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Complexity and identity reconstruction in second language acquisition[1]

Complexidade e reconstrução de identidade na aquisição de segunda língua

Liliane Assis Sade*
Universidade Federal de São João del-Rei - UFSJ

RESUMO: A participação do indivíduo em diferentes práticas discursivas contribui para a formação social da identidade que não apenas se fractaliza, mas emerge via discurso. Tomando-se o conceito de polifonia proposto por Bakhtin (1981, 1986), este trabalho pretende discutir a formação social do eu e a emergência de múltiplas identidades pela perspectiva da Teoria da Complexidade. Fazendo uso dos conceitos de atratores, pontos de bifurcação e fractais da Teoria do Caos e relacionando-os às questões de identidade, este artigo procura demonstrar como o reconhecimento da identidade como um sistema complexo e caótico pode ser útil para um entendimento mais profundo do processo de aquisição de línguas. Algumas narrativas do projeto *AMFALE* são usadas para ilustrar os pontos teóricos propostos.

PALAVRAS-CHAVE: Identidade, complexidade, caos, aprendizagem de línguas

ABSTRACT: The participation of the individual in different discursive practices contributes to the social formation of identity which is not only constituted, but also, fractalized and emerged via discourse. Taking the concept of polyphony, proposed by Bakhtin (1981, 1986), this work intends to discuss the social formation of the self and the emergence of multiple identities through the perspective of Complexity Theory. Borrowing the concepts of attractors, bifurcation points and fractals from Chaos Theory, and relating them to identity issues, this paper shows how the acknowledgement of identity as a complex/ chaotic system can be useful to a deeper understanding of the language acquisition process. Some narratives of *AMFALE* project are used in order to exemplify the theoretical issues proposed.

KEYWORDS: Identity, complexity, chaos, language learning

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[1] This paper is part of my PhD dissertation, developed at UFMG and supervised by Dr. Vera Lúcia Menezes de O. e Paiva. It was previously presented in the symposium *Multilingualism and second language acquisition in the realm of complexity theory* that took place during the *15th World Congress of Applied Linguistics* which was held from August 24th to 29th in the University of Duisburg-Essen, in Germany, 2008.

* lilisade@yahoo.com

Introduction

> The hard psychological truth is that there is no permanence in human relations, more than in the stock market, in the weather, in national 'security' and so on...
>
> Giddens, 2002, p. 73.

The participation of the individual in social practices throughout a life span contributes to the emergency of a multiplicity of identities which are in constant interaction among each other, and with and within the social world. This paper reflects upon the process of identity emergence and how it relates to the process of language learning.

Several theories and studies have been developed in the field of Applied Linguistics aiming at understanding this relation.[2] The paper presented here shares with the others the concern with identity issues and with language learning process, but it differentiates from them in the fact that it seeks to understand such matters adopting a holistic view brought by the Complexity Paradigm, in particular, the constructs and concepts of Chaos Theory. The usage of such theoretical framework enables a rupture with the cause / effect view of the Cartesian paradigm and contributes to the understanding of the wholeness which characterizes both processes.

The rise of interest for Complexity is explained by the acknowledgment that in our recent era, the increasing interaction among individuals and societies and the ever growing access to new discourses add a fluid, dynamic, and unpredictable character to human relations. Larsen-Freeman and Cameron (2008) observe that such theory brings a new focus for Applied Linguistics research; one which rests on dynamics, emergency and change, and which is able to account for the fact that, when talking about human beings, predictability is impossible to be achieved; just probable patterns can be mapped out. In this direction, Complexity Theory not only offers new metaphors to look at the same phenomena with a new perspective, but also works as "a bridge that takes us into a new way of thinking" (p. 15).

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[2] See, for example, Schumann (1978), Giles (1979), Pavlenko and Lantolf (2004), Norton (2000), Murphey *et al.* (2005), Warschauer (2004), Block (2005, 2006), Moita Lopes (2002).

Applied Linguistics such as Van Lier (2004), Larsen-Freeman (2002) and Kramsch (2002) have already adopted a Chaos / Complexity view to their researches. In Brazil, an important step has being made in this direction. Paiva (2005) coordinates a research project – *AMFALE*[3] – which aims at developing a model of foreign language acquisition, based on the Chaos / Complexity theory, and trying to understand language acquisition as a complex and non-linear system composed by several interacting variables. Several contributors who gather narratives for the project are using the complexity perspective on their researches.[4]

In the next section some basic concepts of Chaos / Complexity theory will be presented and will be associated to identity issues.

Identity through the optic of Chaos / Complexity Theory

The main features of Complex Systems are adaptation, aggregation, emergence, diversity, dynamism, and non-linearity. Among the many theories which deal with complex systems, in this paper I will borrow some concepts from Chaos Theory.

