

## **DYNAMIC SYSTEMS THEORY APPLIED TO EFL: THE CASE OF NON-BILINGUAL SECTIONS OF 1<sup>st</sup> OF COMPULSORY SECONDARY EDUCATION STUDENTS IN A HIGH SCHOOL IN MADRID**

### **LA TEORÍA DE SISTEMAS DINÁMICOS APLICADA A LA ENSEÑANZA DEL INGLÉS COMO LENGUA EXTRANJERA: EL CASO DE SECCIONES NO BILINGÜES DE ESO EN UN INSTITUTO DE MADRID**

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#### **Abstract**

The present study analyzes some possible applications of Dynamic Systems Theory to the context of English as a Foreign Language in High school students of Madrid. Following this theory, tenets such as implicit teaching, real language, and crossmodal input have been applied to the teaching of one group of 1<sup>st</sup> of Compulsory Secondary Education students for a two-week training period followed by two more weeks of treatment. The results show that students in the experimental group obtained higher academic results in a given unit of the course in comparison with students who simply followed the traditional teaching methodology. This little study thus calls for further research on more innovative teaching methods based on the dynamic nature of foreign language acquisition.

**Key Words:** Dynamic Systems Theory, Chaos/Complexity Theory, Secondary Education, English as a Foreign Language, language learning theories.

#### **Resumen**

Este estudio analiza algunas de las posibles aplicaciones de la Teoría de Sistemas Dinámicos a una asignatura de inglés como lengua extranjera en un instituto de Madrid. Siguiendo los postulados de esta filosofía, se ha aplicado la enseñanza implícita, el material auténtico y el input multimodal a la docencia de dicha asignatura a un grupo de estudiantes de 1º de la ESO durante un periodo de entrenamiento en esta metodología durante 8 sesiones seguidas de dos semanas más de tratamiento. Los resultados muestran que los estudiantes en el grupo experimental obtuvieron mejores resultados académicos en el examen de una unidad del temario en comparación con otro grupo de estudiantes del mismo curso y del mismo centro escolar que seguían el enfoque tradicional de enseñanza. De este modo, este pequeño estudio invita a más investigaciones de innovación didáctica basados en la naturaleza dinámica de la adquisición de una lengua extranjera.

**Palabras clave:** teoría de sistemas dinámicos, teoría del caos o complejidad, educación secundaria, inglés como lengua extranjera, teorías de aprendizaje de lenguas.

## 1. INTRODUCTION

Research on new learning and teaching methodologies in Second Language Acquisition (SLA) and Foreign Language Acquisition (FLA) still remains from being put to an end. In detriment of generative approaches in the field, more and more scholars have turned to sociocultural and cognitive approaches to language teaching (Lightbown & Spada, 2013). Moreover, the communicative approach many instructors have recently advocated in their teaching is still taken for granted in many high schools all over the world, as many schools still follow a structure-based program (Verspoor & Ngunyen, 2015, p. 305). One of the reasons why structure-based approaches are widespread is because many teachers, students, and parents still believe that grammar is the core of language, which follows strict rules. There is a strong focus on accuracy and grammar perfection, which does not allow exposure to meaningful and authentic input to take place.

Besides Content and Language Integrated Learning programs, which are becoming widespread in Spain, focus on communication is still rare in some Spanish high schools. The school presented in this research represents one traditional school in Madrid where the English curriculum is applied following a structure-based textbook and a traditional teaching methodology which heavily relies on the activities presented in the course book. This type of education produces learners who disregard English as a means to communicate, simply seeing foreign language as one more subject to pass in order to move on to the next grade. For this reason, this study analyzes how a more active and dynamic methodology will influence the students' motivation towards foreign language learning, which will be evidenced by an increase of academic results.

The theoretical tenets set out here belong to the paradigm of modern day Cognitive Linguistics so-called Usage-based linguistics (Langacker, 1987) combined with a communicative and implicit approach to language teaching through the well-known Theory of Chaos (Poincaré, 1899; Larsen-Freeman & Cameron, 2008; Zamorano Aguilar, 2012; Romano Mozo, 2014). According to these two views, language knowledge and usage emerge from the interaction of different systems: students, resources, the contexts of learning or even the language itself. To illustrate the hierarchies in a system, oral comprehension is just one subsystem within the individual, which counts as a system on its own. Subsystems compete to be processed but they also integrate the input they receive in order to form a whole. Thus, a listening activity in which the students just listen to a podcast without getting visual input and interactive input is incoherent. Oral comprehension does not occur in isolation from other cognitive faculties humans share. Therefore, this research advocates the need to make learning more real through coherent multimodal activities that boost real interaction with other students, materials and the context of learning. Besides, usage must not be taken for granted. Students must learn authentic language produced in real contexts of communication so that they understand the communicative intentions underlying any speech act or language structure in general.

