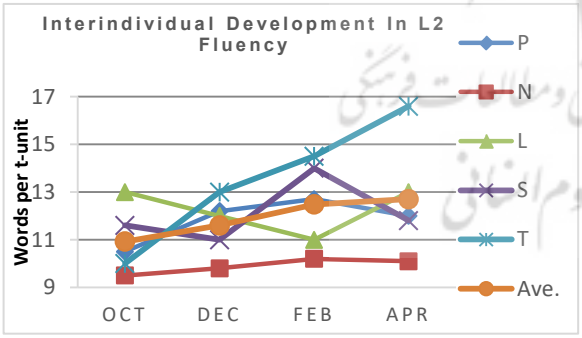
With respect to L2 speaking, except for the global upward tendency in the average development of L2 grammatical complexity, other indices show noticeable increases and decreases. In fact, their complex developmental paths, full of growth and decline at various points, did not indicate straightforward and continuous upward or downward trends. For example, regarding L2 fluency, after a continuous ascending trend from October to February, a sudden descending movement is observed from February to April. In terms of L2 accuracy, there are even intensive fluctuations visible in the diagram. Finally, with regard to L2 lexical complexity, after a sharp increase from October to December, there are two rather mild decreases in the next two intervals.

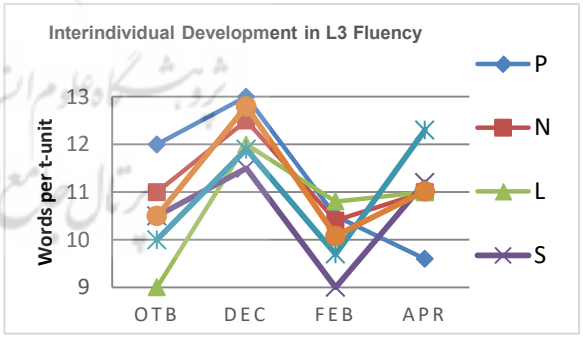
In terms of L3 speaking, there were noticeable increases and decreases in fluency metrics between October and February. From February onwards, there was a slight increase in fluency metrics until April. Despite the overall increase in L3 accuracy, there were noticeable declines in performance, followed by significant improvements in succession. During this period, the overall decline in grammatical complexity was interrupted by a rather sharp increase in December and a milder one in April. However, lexical complexity followed a pattern resembling a U-shape, starting in October, decreasing until February, and then increasing again until April.

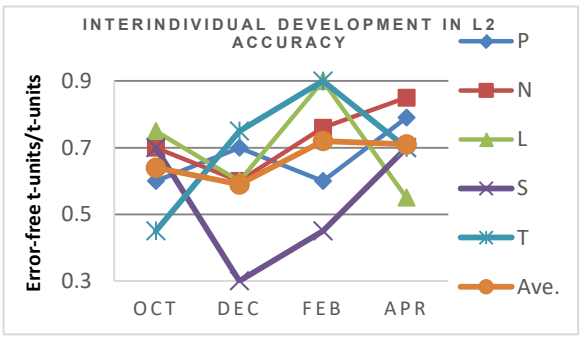
Group averages can offer helpful insights into examining the progression of learner language development. However, it is important to recognize that these averages might mask a wide range of individual differences, as highlighted by Larsen-Freeman (2006). Additionally, relying solely on group averages does not capture the full complexity of the process. According to Sidman (1960), the validity applies to every individual. As a result, our study will prioritize analyzing individual differences by separating the data collected from the group.