There are some semantic traps when we use the terms of Chaos, so we need to clarify them. To begin with, let's start with the word Chaos itself. Many would associate it to its ordinary usage, meaning something which is negative and / or disordered. However, the word Chaos in Physics has a different meaning. It's a "stochastic behavior which happens in a deterministic system" (STEWART, 1991, p. 23). This explanation sounds a paradox on the first sight: stochastic means "at random" and deterministic refers to behaviors that are governed by general laws. So, Chaos would be understood as a law-free behavior which is entirely governed by law. What the apparent paradox means is that Chaos describes short-term unpredictable behaviors which have a long-term underneath order.

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[3] *AMFALE* stands for "*Aprendendo com memórias de falantes e aprendizes de língua estrangeira*" (Learning with the memories of speakers and learners of foreign language). The text of the project and the narratives gathered by its contributors are available at: <http://www.veramenezes.com/amfale.htm>.

[4] See, for example, Braga (2007), Martins (2008), Silva (2008) and my own research: Resende (2009).

One of the main principles of Chaos is what is known as "the butterfly effect",[5] which is the sensibility of the system to small changes in the environment. Due to the high degree of interaction among the elements that compound the system, a small change in environment conditions can cause increasingly new changes that propagate throughout the system. The higher the level of interaction among the elements, and the more the system is sensible to changes in the environment (feedback effect), higher is the possibility that small changes will cause huge effects.

Another semantic trap is the term "initial conditions", which is misleading in the sense that it can be understood as "beginning", or "starting point". However, what this term means is that "two extremely similar conditions can generate totally independent things" (STEWART, 1991, p. 125); we cannot explain one effect linking it to a specific cause: it's what we call non-linearity. In a non-linear system, the interaction among the component parts causes each part to influence and be influenced by the others. This chain of interconnected actions multiplies the effect of the first change (multiplicative effect). As a result, behaviors emerge that could not be predicted by the actions of individual parts.

Now that some of the main concepts of Chaos theory were cleared, we can apply them to matters of identity. To do that, let's borrow the concept of polyphony proposed by Bakhtin (1981). According to the author, when the speaker emits an utterance, he / she presupposes the presence of a second part. Besides this second part – the addressee – Bakhtin also states there is a third part that is represented by the discursive genres in which the person was brought up and which carry the ideological meanings of a particular society. As pointed out by Bakhtin (1981, p. 293),

> all words have the "taste" of a profession, a genre, a tendency, a party, a particular work, a particular person, a generation, an age group, the day and hour. Each word tastes of the context and contexts in which

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[5] Edward Lorenz, a meteorologist in the decade of 60s, while testing some weather simulations in his computer, observed how small alterations in the initial data caused a huge effect in the pattern of the weather. Lorenz wondered if the flipping of the wings of a butterfly in Brazil would lead to a hurricane in Texas. Thinking on that and observing the new pattern of movement which resembled a butterfly (which came to be known as Lorenz attractor), Lorenz decided to call "butterfly effect" the phenomenon under investigation.

it has lived its socially charged life; all words and forms are populated by intentions. Contextual overtones (generic, tendentious, individualistic) are inevitable in the word.

Within this theoretical framework, we can establish the first principle that characterizes identity as a complex system: interaction. Social identity is marked by the interaction among the individual, the social context and the other individuals, and it is due to this interaction that new identities emerge.

In this sense, the process of identity emergence cannot be explained by simple causes and deterministic laws. The individuals, in their daily lives, participate in several social practices, or as Wenger (2000) suggests, in several communities of practice: family, school, club, and so on. To each community they belong, a new social identity emerges and with it new patterns of linguistic and non-linguistic behaviors which are associated to the genres of the social institutions they participate. As Giddens (1999, p. 416) points out, in each social encounter we adjust ourselves and our linguistic and non-linguistic behavior to suit the demands of that social situation, and "such a view is often thought to imply that an individual has as many 'selves' as there are divergent contexts of interaction." TAB. 1 shows an example of the social formation of the "self" and the emergence of multiple identities:

TABLE 1

Participation of the "self" in communities of practice; identity emergence

SOCIAL ACTORS: CHILDREN, HUSBAND, PARENTS; SOCIAL CONTEXT: HOME; DISCOURSE: SOCIAL PRACTICE OF FAMILY LIFE ↓	SOCIAL ACTORS: STUDENTS, OTHER TEACHERS, ETC. ; SOCIAL CONTEXT: UNIVERSITY; DISCOURSE: SOCIAL PRACTICE OF UNIVERSITY LIFE. ↓	SOCIAL ACTORS: RESEARCH GROUP, SUPERVISOR, ETC. SOCIAL CONTEXT: TEACHER'S OFFICE, UNIVERSITY, ETC. ; DISCOURSE: SOCIAL PRACTICE OF ACADEMIC LIFE. ↓	SOCIAL ACTORS: FRIENDS; SOCIAL CONTEXT: CLUBS, BARS, ETC.; DISCOURSE: SOCIAL PRACTICE OF LEASURE ACTIVITIES. ↓
MOTHER / WIFE / DAUGHTER	TEACHER	RESEARCHER	FRIEND

In the example above, the interaction among the members of the social institution "family", in the context: "home" and with the discourse related to the social practice of family life, contributed to the emergence of the identities of "mother", "wife" or "daughter", according to the social actors involved.

