A Snapshot of Signature Dynamics in an English Class in Brazil: From a Motivational Attractor Basin Towards an Attractor State[1]

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Abstract: Considering the dynamic nature of the foreign language acquisition process, it seems that some components of the learning experience are competing motivational forces that directly influence the teaching and learning outcomes within the relational context of the English class. As the behavior of a complex system is by definition unpredictable and random, documenting nonlinear changes - its signature dynamics, is considered a possible way of researching it. In this perspective, this article aims to outline motivational signature dynamics of an English class using the retrodictive qualitative modelling. Firstly, the teacher's class plan plus the information from a semi-structured interview were used to recover most of the initial motivational conditions of the system - its attractor basin. After that, from the teacher's description of this class, it was possible to study the ecology of the teaching experience in interrelation with the students' motivation. An outline of a motivational change in the system state seems to indicate one of the system's possible attractor state. This result demonstrates that it is possible to document signature dynamics by properly eliciting and exploring the teaching experience.

Keywords: *signature dynamics, attractor basin, attractor state, classroom experiences*

1. Introduction

According to Dörnyei (2014), a system is considered complex or dynamic when it meets three conditions: (1) consists of two or more elements, (2) the elements of the system are interconnected and (3) these elements, although interrelated, draw independent trajectories from each other over time. Likewise, the most recent studies on experiences of teaching and learning English in Brazil (Miccoli, 2010, 2011, 2013, 2014a; Miccoli & Lima, 2012; Lima, 2014) acknowledge the complex character of the ecology of experiential components in second language acquisition.

In line with Lamb & Wedell (2013), who advocate the study of formal teaching experiences due to the significant influence that teacher practice has on student motivation, and considering motivation as a dynamic and situated system (Dörnyei & Ushioda, 2009; Dörnyei & Ushioda, 2012; Dörnyei, 2014), this study, funded by the sponsoring agency CAPES –

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Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brazil, focuses on the investigation of how a teacher's motivation changes in interaction with the environment and how the system reorganizes itself after the change (de Bot, Lowie, Thorne & Vespoor, 2013; Waninge, Dörnyei & de Bot, 2014).

In order to reach this objective, the teaching experiences lived by a teacher interacting with his/her students will compose the immediate context from which motivation should emerge and, therefore, be documented, according to Ushioda (2009), within a "person-in-context relational view of motivation" perspective. In Mercer's (2013, p. 377) words, "typically, contexts or the environment, which are themselves conceptualized as systems, are not viewed as external variables affecting a system from outside, but rather [are considered to be] integral parts of the system".

Having set this objective, three research questions can be presented: (1) what experience did the teacher have in this class? What are its main components?, (2) how do these components interrelate in weaving the experience?, and (3) what are the main motivational signature dynamics in this class, i. e., what are the novel outcomes formed by the system due to the interaction of its components?

In order to reveal this class motivational signature dynamics, it seemed essential to recover and consider both the system attractor basin and a detailed description of the class. From this description, there emerged an outline of its attractor state which will be presented and discussed.

2. Theoretical basis

This research initiative has taken an English class at a public high school in Brazil as a dynamic system in which the teaching experience was focused on. As the teacher intuitively conducted her class in a different way from what she had planned in a clear response to students' behavior, an effort was made to show the motivational dynamics of this system. Some concepts such as: attractor basin, signature dynamics and attractor state are central to this study.

2.1 Motivational attractor basin, signature dynamics and motivational attractor state

Although the behavior of a dynamic system is essentially random, and many times chaotic, it also shows some systematic trends. According to Hiver (2015), dynamic systems tend to self-organization, which means that they usually evolve to attractor states. So, an attractor state can be conceptualized as an emergent, dynamic and context-dependent temporary outcome of a complex system reached as a result of its self-organizing dynamics, be it converging to or diverging from critical patterns.

Signature dynamics are the system unique development paths (Dörnyei, 2014). Hiver (2015) explains the term as changes in the system behavior or state, resulting from internal interaction. Basically, the system dynamics can form a new outcome in two ways: naturally, without any intentional interference of any of its own agents, or under the impact of an input or any disturbing force that changes the system's natural trajectory, launching it into a different direction.