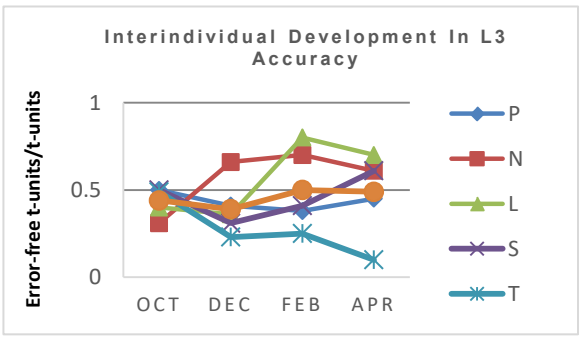
Inter-individual Variations

As shown in Figure 2 There is a considerable amount of variation in all four measures across L2 and L3 speaking. In fact, except for L3 fluency, almost no learner adhered to the group's average paths in other indices. In terms of their second and third language speaking, certain differences were more distinct while others were relatively stable and less apparent. However, the majority of their performances experienced ongoing fluctuations and unpredictable changes, often experiencing periods of growth followed by periods of decline. Consequently, their second language (L2) and third language (L3) did not exhibit regressive nonconformity or progressive conformity to the standards of the language being acquired. Moreover, the trajectories of individual development manifested notable divergence from each other.









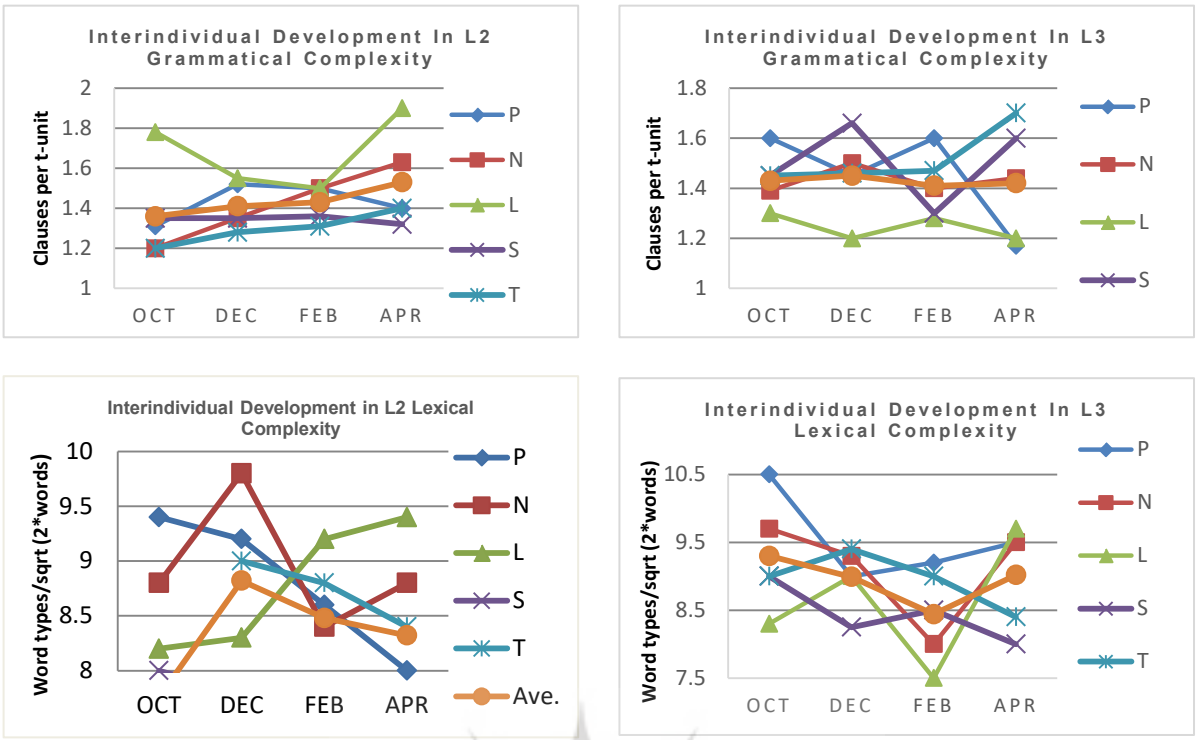


Figure 2. Inter-individual Development of Fluency, Accuracy, and Complexity in L2 and L3

Intra-individual Variations

When analyzing variations within individuals, the focus was on two different aspects. The first aspect was examining and contrasting a solitary measurement throughout various instances of speaking in L2 and L3 (for example, fluency in speaking within these languages). Next, tracking the progress of fluency, accuracy, grammatical complexity, and lexical complexity in speaking a specific language (such as L2 speaking) as time goes on. As a result of spatial constraints within this article, our analysis will focus solely on select intra-individual data in order to evaluate the observed variations. The investigation will commence by examining a solitary measurement across the L2 and L3 speaking domains, utilizing the data obtained from P as an illustrative example.