Other examples are presented for the identities of "teacher", "researcher" and "friend". This process repeats in each social encounter and many possibilities of identity emergence can occur; it's what has been called "fragmentation of identity".[6] Later in this paper, I will argue for a new term to describe this process. For now, it's time to show how the process of identity (re)construction and emergence can be viewed as a complex system.

The "self" is constructed via emergence of several other "selves"; therefore, we can say it's a system once it is compounded by several parts. Each of these selves interacts with the others, influencing and being influenced by them. From this interaction unpredictable behavior emerges. So, we can say it's a complex system.

The emergence of those many selves, however, does not cause just the fragmentation of the social identity. The interactions developed by the social identities also help create a sense of "wholeness" (TAB. 2).

TABLE 2
Social constitution of self

MOTHER/WIFE/DAUGHER →		
↑ ↓		
TEACHER →		*SELF*
↑ ↓		
RESEARCHER →		

In the example presented in TAB. 2, the attitudes as a "mother" are influenced by the way the person acts and thinks as a "teacher", a "researcher", and so on. Meanwhile, the identities of "teacher", "researcher", and all the others are affected by the way one performs her "mother" identity. As pointed out by Wenger (2000, p. 242), identity is not "something we can turn on and off. When we go to work, we don't cease to be parents, and when we go to the theater, we are still an engineer or a waitress".

When talking about complex systems, Larsen-Freeman and Cameron (2008, p. 19) say that "the relations among the components [of the system] give it some identity as a whole". It seems to be the case presented here that the relations established among the social identities give a sense of "wholeness" to the self. It's this sense which explains the paradox that each person is unique, just because he / she is socially constituted.

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[6] See Hall (2001), Giddens (1990, 1999), Moita Lopes (2002) and Rajagopalan (2003).

It is important to emphasize that although we can acknowledge the individuals are socially constituted, we have to keep in mind that they are not a mere reflex from the institutions to which they participated. Not a single person is exactly the same of the sum of the discourses to which he / she had access. If that was so, a person raised with some values by his parents, school, or church, would tend to reproduce them. What we can really observe, however, is quite different. There is a constant interaction among the several discourses to which the individual has access, and, as a result, unpredictable behaviors occur.

Not knowing or recognizing identity as a complex system has led several people to judge others based solely on one's birth, or social, or school conditions and so forth (using the terms of Chaos, based on the initial conditions). Many acts of prejudice have been developed based on that linear and deterministic view. To assume a linear perspective in the understanding of identity issues and labeling people according to single laws and (pre)conceptions is an erroneous attitude and, worse, it reflects the total ignorance of the complex nature of human beings, denying them the chances of a personal and professional growth.

In the next section, the concepts of attractors, strange attractors and fractals will be discussed aiming at suggesting a new term to refer to the process of identity emergence.

Attractors, Fractals and Fractlized identities

Complex systems present a pattern of movement which receives the name of "attractor". Kauffman[7] (In: TAYLOR, 2001, p. 283, n. 36) defines attractor as a "term used to describe the relatively long-term behavior toward which a system tends, or a set of points such that all trajectories nearby converge into it". As it was stated, any element that is placed in the area next to the attractor, in a space named "basin of the attractor", is "caught" by this pattern of behavior, or, giving a technical explanation, any point in the basin of the attractor converges into it.

How could we think of attractors as metaphors to understand issues of identity? Bakhtin states that two forces act in discourse: a centripetal and a centrifugal one. According to him (1981, p. 270), the centripetal forces of language work towards unification and centralization; they help to overcome

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[7] KAUFFMAN, S. *At home in the universe: the search for the Laws of self-organization and complexity*. New York: Oxford University Press, 1995.

heteroglossia. They are represented by the unitary language of a given society which carries its values and ideologies. Bakhitin (2003, p. 282-283) states that we talk in genres; for every social activity there is a particular genre which limits and constrains the linguistic choices and behavior. It is due to those genres that communication is possible once they allow for mutual understanding. There is a diversity of genres once they respond for the diverse social situations. However, no matter how diverse they are, they have some patterns of linguistic choice which constrain what is appropriate to say and to do. The individual learns how to behave in those genres through participation in the social practices. Giddens (1999, p. 416) argues that the appropriation of mediated experience is accomplished via rotinization of habits.