Finally, the initial conditions of a system which contextualize and support its development towards an attractor state are called the attractor basin (Hiver, 2015).

Considering the teaching experience as a key component of this system means acknowledging its complex nature – experiences nest themselves into one another, creating a net of dynamic relations, deeply influencing and being influenced by the context they are in. In order

to recognize nonlinear changes that may eventually emerge during the analyzed English class, it seems essential to understand the ecology of the teaching experience in interrelation with the students' motivation. To do so, the framework of formal teaching experiences seems to be a useful resource.

2.2 Framework of formal teaching experiences

Miccoli & Lima (2012) defend the organic and complex nature of human experience. They explain that our experiences involve a vast number of different inter-connected elements, interacting in diverse ways. In Lima's (2014) words, any experience "constitutes itself as more than an isolated event, once every experience encapsulates a process that, to be understood, makes evident other events and relations which permeate it, fostering their emergence" (p. 46).

The foreign language classroom dynamics, and the teaching experience, emerge from the interactions between the teacher and his/her students. From more than 20 years of collecting and analyzing foreign language (L2) teaching and learning narratives, Miccoli (2014b) has built the understanding that these interactions modulate the experiences lived by teachers and students within the classroom context. The evidence supporting this understanding emerge from teachers' and students' discourses. More specifically, it comes from the experiential components present in the descriptions of their teaching and learning trajectories.

To better investigate the teaching experience in its complexity, this study departs from the framework of formal L2 English teaching experiences elaborated by Miccoli (2007, 2010) and updated by Miccoli & Lima (Lima, 2014), and propose an adjustment to it. Once the study focuses on the motivational dynamics of the system, it is expected that motivational components will play prominent role in the data analysis, allowing for the unveiling of the emerging phenomena. Thus, in order to support the data analysis of this study, this framework was adjusted to encompass another category, related to motivational experiences.

Having Dörnyei's model of process motivation (2001) and the results of a doctoral research (Bambirra, 2009) as the main references, it was possible to conceive the category of motivational experiences constituted by seven sub-categories, as shown in Figure 1. The framework, adapted from Lima (2014), lists all the documented types of experience of teaching English as a foreign language in Brazil since 2006, when Miccoli started to formally investigate them, added by the category of motivational experiences. It encompasses then seven categories of experiences (originally six) and each category comprises its own sub-categories.

Conceptual experiences

Cpt 1. Teaching English at a regular school
Cpt 2. Learning English at a regular school
Cpt 3. Student role
Cpt 4. Teacher role
Cpt 5. Own capacity, competence, knowledge
Cpt 6. Teacher status
Cpt 7. English teaching status
Cpt 8. Concept re-signifying

Personal experiences

Per 1. Derived from the socio-economical level
Per 2. Previous experiences
Per 3. Current experiences
Per 4. Informal qualification – Studies, participation in academic events etc
Per 5. Reflection
Per 6. Self-knowledge
Per 7. Experience re-signifying

Environmental experiences

Env 1. Extra-institutional educational experiences
Env 2. Institutional experiences
Env 3. Working conditions
Env 4. Related to time
Env 5. Derived from the physical environment
Env 6. Related to the foreign language
Env 7. Derived from the research interference

Pedagogical experiences

Ped 1. Class management
Ped 2. Related to didactic material
Ped 3. Related to digital technology
Ped 4. Assessing teaching, learning and students
Ped 5. Use of teaching strategies
Ped 6. Description of students' actions

Social experiences

Soc 1. Derived from being the teacher
Soc 2. Description of the student/group profile
Soc 3. Derived from the interaction w/ students
Soc 4. Social strategies

Affective experiences

Aff 1. Creativity and (un)interest
Aff 2. Effort and persistence
Aff 3. Feelings
Aff 4. Self-esteem
Aff 5. Personal attitudes
Aff 6. Intuition
Aff 7. Use of affective strategies