Moreover, a complex-dynamic system approach is presented in this study, since it is believed that language learning development entails the interaction of different systems and subsystems. Throughout the unit taught during this period at the high school, the aim was that students as systems interact with

the other systems in order to produce language learning, which is also initiated by an increase in motivation when providing students different sources for learning and real language. It was expected that students would develop a better attitude not only towards the English subject but also to English learning in general. Besides, it was expected that students would improve their skills in the target language as well as improve their grades, which would mean that a Usage-based approach does not simply help students with their implicit competence in the L2 but also with their explicit knowledge of the English language as evidenced by better results in the same typology of exams they have been taking throughout the year.

Finally, regarding the structure of this study, we will firstly present the theoretical framework to understand the approach. Then, the experimental study will also be explained. Thirdly, we will present the data obtained and the discussion of results. Finally, some concluding remarks will follow.

## 2. THEORETICAL FRAMEWORK

This section will shed light on key concepts derived from Dynamic Systems Theory (henceforward, DST). Firstly, the differences between learning, acquisition and development will be set out. Secondly, Chaos/Complexity theory will be explained. Thirdly, a dynamic usage-based approach to foreign language development will be described.

### 2.1 *Language learning, acquisition and development*

Stephen Krashen's (1985) distinction between language acquisition and language learning has become a solid landmark in the history of language learning theory. According to this approach, whereas learning is a formal and conscious process, acquiring is a more unconscious one. Foreign language learning refers to learning a language in a country where that target language is not spoken as an official language (like English in Spain). Second language acquisition normally refers to the process of learning the target language in a country where such language is spoken officially. However, this dichotomy does not fully represent the nature of language learning contexts, as for instance, English can be learnt as a second language in Spain in certain bilingual families.

Moreover, acquisition (understood as a synonym of foreign language learning depending on the context) entails a static view of language which somehow assumes that learning has starting and finishing periods, from A1 to C2. However, “research on language attrition has shown that even for the first language there is no such thing as an end state” (De Bot, Chan, Lowie, Plat & Verspoor, 2012, p. 191) but there exist some steady states. Systems such as language depend on changes in the environment (another system) to produce either learning or attrition in learners, who are systems as well.

All of this leads to a picture of language development that is quite different from the traditional view of language acquisition as a steady process towards higher levels of proficiency. Depending on language use and contact, proficiency may grow or decline and subcomponents of the language system may actually show different developments in which growth of one part may coincide with decline in another part (De Bot, Chan, Lowie, Plat & Verspoor, 2012, p. 191).

In fact, most constructs in Second Language Acquisition have been studied from a linear point of view (De Bot, Lowie, Verspoor, 2007, p. 15). However, “language acquisition, and language attrition are much more intricate, complex, and even unpredictable than a linear position would allow” (De Bot, Lowie, Verspoor, 2007, p. 7). This is why we here advocate for Dynamic Systems Theory, as it understands learning as a process rather than a product, “a non-linear development that is dependent on internal as well as external resources” (Roehr-Brackin, 2015, p. 181).

## 2.2 Complexity/Chaos theory: Language learning as a developmental process

Chaos theory is based on the work of the physicist René Thom (1923-2002), *Modèles mathématiques de la morphogenèse* (1980), and the mathematician Henri Poincaré (1854-1912), *Les méthodes nouvelles de la mécanique céleste* (1899), who worked with catastrophes such as material realizations of abstract concepts in a system that allows more than one stable state. It is a theory that has been studied by numerous scholars such as Jean Petitot at the Semiotic School of Paris, Wolfgang Wildgen at Bremen, Per Aage Brandt at Arhus and Enrique Bernárdez Sanchis at Complutense University of Madrid (Zamorano Aguilar, 2012, p. 681).

Chaos shall not be approached as a synonym of disorder because it actually follows some mathematical rules, although they are unknown. Chaos theory assumes that some initial conditions are sensitive to change, producing a dynamic and complex system, since the different subsystems within the system interact and produce change in one another. These ideas, when applied to language acquisition, explain the emergentist nature of language, which develops in a social system and the interaction of different subsystems within the system.