Let's go back now to complex systems: what is routine if not a repeated pattern of states? At this point I would suggest using the term "discursive attractors" to refer to the patterns of linguistic usage which are determined by the centripetal forces exerted by the genres of a given society, and which constrain linguistic and non-linguistic behaviors.

As any element inserted in the basin of the attractor tends to be incorporated to the pattern of its behavior, any person who is born or comes to live in a particular society is incorporated through language to the patterns of the discursive attractors of that society. Otherwise, there may be social exclusion.

The attractors of the system may change when there is a "bifurcation". The bifurcation points are points in the trajectory of the system that cause the system to bifurcate and create new patterns of movement – new attractors (FIG. 1).
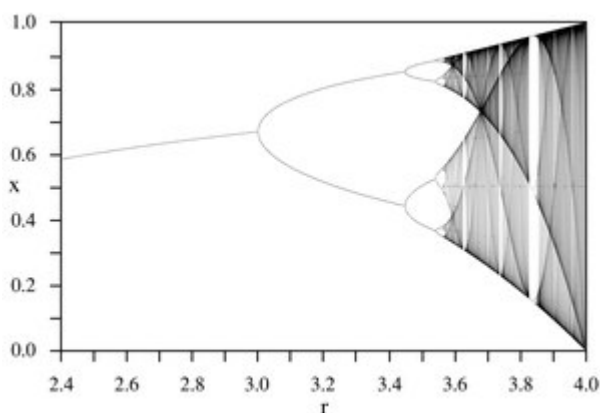

FIGURE 1 - Bifurcation point.
From: CHU-CARROLL, 2007.

In FIG. 1, we can see a point in the trajectory of the system when it splits into two. Each two can split over and over again. Each time they split, new attractors emerge. The system oscillates among those different attractors, changing constantly from one to another. It is important to state, however, that not all systems will react the same way to bifurcation points. The system may pass by them and keep its regular route or it may bifurcate and change its movement pattern.

Coming back to identity issues, our contemporary societies are marked by a process of globalization in which a wide range of discourses is available to the individuals. In face of them, some may keep their regular trajectories, without being "touched" by their appeals, while some will be "attracted" to them. In the latest case, due to the affiliation of the individual to new discursive communities, some social identities will emerge, causing the others to be reformulated. Giddens (2002, p. 72) acknowledges those moments in one's life, and calls them "risky moments", because each decision made of this kind involves risk and a rupture with past established habits.

Although new identities emerge in those bifurcation points, the other ones don't cease to exist, that is, depending on the social situation and on the social practices performed some identity fractals[8] will come to the front and others will be in the background; when the situations and practices change, another identity fractal will come to foreground, having the others in background. Using the terms of Chaos, one's identity system bifurcates in the risky moments and keeps oscillating among the discursive attractors generated from the bifurcation points.

There are some systems that are very sensible to environment changes and bifurcation points occur very often. The attractors that emerge are called "chaotic" or "strange attractors".[9] The chaotic attractor, as the ordinary attractor, can be understood as a pattern of movement in which the system stabilizes. However, different from the ordinary attractor, the chaotic attractor is a pattern of movement which never repeats itself.[10]

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[8] The term "identity fractal" will be better explained later in this chapter.

[9] Stewart (1991, p. 134) explains that when mathematicians discover something that is not the ordinary behavior they are used to, they give the name of strange, pathologic or abnormal. As there were only two kinds of attractors – stable points and limit cycles – the new attractor received the name of "strange".

[10] Lorenz attractor mentioned before is an example of a chaotic attractor.

As the chaotic attractors, the process of identity emergence and reconstruction follows a pattern of behavior which never repeats itself. Once new identities always interact, influence, and are influenced by the others, each identity emerged causes the others to be reconstructed. The concept of strange attractor helps us understand this process as something dynamic and ever changing.

The geometric representation of a chaotic attractor has a fractal form. The term fractal was coined by the mathematician Benoit Mandelbrot, who, while studying the irregularities of British coast, developed a geometric representation of what he observed and gave it the name of fractal. A fractal has two properties: multiple possibilities of internal subdivision and self-similarity. To better understand them, let's examine figures 2 and 3.
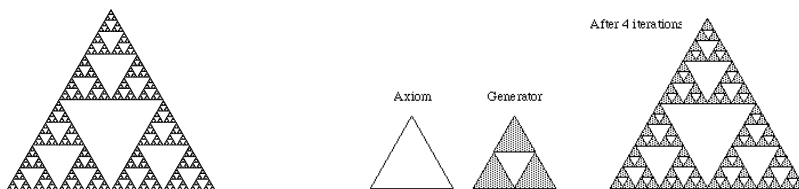

FIGURE 2 - A triangle named "Sierpinski gasket": a representation of fractals
From: MANDELBROT, B., 1990.

FIGURE 3 - How to create a *Sierpinski Gasket*
From: MANDELBROT, B., 1990.