Motivational experiences

Mot 1. Accepting responsibility
Mot 2. Investment on autonomy
Mot 3. Identity issues
Mot 4. Goals setting
Mot 5. Intention formalization
Mot 6. Goals operationalization
Mot 7. Motivation management

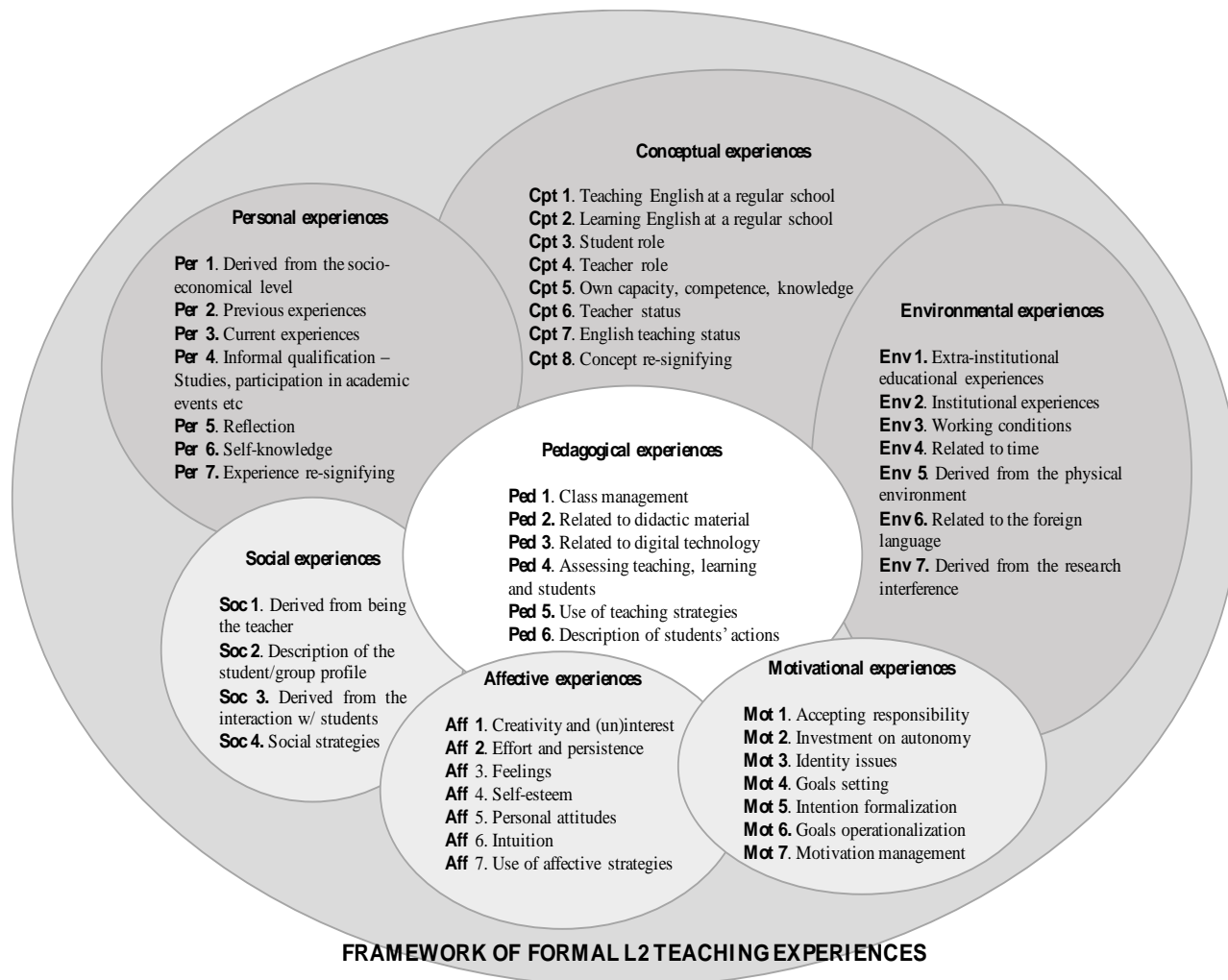**FRAMEWORK OF FORMAL L2 TEACHING EXPERIENCES**

Figure 1. Framework of formal L2 teaching experiences

Figure 1 aims at representing all types of teaching experiences documented by research findings according to their nature. It is an attempt to didactically display the possible constitution of any teaching experience. As an experience is usually a constellation of others, the endless possibilities of combination among them assures its uniqueness.