In Figure 3 the graphical representation provides visual evidence of fluency, accuracy, grammatical, and lexical complexity indices across L2 and L3 speaking. The levels of fluency for L2 and L3 all showed an upward trend from October to December. Notably, the increase in fluency was more pronounced for L2. On the other hand, the growth in fluency for L3 was less significant. From December to February, although L2 fluency continued its increase at a milder pace (compared to that between October and December), there was a sharp decline in L3 fluency which continued with a milder slope from February to April.

During the same time, however, L2 fluency started a sudden decline after two months of increase.

Regarding the accuracy index, while there was a mild increase for L2 from October to December, a moderate decrease was observed for L3 during the same period. However, from December to April, in both languages, one can observe a decrease and an increase respectively, with sharper slopes for L2.

With respect to grammatical complexity, even more variations can be observed when comparing L2 and L3 development. While L2 complexity demonstrated one upward and two declining trends respectively from October to April, L3 complexity experienced a more fluctuating movement with alternate increases and decreases during the same period. This is not at all in harmony with L2 development. In fact, the complexity exhibited by L3 was found to possess the highest degree of variability.

Regarding lexical complexity development during the observed 7-month period, the L2 lexical complexity exhibited a rather consistent decline. At the same time, a U-shaped curve in L3 speaking was observed during the same period, with an initial decline from October to December followed by an increase from December to April.