In FIG. 2, we have a triangle known as *Sierpinski Gasket*. To create the gasket, we cut out the middle piece as shown in the generator above (FIG. 3). This results in three smaller triangles to which the process is continued. The nine resulting smaller triangles are cut in the same way, and so on, indefinitely.

Observing the gasket, we can see the first property of the fractals: there are infinite possibilities of internal fragmentations, but those possibilities are limited by the outer area of the triangle. The second property, self-similarity, is also shown in the picture: each triangle is self-similar to the whole.

Taking the two properties of fractals described above, I'll argue for a new term to describe the process of identity emergence and reconstruction. As argued by Bakhtin, "alongside the centripetal forces of language which carry verbal-ideological centralization and unification, there are also centrifugal ones which are responsible for the uninterrupted processes of decentralization and disunification" (1981, p. 272). The centrifugal forces are the ones which come from the many "others" who talk to us from their social location and whose

voices contribute to a rupture with the old discursive attractors and present new possible patterns of linguistic and non-linguistic behavior. The more we have access to those different voices, greater is the probability of identity emergence.

To better describe this process, I suggest substituting the widely used term "fragmented identities" to "fractalized identities".[11] This new term evokes the properties of fractals and can be a better metaphor to encompass all the complexity which is involved in the process. The word "fragmented" leads us to think of "fragments", or "broken pieces". When talking about identity, the term evokes the idea that the process of identity emergence causes the human to be "broken into pieces" as if the emerged identities were isolated constructions of one's self. However, as already stated before, the process of identity emergence also contributes to a sense of wholeness which is achieved through the interactions of the several social identities.

If we take the properties of fractals, we can realize the possible analogy to be made between them and the identity system. As in a fractal, there are infinite possibilities of identity fractalization, as it is also infinite the number of possible discourses we may have access throughout our life span. However this internal subdivision of the self is limited by the external factors such as one's embodiment and sociohistorical location (first property of fractals). It means that the human embodiment keeps the identity of, let's say, a bird, from emerging. On the other side, but using the same perspective, the social location of a particular individual enables him / her to have access to some linguist and non-linguistic choices and not others, what Kress and Van Leeuwen (1996, p. 1-17) call "semiotic landscape". The availability of some resources and not others in the semiotic landscape constrains which identities will emerge.

The second property of the fractals - self-similarity - evokes the idea of the whole. No matter the number of internal fractalizations, the parts are interconnected into a whole which is self-similar to the parts. As observed by Wenger (2000, p. 242), "[identity] is neither unitary nor fragmented. It is an experience of multimembership, an intersection of many relationships that you hold into the experience of being a person, at once one and multiple".

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[11] The usage of the term "fractalized identity" was suggested by my supervisor – Dr. Vera Lúcia Menezes de Oliveira e Paiva – in a supervising section. Her insight was imperative for the following development of my research. For that, I have to pay her this tribute.

From this quotation, it's possible to acknowledge that the identity fractals influence each other to form a sense of wholeness. Based on those reflections we can say that each identity fractal which emerges has all the properties of the other fractals, and the identity as a whole keeps all the features of its component parts. Therefore, I argue for the usage of the metaphor "fractalized identities" to refer to the process of identity emergence and reconstruction.

Chaos, Fractalized Identities and Language Acquisition

In this section I'll borrow two narratives from the *corpus* of narratives of *AMFALE* project to show the implications of the understanding of identity as a complex system for second language learning.

Narrative 1:

> What I am Comes Into Existence"
>
> I started learning English when I was a JHS student. In the English class, I learned grammar mainly and a little communication. Every Friday I had classes taught by an assistant English teacher from the U.S. It was my first contact with a foreigner. At first, I could hardly speak with him, though I gradually became to be on good terms with him through his class. Even outside of the class, I communicated with him in English. How funny talking with him was! That was why I learned to like English very much.
>
> In HS days, I had no communication classes but only grammar ones. Moreover, I never had classes taught by foreigners. I could not improve my speaking ability by myself. Because however hard I listened to the radio or other materials, all I could do was to improve only my listening ability. I have an idea that the best way to improve communicating ability is to talk with foreigners or friends who want to do it. So I am very satisfied with what I do in the OC class.
>
> In this college, I was surprised at the OC class, especially at its style. For example, in talking we must look in our partner's eyes and smile to them and shadow. At first, I was so shy that I could not do it at all. In addition, on the first videoing day I spoke little and made many silences. So I envied whoever could do it better than me and at the same time I wanted to be like them.
>
> The other thing I was surprised at was that making mistakes was O.K. When I heard it first, I could not understand why it was O.K. Then the teacher explained that if we were afraid of making mistakes, we would not risk speaking. I was convinced of it soon, because I had already experienced such things. When I was a HS student, I belonged to the rugby

football team. In practicing it, I always made progresses after failures. Furthermore, I never succeeded in the first challenge. I can say the same thing in videoing. Compared with the first one, I have improved greatly. By trying to do them again and again, I came to smile much more and to look into my partner's eyes more.

