

How to Implement Chaos Theory in SLA Classroom as a Complex System

Zahra Jamaledin¹

Sima Sayadian²

Department of English, Maybod Branch, Islamic Azad University, Maybod, Yazd, Iran

Abstract: *This paper makes an endeavor to illuminate how chaos theory can give advantages to SLA and education. Chaos theory tries to explain how disorder contributes to order and chaos scientists investigate how disorder gives ways to order. Thirty years ago, it was proposed in the study of natural sciences and nowadays linguistics tends to use this model to find disorder to reach order in SLA and educational systems since language learning is a dynamic system and a natural process that contains order and chaos. This theory teaches teachers to expect unpredictable phenomena in order to know how they can cope with chaotic situations. We want to have a better understanding of what occurs in SLA classroom and whether we can predict the problematic issues by grasping the features and principles of chaos theory and how we can reflect and what we should expect in the classroom. We are eager to know the influence of feedback, butterfly effect, and fractals on teaching and learning. The twelve features of chaos theory and their implications for SLA classroom have been mentioned.*

Keywords: *Chaos theory; Features of chaos theory*

Introduction

Chaos theory deals with the behavior of dynamic systems, those that change over time, and since language classroom can be viewed as a natural world it can contain features of chaotic systems "the behavior of complex systems emerges from the interactions of its components ,it is not built in to any one component" (Larsen-Freeman, 1997). Larsen-Freeman was one of the first linguists who linked between language and chaos theory. Chaos refers to different forms of randomness that mean shortages of order in a system but this randomness follows particular rules (Fahim & Abbasi, 2014). Why has this theory become so attractive? Because it gives us a new view of complex system and also shows us a deeper understanding for multi-faceted world in which we live. For example, now it can answer the question of inconsistency of weather patterns and why prediction has sometimes been inaccurate. The reply is that this unpredictability is a result of an aspect of chaos theory," butterfly effect" which means a butterfly flapping its wings in one place and seems not to be critical may be responsible for a huge atmosphere disturbance like a hurricane in a distant location. So it is clear to us why we cannot predict accurate weather forecasts beyond a few days (Kozden, 2005). This feature can sometimes determine

why language teaching input can be effective for some learners' progress while it does not have any effect on others' (Dörnyie et al. 2014). Complex systems reject determinism that believes every event can be forecasted because of predicting events and cause and effect rule controls all motions. Some studies have been done on the application of chaos theory to SLA classroom. Fahim and Dehghankar (2014) try to investigate how to teach literature through the features of chaos theory. Because literature and its genres and sub-genres can be analyzed as a chaos system. As the principles of chaos theory can be applied to both first and second language milieu and literature is as a part of culture and culture itself is a part of language. So teaching it accurately can help learners to understand the language better and viewing literature from this perspective, we should not focus on and prefer linguistic aspects such as vocabulary and grammar to scientific and complex aspects more including "cultural awareness, communicative competence, and discourse analysis." Ahmadi (2011) in a study reveals the effect of one of the features of the chaos theory, sensitivity to initial conditions, on language assessment. He plans to detect if changing the first item of MC test has any effect on test performance and shows how this principle can be applied to test. He selected some items and administered the test. After an interval of two weeks the same students took the test but in different order and versions of items. The results showed that 72% of the students had a different performance on the second test. He claims that the first item has an essential role in determining how the students may perform on the following items. So if the students do not know the answer of the first question it may have effect on them emotionally and consequently on their performance on the following items and the whole test. Reigel (2005) reports the usefulness of one feature of dynamic system model of SLA, the role and the impact of positive feedback on English as a second language learning. Regarding SLA as a complex system, positive feedback causes the system to evolve, expand, and change. Briggs (1992) alleges that "feedback is perhaps the key element in transitions from chaos to order and from order to chaos" (cited in Reigel, 2005). Reigel (2005) states that this positive feedback can trigger certain initial conditions that result in flourishing learner's inter-language. Applied linguists who study complex systems based on the perspective of chaos theory believe that they can propose not only certain methodology principles but also new matters in the field. Larsen-Freeman (2012) suggests many humanistic principles including "embrace, the value individual diversity, human relationships, contextual sensitivity, and the quality of life in the classroom for all the participants" (cited in Mahmoodzadeh, 2013).