Situated and context-dependent, each teaching experience usually combines experiences that originate in the classroom and experiences that do not originate there. Research findings (Miccoli, 1997 to 2014a) have demonstrated that the experiences originated inside the classroom, as a direct consequence of the teaching action, are usually pedagogical, affective, and social in nature. Because they originate directly from the teaching effort, they tend to be central in comparison to others. Just like the tip of an iceberg, they seem more evident at a first look at the data but they are not able to realize the complete experience. At a second look, it is understood that these experiences are deeply affected by others that do not originate in the classroom but influence the perception or explain the behavior of the teacher. Still using the metaphor of the iceberg, they would be deeper, indirectly influencing the ones originated in class, having a great relevance for the pedagogical processes they modulate – the iceberg as a whole. Acknowledging

this essential distinction between the two types of experience, Miccoli (1997) has called them direct and indirect experiences.

The indirect experiences – environmental, conceptual and personal – do not originate in the classroom. As their names say, the environmental are determined by the environment but the conceptual and the personal originate within the inner world of the person who describes the lived experience.

In the diagram (Figure 1), the lighter the experience, more central it is. Due to the investigative focus of this study and the way the research questions were elaborated, the pedagogical experiences took the central position, followed by the affective and the social ones, together with the motivational experiences. Deeper, come the conceptual, the personal and the environmental ones, as will be made clear in the analysis of the teacher's narrative. That is why the framework has gained this representation and presents the conglomerates of experiences in three different shades of gray.

3. Methodology

This article presents a case study of mixed nature. Based on the framework of formal L2 English teaching experiences updated by Miccoli & Lima (Lima, 2014) and adapted for this study, the components of the teacher's experiences were first identified, categorized and quantified to try to document and explain any motivational change that occurred during the analyzed class. Then, qualitatively, the motivational components of the experience were made explicit in their relation to other experiential components lived and discussed.

3.1 Participants

The participants were one English teacher at a public high school in Brazil, and one of her groups: 16 students taking their second high-school year, all of them from 16 to 17 years old.

3.2 Data collection

The data collection was designed to register the manifestation and evolution of emerging motivational components in the participants' experiences. Thus, the following steps were proposed:

a. Before class, under request of the researcher, a brief class plan was formalized by the teacher outlining the activities devised to reach her pedagogical objectives, her main choices and expectations;

b. At the end of the class, a short narrative (some 5 to 10 minutes) was digitally recorded, in which the teacher was expected to describe and evaluate the experience lived in that class, trying to point out to what extent her plans were accomplished, and how she was feeling about that specific class, commenting on anything she considered relevant, if she wanted to;

c. At the beginning and at the end of the class, the students' impression about their motivational level for that class was registered. They were given a logbook, called motivational journal, together with a collection of colorful stickers (Figure 2), showing happy faces in green, neutral faces in yellow, and unhappy faces in red. They were asked to use them to assess (1) their motivation at the beginning of the class and (2) the feeling with which they left the room at the end.

Figure 2. The students' motivational journal and a set of stickers

The logbook has 20 pages since it was made to be used for a whole semester. Each page conceals the information on one English class so, at the top, it clearly indicates the date in which it occurred. The two circles were the spaces where students were supposed to place the corresponding stickers, while the rectangle area was added to give them some space where they could add any comment, explaining or exemplifying the sticker used, in case they wanted to. They were requested to add a comment of this nature any time they used a red sticker.

3.3 Data analysis

Given the nature of the phenomena investigated, this study was methodologically developed using one of the strategies proposed by Dörnyei's (2014) to conduct research involving nonlinear complex dynamic systems change and evolution in a meaningful way – the retrodictive qualitative modelling (RQM).