Therefore, what I am comes into existence.

I think what I learned in the OC class will be useful to me in the next three years and even after graduation. I am going to work for a company which handles foreign trade and make use of my English in business with foreign companies.

Finally, I would advise, next year's freshman. First, you should do your homework certainly. In April I heard from my elder that OC teachers gave much more homework than other teachers did, though the harder I did them, the sooner I could improve my English. As he had told me, I could improve while practicing and carrying it out. So doing homework regularly and diligently is very important for you. Second, you should come to all classes and make them comfortable for you. If you have some troubles in doing it, please think of the OC class as what you really want to join. Then you will be able to enjoy it very much. Third, you should have your own goals. Because doing so makes you have a good attitude for achieving them. But they must be small so that you can make them come true. Lastly, do not be afraid of making mistakes. It is natural to make mistakes in speaking English, because we are not native speakers.

This narrative was written by a Japanese university student. The very first sentence – *What I am comes into existence* – already shows he has a sense of "self" which is constructed through his narrative. He starts his story going back to his school days[12] and he describes the discursive attractors of that social practice: learning grammar and little communication. One bifurcation point happens when the student reports the arrival of a foreign teacher. A new social agent was inserted in the system and started to interact with the other aggregates. The narrator describes the different discursive attractors established with such insertion and the effect of it on the improvement of his English skills.

A new bifurcation point occurs when he enters another social practice: high school. The identity of high school student emerges and he returns to the previous discursive attractor: no communication classes, just grammar ones. To overcome the dullness of such practices, the narrator tries to get in touch with the language through other means of communication, such as the radio

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[12] JHS stands for Junior High School.

and others. Here we can see how the student identity fractal student oscillates between two patterns of behaviors.

Living the discursive attractors of his society, he followed the normal path of youngsters of his age and entered university. That new bifurcation point caused the emergence of another identity fractal: university student; new discursive attractors came into being which differed in a positive way from his previous student's experiences. In spite of recognizing the positive aspects of his new academic life, the narrator mentions the troubles faced throughout his adaptation process. The difficulty this student had at first was not with academic issues, or with the language itself, as one would suppose. On the contrary, the source of his difficulties is attached to the discursive attractor established in this social practice. The student mentions the hard time he had when having to look into someone's eyes and smile. He attributes this difficulty to a personal trait: shyness. When analyzing his comments from a complexity perspective, we have to acknowledge the fact that, although personal features might have influenced his behavior, social forces acted as well. The discursive attractors associated to his national identity – Japanese – are acting in the way he behaves. It is known that in Japanese culture the act of staring someone can be offensive. It can be understood as confrontation or disrespect.[13] So, Japanese people avoid looking at someone straight in the eyes. We can see clearly here the centripetal forces mentioned by Bakhtin. The genres of Japanese culture constrain the linguistic and non-linguistic behavior of that student.

Something also worth mentioning here is his attitude in the identity fractal of a classmate. The presence of his classmates has a double effect on him: a negative and a positive one. The negative refers to the fact that when among his peers he "made *many silences*". This behavior can be understood by what Giddens (1999, p. 416) considers a strategy to preserve ontological safety – a way of preserving the "self". Once he felt disturbed by the performance of his classmates, he assumed a negative attitude towards learning as a way to protect his "student identity fractal". At the same time, the presence of "the others" also motivated this student to overcome his problems and succeed in his language studies: he mentions he wanted to be like them.

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[13] In Brazil, on the contrary, people should look into someone's eyes to add truth value to what is said. If someone avoids looking into the eyes while talking, the person can sound false.

Being allowed to make mistakes is another attitude that belonged to the new attractors associated to the identity fractal of a university student. Once more, in the voice of the narrator, we are able to listen to the voice of the Japanese culture. In Japan, they have a very strict education system and mistakes are understood as something negative that must be avoided. It is important to mention here that the narrator's English teacher is American.[14] He introduced new methodologies for second language teaching according to his own values and ideologies. At first, this fact worked as a cultural shock for the student, but after this first moment, the access to a new discourse brought by his teacher caused once more a bifurcation on the identity system of the student and it contributed to his progress in language learning.

Another important fact mentioned by the student was his previous participation in another community of practice: his rugby football team. When he mentions this community, another identity fractal emerges in his discourse: a "rugby player". It was due to this identity fractal and to his participation in this other community of practice that he was able to understand the importance of making mistakes. This attitude is part of the discursive attractor of another identity fractal and the narrator was able to use the resources from one community to apply in another. Holland (1995, p. 31-32), while describing the features of complex systems, mentions the "internal models", a mechanism used by agents of complex systems to predict future actions:

> [t]he agent must select patterns in the torrent of input it receives and then must convert those patterns into changes in its internal structure. Finally, the changes in structure, the model, must enable the agent to anticipate the consequences that follow when that pattern (or one like it) is again encountered. The agent uses the model to anticipate future events.