Implementing Chaos Theory in Language Classrooms

Chaos theory was proposed in the study of natural sciences thirty years ago. Other specialists including SLA experts can apply its metaphors and features to view their fields because learning a language is a natural process too. For example language classroom can be considered as a complex system and natural world because it can entail and show many characteristics of these systems. So the teachers who are aware of this theory know what is going to happen in their classroom. Kozden (2005) tries to explore ways of bringing chaos theory into his lesson and course planning since he believes the theory can distinguish the problems in a language class and create a new framework for teaching. Fahim and Dehghankar (2014) explain twelve features of complex systems that are defined by chaos theory simply. After mentioning each feature, we try to show that it takes place in language classroom too.

Dynamicity: the most important feature of complex system is dynamic, that is, it changes during time. Dynamicity happens in classroom because the learners encounter new concepts every moment and learn new things. So they are always becoming a new learner. The classroom that is devoid of this feature becomes a barrier. So "becoming" rather than "being" is a trait that should occur in class because it is a dynamic environment. We as teachers should observe and reflect upon these changes. In addition to observation, students' feedback is another way to notice these changes (Kozden, 2005). **Complexity:** a complex system often contains many components that influence each other (Larsen-Freeman, 1997). Alemi et al. (2011) state that "another feature of the system is complexity in the sense that it has a large number of components or agents which are connected to each other in one way. Therefore, a single effect on one part of this system can lead to great change in whole system." In a class there are elements including teacher, students, materials, and environment that impact each other. In a discussion activity students use target language and these words acquire meaning when the class hears and gives feedback on it (Kozden, 2005). **Nonlinearity:** this property insists that the system does not follow a straight line. Therefore, in an educational context like language classroom students should have opportunities to encounter materials in different ways and practice a concept from different angles. Contrary to ALM that believes learners learn a language in a specific way by rote, connectionism believes learning does not take place in a straight line and sequence phases but in a parallel and zigzag way (Menezes, 2013). In EFL class some experience may help one to learn but block another. The teacher should provide every student with different chances in order to overcome these barriers (Menezes, 2006). **Chaos and self-organizing:** chaos

refers to period of randomness and lack of order (Fahim & Dehghankar, 2014). Kozden (2005) explains how these two, that is, order and randomness happen in the classroom. Some may think of chaos as a discipline issue but there is another chaos that is possible and necessary if we wish learning to take place. When the teacher is going to control, a kind of order, students start learning that accompanies by a kind of chaos. Kozden (2005) claims that these chaotic moments are necessary for students to learn. In other words, chaos means students' initiative because it is not under teacher' control. Teacher should hunt these moments and create opportunities and activities that learners work with target language which have excessive impact on the quality of their learning. Self-organization indicates a way that chaos tends to evolve as an effective result. Menezes (2008) believes language learning "develops through dynamic and constant interaction among the subsystems, alternating moments of stability with moments of turbulence. As complex systems are in constant movement, after chaos, "under- stood here as the optimal moment for learning, a new order arises, not as a final static product, but as a process, *that is.*, something in constant evolution." AS mentioned earlier, a complex system has independent components that interact with one another in many ways, these interactions cause the system as a whole to undergo spontaneous self-organization (McAndrew, 1997). Self –organization may have a contribution called "emergence "what emerges is different from before and is more than the sum of its parts that cannot be explained by the activity of its different parts. When learners face new experiences outside their schools and classrooms and try to cope with new conditions a new inter-language phase emerges. This stage is more than the sum of school activities (Menezes, 2013).

Unpredictability: Soleimani et al. (2013) make clear the difference between a simple system that contains a few elements with a predictable pattern and complex systems. For example, "traffic light system" is a simple system with only three choices "green, amber, and red". This pattern is predictable and fixed and a driver knows a red after an amber means that s/he has to stop. But a complex system that contains huge number of components that affect each other and change in different ways is unpredictable. It is difficult to predict occurrence randomness of complex system. If a teacher is going to teach "reading comprehension" for this session but the students are not in a good mood s/he can change the subject matter and teaches grammar. Or the students' responses indicate that they have a lot of problems with "present perfect" and s/he was going to present "past perfect" the teacher can postponed new subject and dwell in pervious subject. This property leads to