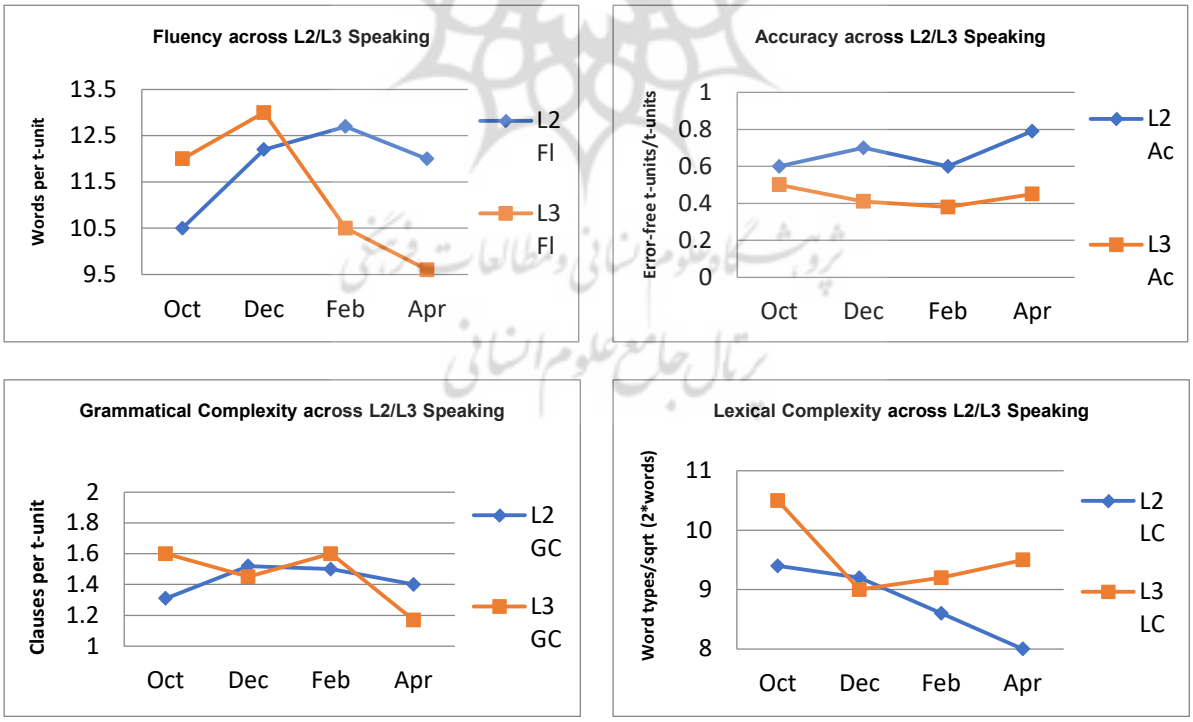


Figure 3. Intraindividual Variation of a Single Index of Fluency, Accuracy, and Complexity across P's L2/L3 Speaking

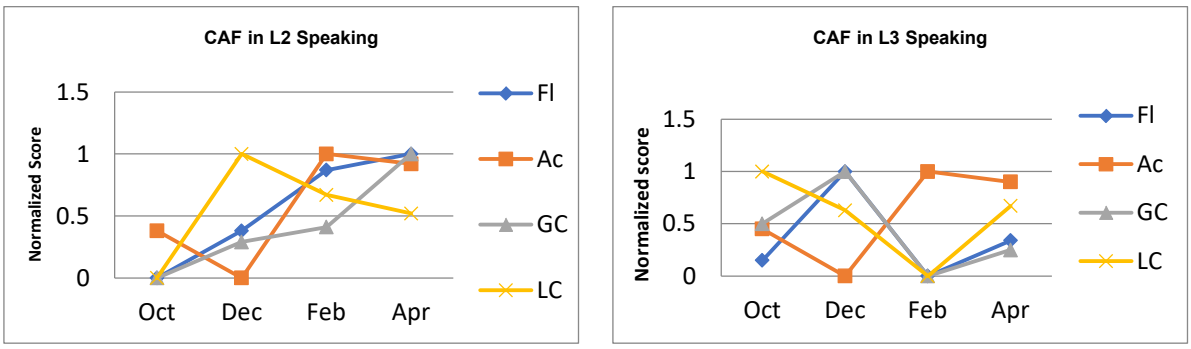


Figure 4. Intraindividual Variation of Fluency, Accuracy, and Complexity in S's Speaking of a Single Language Over Time

Finally, regarding the intraindividual variation of fluency, accuracy, and complexity in S's speaking of a single language over time, Figure 4 illustrates a great deal of variation. As for fluency, accuracy, and complexity in L2 speaking, although there is a general increase in all four indexes from October to April, there are waxes and wanes, especially in accuracy and lexical complexity indices. Variations and fluctuations are even far more pronounced when one observes complexity, accuracy, and fluency indices in L3. In fact, there is not a consistent trend of development in any of the four indexes.

To elucidate the interaction among various metrics throughout the process of acquiring the second language (L2) and third language (L3), correlation coefficients were calculated. The data displayed in Tables 1 and 2 suggest a relationship between L2 and L3 speaking skills.

A positive correlation indicates a mutually beneficial association where two factors support and promote each other's growth. The observation of negative correlations suggests the presence of competitive relationships, as inverse trends indicate constructs may impede each other's development. Specifically, results revealed a significant positive correlation between L2 linguistic complexity and L3 linguistic complexity ($r = .47$, $p < .05$). This aligns with models wherein acquiring one language can facilitate growth in another language system. However, significant negative correlations emerged between L2 accuracy and L2 fluency ($r = -.57$, $p < .05$), and between L2 grammatical complexity and L3 grammatical complexity ($r = -.45$, $p < .05$). These competitive associations imply trade-off effects, where progress in one area occurs at the expense of another. Taken together, findings demonstrate both cooperative and competitive dynamics between second and third-language systems. The interplay of positive

and negative correlations highlights the complex interactions underpinning multilingual development.