The RQM was presented as an approach to data analysis based on the fact that it may be possible to revisit the documented outcomes of a system dynamics and explain its signature dynamics. As Dörnyei (2014, p. 85) puts it, "… by tracing back the reasons why the system has ended up with a particular outcome option we produce a retrospective qualitative model of its evolution".

So, in the following section, the results are discussed in this way: first of all, the class plan, the teacher's mood and the students' moods at the beginning of the class were used to stablish the motivational attractor basin. After that, the moods in which the teacher and the students left the room were used to assess the teaching experience and present a possible motivational attractor state of the system. Finally, to show the signature dynamics of this class, the experiential components of the teacher's narrative were mapped and quantified and the motivational experiences were discussed qualitatively.

4. Results and discussion

4.1 The motivational attractor basin of the system

Facing the challenge of describing the initial conditions of this system-class, two elements will be considered: the teacher's and the students' declared before-class moods, and the teacher's class plan, in which her intentions and main pedagogical choices are stated.

The teacher has declared in her narrative that she was exhausted that day. So, the smiley face to be associated with her mood would be the unhappy face. In turn, from the journals, we have the students' moods. This information is summarized in Table 1.

Table 1. Initial overall motivation for the English class on that specific day

Students	Teacher	Moods	Meaning
3	1	☹	Unhappy
6		😐	Neutral
7		🙂	Happy
16			

The overall mood seems to indicate that most of the group – ten people out of 16 – was not that motivated for this class. However, six students, indicated their moods as neutral. Because the expected role of the teacher is still to get hold of the class, add an inspiring atmosphere to it, and motivate students to engage in meaningful activities, the teacher will have to spend a great effort to teach these kids and fulfill her class plan successfully.

The second source of data to contextualize the initial conditions of this system is her class plan. The class is very well prepared but we can notice that, depending on the way this teacher develops these activities, they will impose a high cognitive demand on the group.

CLASS PLAN: May 26, 2015

Duration: 1 h 40 min
Theme: informal interviews
Support: some activities of the book "Alive High 2" – Unit 2: On the waves of the radio

Activities:
1. *(10 min) Pre-reading activity – an informal conversation to arise the students' curiosity. The teacher will throw some questions to which they do not have answers on subject related to the text they are about to read. Observation: I have prepared 7 questions, and 4 of them will be answered by the text.*
2. *(40 min) Reading activity – use the reading strategies to help the students understand a story about the invention of the radio (basically skimming, scanning, and lexical inference)*
3. *(20 min) Grammar study activity – the use of the simple past*

> 4. *(10 min) Pre-listening activity – discussion about some aspects of informal interviews sometimes given by famous people (press behavior, privacy invasion, famous artists' reactions, and the students' opinions about the artists' responsibility in relation to feeding their fans with news)*
> 5. *(20 min) Listening activity: Kelly Clarkson's interview*
>   *Duration of the audio: 7 min*
>   *Exercises on the interview (proposed by the book)*
>
> (Our translation)

It seems that some ludic activity could have been included in this class plan. Something like a game, a role-play, a short karaoke, some video clip watching etc. Ninety minutes of cognitive effort may be too much for any group to handle. So, it is relevant to verify the motivational level of the group after the class. It was expressed in this study by the teacher's and the students' moods, as can be seen in Table 2.

4.2 Towards the attractor state of the system

Table 2 shows the students' and the teacher's moods, before (BC) and after (AC) class, represented by smiley faces. It also shows some comments the students have written in their journals.

Table 2. Visual representation of the motivational move of the class

Ss	Mood		Comment
	BC	AC	
S1	🙂	🙂	
S2	🙂	🙂	
S3	🙂	🙂	
S4	🙂	🙂	
S5	🙂	🙂	I am in love with my teacher!
S6	🙂	🙂	
S7	🙂	🙂	
S8	😐	😐	
S9	😐	😐	
S10	😐	😐	
S11	😐	😐	
S12	😐	🙂	
S13	😐	🙂	
S14	🙁	🙂	I was late to class!
S15	🙁	🙂	Tired, bad grades, really bored
S16	🙁	🙁	I can't learn
T	🙁	🙂	She was "exhausted" that day.