another feature called sensitivity to initial condition. **Sensitivity to initial condition:** this feature suggests that minor thing can have a remarkable consequence on a system. Sometimes the things that are not considered crucial cause huge effective difference on the lesson .The teachers should try to make a first good impression because it can strongly impact the entire school year and future behaviors. SLA is so complex and a lot of factors can influence it and sometime delay its learning (Kozden, 2005). The "butterfly effect" reminds us of a butterfly fluttering its wings in one place of the world, for example Asia can cause a chain of reactions that extend to the way of a tornado in another place like Europe because of interconnectedness of the world into a dynamic system (Brown, 2004). Another metaphor that has the same meaning is "camel back effect "that quotes a story about a man who put a lot of loads on his camel and it started to move. But he remembered that he had to add a feather too but when he added it to camel's back suddenly it fell down. We can deduce that a very small thing can lead to huge changes (Alemi et al. 2011). A slightly inaccurate emotional response by the teacher can affect the class significantly. Considering individual differences and the same conditions and facilities provided for the students, sometimes we face the students who have a lot of problems in learning the target language one of the reasons may be "butterfly effect "one. **Openness:** Kramsch et al. (2012) explain there are no definite boundaries for complex systems. They are open and if this feature is absent the systems disappear. They contain movement and change because of dynamics property rather than statics. This property can justify the nonlinear and dynamic ones" because the system are open, what arises may be in nonlinear relation to its cause. In other words, an unexpected occurrences may take place at any time. "So in SLA classroom there should be an interaction between learner and his or her environment in order to make his or her conditions of development. Another way is technology that can open a new world. Movies, television shows and even advertisements can help a lot. According to postmodernism methods the students can have a hand in teaching. We should not think of students as empty accounts to be filled by teachers (Freire, 1970, cited in Pishghadam et al. 2008). **Feedback sensitivity:** two kinds of feedback can be mentioned, positive feedback causes a kind of evolution meanwhile negative feedback may keep the system stable for a long period of time (Briggs, 1992, cited in Larsen-Freeman, 1997).In SLA classroom, openness property provides a lot of benefits. Because the systems are open they can get much feedback and change their behavior. The feedback supports the systems to continue, evolve, adapt, otherwise the systems vanish. There

is an equivalent word for this stage in linguistics "fossilization". In SLA classrooms there are different forms of feedback including student-student, teacher-student, and teacher-colleague ones. Teacher-student feedback can be done through different tests and evaluations. In peer feedback the students can learn from each other that is sometimes more effective than teacher feedback. Sometimes a written feedback at the bottom of learners' assignment has a more useful result than an oral one. But we have to consider the feedback does not result in the affective filter, one of the Krashen' principles because it can cause some damage. This feature can testify sensitive to initial conditions. In SLA classrooms the feedback can cause the students to feel more comfortable since the teacher is sympathetic to their feelings and start vigorously. SLA teachers should pay attention to students' attitudes (Kozden, 2005). **Adaption:** complex system must be able to adjust and adapt to new changes and situations. These systems do not reflect passively to changes and situations but they tend to turn "actively whatever happens to their advantage" (Larsen-Freeman, 1997). In SLA classroom, this adaptation, as a skill, results in evolving. Teacher can adapt the lesson plan and methodology and method based on students' strengths and weaknesses. In other words the way of teaching and activities which are used in a class may be different from that of another class. Sometimes a class may need oral activities and active use of the language and another class needs grammar to be reviewed more. Teacher can modify the activities based on students' learning style. At the beginning of the educational year the teacher should be aware of this adaptation (Kozden, 2005). **Strange attractor:** attractors are some special patterns that the systems prefer and move towards these patterns which constantly change to arrive at a moment of stability. In SLA the learner moves between two poles, first and second languages in order to acquire a new language and finally the learner reaches a stable region, that is, inter-language. Inter-language works as a strange attractor (Menezes, 2006). Some attractors can accelerate the rout of SLA for example, travelling to the country whose language is going to be learnt. There are some stories about learners who tolerate enormous pain in order to get native-like English. Chik and Benson (2008) tell a story of a student who wanted to become a native speaker and "the impact of her experience abroad on her identity as Hong Kong student. In spite of facing discrimination and racism and not becoming a native speaker she got the fluency she needed" (cited in Menezes, 2008). In SLA classrooms the duties of attractors are to establish some boundaries in order to create a balance between chaos and order .So classroom rules are some guidelines of conduct and respect. When doing some homework, a student should be

supported by adequate directions on how to do it otherwise s/he becomes bored and leaves it. Or when the teacher notices that a lot of repetition on a drill leads to boredom the teacher can switch in a more creative practice and so s/he limits this attractor. Based on the learners' needs some strange attractors should be considered in the classrooms. (Kozden, 2005). **Fractals**: all strange attractors have fractal feature, never – ending patterns, complex patterns that are self- similar across different scales. These patterns are familiar to us since nature is full of fractals. "For example a tree , in spite of the fact that trees have different shapes, we can easily distinguish a tree from other objects we zoom at any level of imagination, it always reveals a reproduction of itself"(Hadidi Tamjid, 2011). Kozden (2005) uses this feature and brings it in his classroom. He is going to construct a fractal pattern of community so he emphasizes it in the syllabus, lesson plan, and even every activity that is going to be done in the classroom. He makes this issue clear to his students on the first day of school year. He includes some activities in the class so that the students have to work with one another and engages them in gathering information, sharing experiences for future plans, speaking to each other in different groups.