In the fact narrated by the student, his experience in the community of practice of rugby enabled him to select some patterns of behavior which were internalized. When he faced a similar situation in the community of practice of university life, he could use the model already acquired to anticipate his future results. His identity fractal of rugby player influenced his identity fractal of university student, and because of that he was able to learn a language from making mistakes.

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[14] Although the narrator does not mention clearly the nationality of his teacher, we know he is American because he is one of the contributors of *AMFALE* project and this narrative was gathered by him.

I have already mentioned many identity fractals that emerged in the discourse of this narrator so far, and I have shown how they are in constant interaction, affecting and being affected by each other. Now, it is important to notice how those fractals interact in a way that gives a sense of "wholeness". In his narrative, after mentioning several of his identity fractals (Japanese, a classmate, a university student, an ex-high school student, a rugby player), the student makes a very strong statement: "therefore what I am comes into existence". With this statement he showed that the sense he has of himself was constructed from the interaction of his identity fractals. He also mentions the fact that all the knowledge acquired by those fractals is going to be used in the emergence of a forthcoming identity fractal: "a business man", which he mentions when he talks about his plans for the future.

Finally, at the end of his narrative, we can listen to the dialogue that is established between the narrator and the prospective university students. As Bakhtin has stated, all utterances have a conclusive character in the sense that they allow for a response from one "other". This other can be some imaginative character or a future generation. In the case here, the respondents would be the future university students. More over, the narrator constructs his own voice with the voices of his previous classmates. He reproduces the advice he had received from others to teach the prospective students how to adapt to the discursive attractors of the university; he uses a polyphonic discourse to establish the attractors of successful university life.

Narrative 2[15]

> As I mentioned before I used to be a very shy boy and English became my unique friend. Every time my classmates came by to invite me to go to the parties I would tell them I could not cause "I had to study". But I really wanted to go out with them and have some fun. Poor me.
>
> My English was getting stronger and stronger and my love for languages too. My parents sent me to Sao Paulo in the beginning of the eighties and one can imagine how terrified I got: there was no way out of it – it was dad and mom's dream.
>
> I studied in a Hebrew High School where I could learn the basics of Hebrew as well. The teachers could hardly believe a guy from Bahia was able to speak and write their language so well: and I did it. Hebrew is

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[15] For this second analysis, just an excerpt from a whole narrative will be used. Due to limits in scope of this paper, an analysis of the whole narrative could not be performed, however, the analyzed excerpt is enough to show the arguments I intend to develop here.

written from right to left and it took me just a few months to master it properly. One day a teacher called Miriam assigned us a writing exercise to be done in the classroom right away and a few minutes later I managed to do it correctly. She told me: "you are unbelievable. It can't be. Hebrew seems to be much easier in your hands." As I lived in Sao Paulo something funny came up: a cousin of mine made up his mind and filled in an enrolment form in order to study English at Senac, but he didn't want to attend the classes eventually. He offered me what could be my first English course, but due to my strong shyness I turned it down.

After four years in Sao Paulo I came back to Bahia. My father asked me to help him in his business and I unwillingly became a businessman. It lasted ten years. Meanwhile I studied Spanish, German, Italian, French, Esperanto, Swedish and little bits of Norwegian, Chinese, Hindi, Greek and Thai Businesses broke up. There was nothing left but my old friends: languages. An English School just right here in my small town invited me to have Spanish and English classes and I accepted it right away. I was doing what I had always wanted to do: speaking, living and teaching my loved languages. Two years later I set up my own English-Spanish course in a small garage in my own house.

This narrative was written by a Brazilian university teacher. Throughout his narrative, this narrator describes himself as a shy person. Opposite of the situation described in the first narrative in which shyness could be explained by culture matters as well as by personal traits, this other student's shyness is not culture-bond: Brazilians in general are very extroverted. On the contrary of the Japanese narrator, this student's shyness didn't prevent his language learning from taking place; indeed it was what triggered the process. When asked out by his friends, the narrator would decline the invitation in order to study languages, especially English. English learning worked for him as a strategy to escape from his social demands. At this point, it is important to observe that in language acquisition literature, extroversion is considered a positive feature associated to good students' performance. However, in the case analyzed here it was the student's shyness which was positive for language learning. It proves that as with complex systems, we cannot establish cause/effect explanations to human behaviors. As the system is non-linear, the interactions developed by this narrator with and within his social environment caused an effect in his language learning process that could not be predicted or explained by simple causes. The same personal trait that was negative for the previous narrator was positive for this one; in other words, the same initial conditions can lead to different outcomes.