Table 2 also shows that four 'neutral' students (S8, S9, S10 and S11) did not change their moods during class. They arrived with some neutral feelings at that class and ended up feeling just the same. Student 16 also did not change his/her mood. S/he commented in his/her journal that s/he had some great difficulties in learning English and this is reason enough for feeling bad about many classes. So, five out of 17 people in this group would say they were indifferent or did not like this class.

On the other hand, another five people have changed their moods – both from unhappy and from neutral – to happy ones. S12 and S13 changed from neutral to happy and S14, S15 and also the teacher changed from unhappy to happy.

It is interesting to notice that S14 and S15 presented external reasons for not being in the best mood for this class. S14 explained s/he had represented her/his initial mood with an unhappy face because s/he arrived a little late and that bothered her/him. S15 said that s/he had been taking bad grades in other subjects and so s/he had been worried those days. As they engaged in the class and interacted with their colleagues and the teacher, they have forgotten that initial feeling and could enjoy it.

In a similar way, the teacher, who had started teaching with difficulty once she was feeling tired, became satisfied as the class went by and she could see the students having some fun and learning. She expressed it in her narrative in this way:

> *I liked this class because I managed to develop it, at least I guess so, more in English than in Portuguese, and they [the students] seemed to have had fun. It seems that they got relaxed at the end of the class and left it here so happy. And I did what I had planned, with some change that's true. So, that is all for this class!*

In the end of the class, there were twelve happy faces against four neutral ones and only one unhappy face. This means not only that the class was very successful but also that there was a significant motivational change along the way. So, in the pursuit of outlining this motivational change, the teaching experience will be analyzed.

4.3. The teacher's experience and the motivational signature dynamics of the system

Based on the framework of formal L2 English teaching experiences (Lima, 2014) – Figure 1, the components of the teaching experience were identified in the teacher's narrative, categorized and quantified as shown in Table 3. It is important to consider that this analysis shows the experience as described by the teacher. It is based on what emerged from her discourse.

Table 3. Composition of the teaching experience

Nature of the components	incidence
Pedagogical	22
Motivational	20
Affective	7
Social	3
Personal	2
Conceptual	2
Environmental	1
Total	**57**

As can be seen, due to the nature of the analyzed narrative – a description of a class, and the chosen focus of analysis, the pedagogical experiences take the central position. They emerge in greater quantity as they are the teacher's focus of attention. In such a scenario, it can be understood that the affective, personal, social, conceptual and environmental experiences contextualize the occurrence of the pedagogical ones and, together with the motivational experiences, they support the system self-organization, outlining signature dynamics. The motivational experiences emerge all the time, since they permeate the interactions. A qualitative approach will be taken from now on to explain all that.

The teacher started saying what she had planned for that class. In doing so, she shows that she accepted the teaching responsibility (Mot 1), stablished goals (Mot 4) and formalized intentions (Mot 5).

After that, she assessed her performance briefly announcing that she did not fulfill her class plan (Ped 4). In a very positive way, she started describing what she could do, reporting how she addressed a warm-up activity, and soon a conceptual experience can be derived from her discourse (Cpt 1) – she mentions that she managed to do an activity with the students almost completely in English. It shows that she believes English must be used in class as much as possible. This is not an institution demand so it is understood as a belief. She also shows how happy she was because of it and then an affective experience is realized (Aff 3). The teacher justifies her satisfaction with this use of English explaining how difficult it usually is to achieve it due to the heterogeneous linguistic level of the group. This indicates the presence of a social experience (Soc 2) related to the realization of their competence as a result of class interaction.