Table 1. Descriptive Statistics

	Mean	Std. Deviation	N
L2Fluency	11.9250	1.79499	20
L3Fluency	10.9450	1.13623	20
L2Accuracy	.4590	.18014	20
L3Accuracy	.6675	.15314	20
L2GramComp	1.4355	.17993	20
L3GramComp	1.4310	.15447	20
L2LexComp	8.5950	.72727	20
L3LexComp	8.9375	.72017	20

Table 2. Correlations

	L2 Fl	L3 Fl	L2 Ac	L3 Ac	L2 GC	L3 GC	L2 LC	L3 LC
L2 Fl								
L3 Fl	-.110							
L2 Ac	-.576**	-.076						
L3 Ac	.097	-.092	.133					
L2 GC	.182	-.091	.347	.139				
L3 GC	.084	.413	-.340	-.218	-.452*			
L2 LC	-.287	.392	.212	.118	.085	-.044		
L3 LC	-.190	.218	-.146	-.084	-.076	-.040	.474*	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Discussion

With the exception of the first expectation, the remaining predictions were supported by the results. Contrary to the initial hypothesis, data analysis revealed no systematic overall increase or decrease in L2 and L3 proficiency across measures of complexity, accuracy, and fluency among the multilingual learner group. Instead, developmental patterns in L2 and L3 speaking complexity, accuracy, and fluency followed nonlinear, dynamic trajectories marked by ongoing fluctuations. These findings diverge somewhat from the Model of Multilingual Development (Herdina & Jessner, 2013; Jessner, 2008; Vetter & Jessner, 2019), which

proposes that L3 improvement tends to coincide with decreased L2 proficiency in multilinguals. However, the current results align more closely with the complex and variable nature of language development suggested by dynamic systems theory. The study indicates multilingual speaking skills may evolve idiosyncratically over time rather than adhering strictly to opposing growth trends across systems. In this study, multilingual learners were given a minimum of 10 hours of instruction in their L2 and only 2 hours of instruction in their L3 each week. Consequently, a lack of balance in L2 and L3 input (and output) will result in a decline in L3 proficiency and an improvement in L2 proficiency due to the adaptability of multilingual systems to changes in the teaching and learning context. However, in actual situations, learners in groups did not follow predictable and adaptable progressions but instead displayed more fluid and reversible developments in their L2 and L3.

The group collective means provides a basic understanding of the unpredictable development of multilingual skills based on complexity, accuracy, and fluency, but the individual data adds complexity to the situation. Researchers in language acquisition often overlook individual differences, leading them to assume that learners will have similar developmental patterns (Larsen-Freeman, 2006). However, our findings indicate that no multilingual learner matches the average development curve of the group, as each individual's progress, as measured by fluency, accuracy, and complexity in L2 and L3, is filled with significant changes and many dynamic patterns such as sudden, sustained growth and decline. There may be a question about whether students show improvement in speaking their second and third languages after one year of learning. It holds significance as it determines the success of students in their university assessments and tests. However, the basic assumptions about how we learn language are very different from the principles of DST. Undoubtedly, the development of our language proficiency can be influenced by a variety of intrinsic and extrinsic factors. These factors encompass aspects such as cognitive retention capacity, learning motivation, and the temporal investment dedicated to the learning process. Additionally, the amount of stress we experience from our teachers and parents can result in growth and attrition in language learning. Spoelman and Verspoor (2010) pointed out that ongoing alterations are a regular and advantageous occurrence in any developing and complex system. The results illustrate that the way people learn multiple languages may seem disorderly, but in reality, it is a natural part of the learning experience. This encompasses exploring the transformations that occur over time and the introduction of novel concepts.

The recent findings on the variations among individuals and the mechanisms of group learning indicate that the acquisition of multiple languages is an intricate and ongoing process. It's much more complicated than just learning a second language or being bilingual, and it can't be fully explained by theories about learning a second language. Studying how individuals learn and utilize multiple languages is a crucial area of focus for researchers, particularly those studying second language acquisition. Ultimately, when students conversed in the same language or different languages, there were some interrelations among different elements of language learning. These connections were strong in some cases. The research indicates that individuals who are fluent in multiple languages have interconnected language development and improvement. This suggests that learners have the flexibility to enhance their language abilities independently or collectively. It's as if all the elements function in conjunction to create a larger entity.