Whereas generative accounts of language have become disenchanted with mathematical models to explain linguistics, social approaches to language have advocated probabilistic and mathematical models to describe language from the very beginning of its existence since Labov (López-García, 1996, p. 17). Language is intrinsically social; language emerges thanks to the interaction of a person as a system with other speakers as systems. Learning is affected by internal factors of the human system, such as motivation and aptitude, together with external elements of humans such as input or the school (Verspoor & Nguyen, 2015). A change in the initial conditions leads to a change in all subsystems, which interact by changing the whole system. Thus, even a factor such as motivation can be seen as essential in education, since the motivation levels increase, which makes learning more prone to be successful.

Thus, from the approach of this research, language is not simply a product but a learning process, which can grow or decline depending on changes in the different systems or subsystems that lead to the learning experience. This view leads several scholars to claim that we should no longer talk about acquiring a language but developing a language (Bot & Lowie & Thorne & Verspoor, 2012, p. 199). In other words, the bidirectionality of language can lead speakers to develop it but also to forget it (language attrition). The fact that our language competence can increase or decrease sets exposure, frequency and usage as the core of the language development process. The view held here assumes that

it is the environment that produces the conditions for language to emerge. Initial conditions are the source of change in a system that many scholars call chaos.

### *2.3 A dynamic usage-based approach to foreign language development*

Language has a social function but it is processed cognitively. The model proposed to teach students in this research project derives from DST. Different agents interact within the system, which adapts to its members' output. Thus, language structures in a given community derive from usage and exposure, which leads to entrenchment and mapping of linguistic structures onto the brain. The combination of Usage-based linguistics and DST is defined as a Dynamic Usage-based approach by Verspoor and Nguyen (2015), a theory in which language learning is:

Meaning-based at all levels, emphasizing frequency of exposure to authentic input and usage events, designed as “actual instances of language use, in their full phonetic detail and contextual understanding” (Langacker, 2008, p. 81).

Language, as a complex dynamic system, is not just rules but it has a vast array of different meaningful units intertwined that interact (sound, morphemes, semantic items, etc.). Language development is dynamic, not linear. Language can self-organize itself through iteration of form-meaning pairs (Verspoor & Nguyen, 2015, p. 311). The more a unit is heard and used, the more entrenched it becomes. This functional approach to language assumes that lexicon and grammar form a continuum (Halliday, 2004). Therefore, meaning in sounds, intonation, words, or grammatical patterns is the core of this model. Students must be exposed to authentic samples of language through meaningful context exchanges in which students can identify the social functions underlying linguistic forms. As mentioned above, different subsystems compete in the learner's brain, so the teacher must direct the focus of what is being taught to the right direction. For instance, in a listening activity, students can pay attention to speed, rhythm, lexis, grammatical structures, etc. The teachers must thus ensure students' focus to what they want to teach.

According to Verspoor and Nguyen, a Dynamic Usage-based approach must comply with the following pre-requisites (2015, p. 315):

- A. Input must be authentic and exposed in a communicative context, always linked to a social purpose. On the contrary, no research has proven that output or language production is essential to develop language in learners, at least not until advanced learners (Van Patten & Benati, 2010, p. 38).
- B. Iteration warrants language exposure (Larsen-Freeman & Cameron, 2008). When learners are exposed to the same linguistic structures over and over they pay attention to different aspects – all the subsystems competing in students' attention spans.
- C. Implicit learning more than explicit learning. Studies that claim that explicit learning is beneficial for students seem to be biased (Norris & Ortega, 2000). Implicit learning establishes strong representations, which happens because cognition is situated and embodied, interacting with our perceptual system and our experience of the world (Roehr-Brackin, 2015, p. 184).

However, implicit learning takes much more time than explicit learning and it requires more input over a long period of time.

- D. Additional materials are encouraged if they can boost understanding: translations, paraphrases, visuals, etc. Since language is embodied, multimodality boosts learning. Crossmodal attention allows humans to identify targets more easily if the two modes of communication are complementary (Johnson & Proctor, 2004). For instance, although the visual mode is the more dominant when we communicate, the auditory mode is stronger to draw people's attention than the visual one. Live listening is probably a better method to present students with information than simple unimodal listening activities, as several modes combine to represent meaning. Teachers must aim at multimodal teaching, since students can definitely benefit from the information they can grasp from the different modes they pay attention to.