She kept on describing her class and talked about another activity (Ped 1) – a pre-reading one, and it shows how she operationalized another goal from her class plan (Mot 6). Right after she assessed the group's (Ped 4) performance, and explained why the activity went so well, allowing her to reach a pre-established sub-task (Mot 6). She mentioned that everyone had collaborated (Soc 3) and reassessed the group's performance (Ped 4). Then she described how she conducted the pre-reading activity (Ped 4) exploring the subject prediction, vocabulary inference, textual non-verbal elements analysis, target public, and the social function of the text. By the details she was giving, the motivational components of her experience were becoming evident again, once she was showing how she could operationalize her goals and intentions with the group (Mot 6).

Next she mentioned she pre-checked their understanding of the text general idea (Ped 4), commented that it was all done in English, letting her belief related to how Brazilians should learn a foreign language come up again (Cpt 1), and expressed how it pleased her to speak in English with them most of the time (Aff 3). Before moving on, she registered that she tried to

work communicatively with them, again demonstrating compromise in following the class plan (Mot 6).

Then, she started describing how she mediated their reading of the text and doing the reading comprehension activity (Ped 1). It is clear at this moment the motivational component modelling her attitudes (Mot 6) in response to the students doubts, questionings, interferences, general behavior.

At this point, she realized that time had passed and she only had 30 minutes left to the end of the class (Env 4). But she still wanted to do a listening activity proposed by the book (Mot 5). She commented that the activity was heavy, cognitively loaded (Ped 2), and that the students were sort of tired, getting demotivated (Soc 2). At this point, she noticed that they started talking about a singer whose picture they saw on the book at that very moment (Ped 5). So, because she realized their interest in that singer (Aff 6), in a demonstration of teaching autonomy (Mot 2), she decided to abandon the class plan (Ped 6) in favor of investing in her students' motivation (Mot 7). In her words:

> We still had some 30 minutes or so to the end of the class, they were very agitated, uneasy, dispersed. As I was getting ready to start the pre-listening activity (class plan #4), they saw a picture of Sally Clarkson on the book and started talking enthusiastically about her. I was so exhausted that day that I gave up gathering extra effort to get them engaged into one more cognitively tiring activity such as the ones I had planned (class plan #4 and #5). I just jumped with them into listening unpretentiously to a song by Sally Clarkson! They needed to relax and so did I.

She described how she contextualized the activity (Ped 1) – improvising (Aff 6), she got a sentence by Nietzche from the book and related it to the title of the song: Stronger, promoting a discussion about the consequences of the end of a love relationship (Ped 2).

Right after she commented on the group's reaction (Ped 4) and expressed satisfaction (Aff 3) for having overcome the students' demotivation (Mot 7). Then she assessed her class as a whole (Ped 4), stressed some goals from her class plan she did not reach, some activities she did not do with the students (Mot 7), and reflected on her performance (Per 5) stating that she wants to become more independent from the textbook each day, makes a connection between her motivational level (Aff 3) and the students' (Aff 6) in that specific moment of the class when she decided to abandon her class plan (Ped 6). This experience makes evident a reflection (Per 5) triggered by the fact that she was managing her motivation (Mot 7).

5. Conclusion

This study is an attempt to analyze an English class at a public regular school in Brazil using the retrodictive qualitative modelling, as proposed by Dörnyei (2014). It seems that the effort to describe the ecology and the dynamics between the teacher's reported experiences and the contextual elements allowed the realization and outline of some motivational signature dynamics of the system.

The initial motivational conditions of the system indicated seven motivated participants against ten demotivated ones. At the end of the class, it had changed to twelve motivated against five demotivated. The emergent motivational change in the system was mainly due to (1) the teacher's perception of the students' affective and motivational state, and (2) her intuition, both affective components.

This class signature dynamics, that is, its development paths from the attractor basin state towards an attractor state, corroborate Miccoli's (1997 to 2014a) and her associates' research

finding that motivation and feelings filter and deeply influence teaching and learning under any circumstance. As context is a contingent parameter, it seems wise to always consider motivation and affective experiences while mapping the context of pedagogical learning experiences.

As assumed, the framework of formal L2 teaching experiences was resourceful in making evident the ecology of the processes under analysis.

The results also suggest that this research methodology into the classroom motivational dynamics is a successful approach to analyze motivation from a dynamic system perspective.

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