Conclusion and Implications

Through the lens of Dynamic Systems Theory (DST), this study conducted a longitudinal evaluation of the advancement of multilingual learners in their second language (L2) and third language (L3) oral proficiency throughout an academic year. A comprehensive scrutiny of the data unveiled that the trajectories of fluency, accuracy, and complexity among multilingual learners displayed unpredictable variations as they embarked on acquiring further languages. These trajectories were characterized by frequent progression and regression, constant and emergent variations, and complex interactions among variables. There were numerous factors that influenced their ability to communicate effectively. A variety of important conclusions are drawn from this study. One is that examining the way multilingual learners acquire and use various languages highlights the intricate nature of the process. In addition, this study indicates that the use of complexity, accuracy, and fluency dimensions offers a promising approach for evaluating the development of speaking skills in multilingual learners and studying the complexities of multilingualism. On the other hand, the static structural theory of competence cannot easily explain change during development. A more dynamic conceptualization of language and language learning is needed, which considers learners' goals and intentions, examines task demands, and views performance as adaptive, flexible, and situationally dependent. As Thelen and Bates (2003) discuss, development manifests through the ephemeral growth and decline of patterns, rather than a gradual accumulation of discrete skills. Some patterns are stable and adaptive while others

are short-lived and context-specific. From a complex dynamic systems perspective, interlinguistic patterns emerge from the complexity and frequency of L1-L2 interactions, shaped by individual orientations and variables (Larsen-Freeman, 1997). With multilingual learners, the picture becomes even more complex, underscoring the situated, transient nature of linguistic systems. No one system or aspect of competence inherently dominates, as cohesion arises from specific conjunctions of elements relevant to current tasks (Thelen & Bates, 2003).

In general, CDST underscores the importance of adaptability in language learning (Larsen-Freeman, 2019). This theory suggests that language teaching should focus on creating flexible environments that allow learners to navigate the complexity of language systems and adapt to varying linguistic contexts (Larsen-Freeman & Cameron, 2008). According to Larsen-Freeman and Cameron (2008), language learning outcomes emerge from the dynamic interactions between learners, teachers, and the environment. By fostering emergent behavior in language classrooms, educators can promote natural language development through meaningful communication and social interactions (Hiver et al., 2022).

Furthermore, scholars like Lowie and Verspoore (2022) emphasize the role of self-organization and autonomy in language learning. CDST suggests that learners should take an active role in their learning process, self-organize their linguistic knowledge, and develop autonomy in decision-making (Ellis, 2008). In addition, the sensitivity of language learning systems to initial conditions highlights the need for educators to tailor instruction to meet the diverse needs of learners (Larsen-Freeman & Long, 2014). By considering the initial conditions of the learning environment, teachers can create personalized learning experiences that optimize language acquisition (Ellis, 2008). Finally, dynamic interactions and feedback loops play a crucial role in language learning (Thornbury, 2017). By providing constructive feedback, encouraging interaction, and facilitating meaningful language practice, educators can support continuous language development and foster a collaborative learning environment.

In summary, by incorporating the principles of CDST into language teaching and learning, educators can create dynamic, learner-centered environments that promote effective language acquisition and development. These principles offer a comprehensive framework for understanding the complex nature of language learning and provide valuable insights into optimizing language instruction for diverse learners.

Nonetheless, this research had certain limitations due to its exploratory nature. First, the study examined the progress of multilingual learners' speaking abilities over a period of 10

months. In future studies, the examination of language development over a longer timeframe of 2-3 years and a denser data collection process (possibly on a monthly basis) can be more illuminating regarding the dynamic and complicated paradigms of multilingual development. In addition, this investigation utilizes DST methods to illustrate the development of language, rather than attempting to interpret it. Further research is necessary to investigate why certain languages progress at varying rates and how they interact and compete with one another. In addition, there is a need to understand the factors, both internal and external, that contribute to variations in language learning across individuals.

Declaration of Conflicting Interests

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

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