We can identify four bifurcation points in this last excerpt. The first one is when the narrator moved to São Paulo – this change caused the emergence of a new identity fractal: Hebrew High School student. With this new identity fractal, new discursive attractors were developed, which contributed to increase his love for foreign languages. As the boy mentions, he could not avoid this bifurcation point. The voices of his parents are heard here and his behavior is a response to them. It is imperative to observe the power relations established in the situation reported. Although the narrator did not want to move to São Paulo, he had to go anyway as a determination from his family. As Pavlenko and Lantolf (2004, p. 172) observe, many times the parents organize the life plot for their children based on their past experiences. The problem is that those experiences were acquired in a coordinate of time and space which differs greatly from that in which their children find themselves. In such cases, there is a collision between parents and children's interests and, in many cases, the latter have to adopt the behavior determined by the parents, which means taking up culture-specific ideologies, conventions and values from other generations. In this kind of situation, children have to reorganize themselves in face of the demands imposed by the parents. In this narrative the narrator had to adapt himself, as complex systems do, in order to answer to his parents' wishes. Later in the same narrative the narrator reported similar behavior: "*My father asked me to help him in his business and I unwillingly became a businessman".* In both situations, the parents' imposition and the established power relations contributed to the emergence of new identities – Hebrew student and business man, respectively – which were followed by new discursive attractors, associated to them.

The second bifurcation point was his cousin's invitation to study English in a formal institution. He declined this invitation; in other words there was not a bifurcation of his identity system at this point.

The third bifurcation point happened when he moved back to Bahia and a new identity fractal of business man emerged with new patterns of behaviors.

Finally, the fourth bifurcation point was the breakdown of his family business. The identity fractal of a business man which had emerged before, in face of an environmental change, represented here by the economical crisis of that moment, was reconstructed. Instead of being a business man in the field he was working before with his father, he became a language school owner. This new identity fractal also emerged due to the interaction of his identity fractal of a business man with his other identity fractals of languages student. All those interactions that were developed among his identity fractals, and between

RBLA, Belo Horizonte, v. 9, n. 2, p. 515-537, 2009

them and his sociohistorical context, were responsible for the emergence of his present identity fractal of a university language teacher.

The brief analysis developed showed that language learning is not just sensitive to teaching conditions. On the opposite, the cases presented here demonstrated that the experiences of language learning resulted much more from the interactions developed by the narrators with and within their social worlds than from teaching performances. Identity fractals emerged from the social interactions and the negotiation of those fractals contributed to enhance learning opportunities. Although all the cases described here presented a positive outcome, the reading of the other narratives from the *corpus* of *AMFALE* project reveals that, in many cases, a conflict is established in the negotiation among the identity fractals and this fact prevents language learning from taking place. What is important to acknowledge however is that learning is not a process that can be explained by teaching conditions alone; it is an experience of belonging.

Final remarks

The complex systems are dynamic and evolve continually; unpredicted behaviors occur due to the interactions of the component parts. Thinking about identity reconstruction as a complex system implicates in considering it also a dynamic process which is always evolving. Besides, as behaviors in a complex system emerge from the constant interaction of its component parts, and cannot be predicted, so identity emergence is also a result of the interaction of human beings with other individuals, and with the social context. The identity fractals which will emerge, as well as the behavior of the person in face of those different identity fractals cannot be predicted.

The understanding of social identity as a complex system also enables us to acknowledge the fact that one of the reasons that each human being is unique in some way is because he / she is socially constituted. More over, once complex systems are non-linear, that is, effects cannot be explained by simple causes, to think of identity as a complex system helps deconstruct deterministic positions which are based on prejudgments, prejudice and discrimination.

It is important to emphasize the importance of bifurcation points in the life trajectory. They bring new discursive attractors into being and represent the dynamicity of the system.

The implication of this new view to the teaching and learning of a second / foreign language is the acknowledgement that, although learning may take place in the classroom, it's not in any way limited to it. The way the complex systems use resources from different situations to apply to new environments was observed in the way identities are reconstructed. Belonging to different discourse communities and developing discursive attractors within those communities enables knowledge exchange. More over, the interactions which are developed between the learner with his "others" (teacher, classmates), and with his sociohistorical environment (social institutions, contexts and culture) affect the way the language learning process is accomplished.

The sensibility of the system to environment changes, the famous "butterfly effect" is a useful theoretical framework to help Applied Linguistics deconstruct the dichotomies and deterministic positions which have dominated the field so far. Based on the observation that two extremely similar initial conditions end up having totally different behaviors, we can reflect that something that is useful for one student might not be for another.

Finally, thinking of identity as a complex system can lead us to think about a new metaphor to describe the process of identity reconstruction. Borrowing the properties of fractals, I suggested the term *fractalized identities* to emphasize that the process of identity emergence via discourse does not fragment the individual into pieces, just makes the self more complex.

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