Conclusion

SLA researchers always endeavor to detect how learners learn a second language and have proposed between forty to sixty theories and metaphors. All of them strive to explain this issue and make a definite prediction. One of them is chaos theory which causes a lot of uneasiness but creates opportunities for creativity and development. It can offer some awareness of different aspects of language and language acquisition. Chaos theory teaches teachers that teaching is non-linear and unpredictable and also they should expect the unexpected. Whereas most sciences are concerned with predictable phenomena or events including chemical, gravity, and electricity. Each feature or principle teaches teachers a point and one of the most popular of these features is butterfly effect that states if the butterfly had not flapped its wings just at that time or place the hurricane would not have happened. Therefore, teachers draw a conclusion that minor changes in initial conditions can lead to incredible changes in the result. It means if teachers desire to motivate learners at the first days of school year the starting feedback is crucial and has an essential influence since small stimuli can have unpredictable consequences positively or negatively. Adaptation exhibits itself in the SLA classroom when the learners should be capable of adapting themselves to new setting and they find

ways to act in order to overcome the barriers and to acquire new language. They finally arrive at their willingness and construct their identity as a second language speaker. Chaos theory can emerge a framework for teaching SLA and also for learners to become a second language speaker. This theory can open new horizons for us to view the world around us and for teachers to apply its implications for SLA classroom.

References

- Ahmadi, A. (2011). Chaos theory and language assessment: The effect of sensitivity to initial conditions of test performance. *International journal of humanities and social science*, 1(17), 293-296.
- Alemi, M., Daftarifard, P., & Patrut, B. (2011). The implication of chaos / complexity theory into second language acquisition. *Broad research in artificial intelligence and neuroscience*, 2(2), 34-70.
- Brown, H. D. (2006). *Principles of language learning and teaching*. New York, NY: Pearson education.
- Dörnyie, Z., MacIntyre, P., & Henry, A. (2014). *Motivational dynamics in language learning*. Multilingual Matters Publishing.
- Fahim, M., & Abbasi Talabari, F. (2014). Chaos/ complexity theory and education. *Journal of English language teaching and learning*, 13. 43-56.
- Fahim, M., & Dehghankar, A. (2014). Teaching literature from chaos/complexity theory perspective. *International journal of language learning and applied linguistics world*, 7(1), 167-178.
- Hadidi Tamjid, N. (2011). Chaos/Complexity theory in second language acquisition. *Novista royal: Research on youth and language*, 1(1), 10-17.
- Kozden, M. (2005). *A framework for teaching a foreign language class based on the principles of chaos/complexity theory*. Master's thesis, School for International Training, Brattleboro, Vermont.
- Kramsch, C. (2012). Why is everyone so excited about complexity theory in applied linguistics? In S. Bailly, A. Boulton & D. Macarie, (Eds.). *Didactique des langues et complexite. En hommage a Richard Duda. Melanges CRAPEL* 33, 9-25.
- Larsen-Freeman, D. (1997). Chaos/complexity science and second language acquisition. *Applied linguistics*, 18(2), 141-165.

McAndrew, D. A. (1997). Chaos, complexity, and fuzziness: Science looks at teaching English. *English journal*, 86(7), 37-43.

Menezes, V. (2006). Second language acquisition as a chaotic/complexity system. *Journal of allied*.

Menezes, V. (2009). Chaos and complexity of second language acquisition. *The modern language journal*.

Menezes, V. (2013). Second language acquisition: Reconciling theories. *Open journal of applied sciences*, 3, 404-412.

Mahmoodzadeh, M. (2013). Applied ELT: A paradigm justifying complex adaptive system of language teaching? *International journal of English language and translation studies*, 1(3), 58-74.

Pishghadam, R., & Mirzaee, A. (2008). English language teaching in postmodern era. *Journal of teaching English language and literature society of Iran*, 2(7).

Reigel, D. (2005). *Positive feedback loops in second language learning*. Master's thesis, Portland State University, Portland.

Soleimani, H., & Alavi, M. (2013). A dynamical system approach to research in second language acquisition. *Journal of English language teaching and learning*, 11, 127-143.