### 3. METODOLOGY

In this section, firstly, we will describe the research objectives and main hypothesis. Secondly, the learning context for the study will be presented. Thirdly, participants in the study will be also presented. Finally, the experimental stage for this research will be explained.

#### *3.1 Research objectives and hypothesis*

The objective of this project is to demonstrate that the application of DST principles of teaching can lead to better learners' academic results in formal education. The main hypothesis of this project is that language learning is enhanced when materials are authentic, crossmodal and when it is taught implicitly. Thus, we aim at proving that students learn much better what derives from usage and exposure. Students will learn entrenched constructions better, that is, those appearing on the movies and the ones they interact the most with. Isolated and decontextualized items, as the ones on a textbook, will not be assimilated as much as those aspects studied with the suggested methodology.

Thus, students working with crossmodal activities will be more motivated and will obtain better results, as this kind of processing corresponds with the way we process our L1 in daily life. Extracting the lexis from instances of real language, as taken from original movies and books with no adaptation, will be more effective than learning linguistic items explicitly. In this line, we will try to demonstrate that language acquisition has to do with the implicit recognition of verbal patterns in real language.

Therefore, unlike those students in the control group who work with explicit grammar and vocabulary taken from a book, students in the experimental group, who work with crossmodal input, a more communicative, interactive and implicit teaching approach, and authentic language taken from real instances of communicative events (such as original movies or unabridged books) will increase their academic results for English learning. Thus, we will attempt to show how altering the initial conditions in a system (by altering the learning resources) can lead to more changes in the system. Obtaining better results in the test unit test both groups undertake at the end will evidence the fact that their learning experience has improved through treatment.

### 3.2 Learning context

The experiment in the study took place in a high school in Madrid during the second term of the school year (from February to April 2016). This secondary education center is a state funded school which has both bilingual and non-bilingual sections for the Spanish Compulsory Secondary Education (*ESO* in Spanish), 7<sup>th</sup> to 10<sup>th</sup> grade, and the Spanish Baccalaureate, 11<sup>th</sup> and 12<sup>th</sup> grade.

The school is located in the city of Madrid. It belongs to the Aluche neighborhood, in the Latina district. Aluche has a population of approximately 66,000 inhabitants, of whom around 16% of people are immigrants (consistent with the average ratio of immigrants in the city). People living in this area have low and middle socioeconomic status, and the income per person of the families in the area is lower than the one ascribed to the rest of the residents of the municipality. Inhabitants of this district work in construction, services, commerce, transportation and communication. Besides, 25% students in the school are immigrants, coming mainly from countries such as Colombia, Ecuador, Romania, China, and Morocco.

### 3.3 Participants

The study counted with 48 students of the subject of English as a Foreign Language in non-bilingual sections. These students were enrolled in the 1<sup>st</sup> course of Spanish Compulsory Secondary Education. The control group, who followed the traditional methodology, had 23 students (one did not participate in this study), whose ages ranged from 12 to 15, as some of them were repeat students. In terms of participants, 14 students were female and only 9 were male.

It is interesting to note that not all students belong to the same class. 4 students join this group just for the English subject. As expected, the level of English of the class is not homogeneous, and throughout the year four students obtain the highest grades consistently. There are two students in this class who always fail the English subject and who never study. One student has Asperger's Syndrome and needs more support but always passes tests. Finally, there is one student who hardly ever comes to classes. During this study he was abroad, so he never took any of the tests in the analysis.

As far as the experimental group is concerned, it included with 26 students (5 students did not participate in the study), whose ages ranged from 12 to 15, as some of them were repeat students. In terms of participants, once again, there were more female than male students (20 vs. 11).

In this case, all students come from the same class. As expected, the level of English of the class is not homogeneous, and throughout the year four students obtain the highest grades consistently. The number of students in this class who always fail English tests and who never study is higher than in the Control Group (around 8 students). There is one student who suffers from autism and needs more support but always passes tests. Finally, five students in this class skip lessons quite regularly, so they did not take the exam because they were expelled from school at that time.

### 3.4 Experiment

Both control and experimental groups are 1st of Compulsory Secondary Education students at the same bilingual school, but belonging to non-bilingual sections. English is a compulsory subject in their curriculum and they have 4 sessions of 55 minutes every week. Apart from the 4 different sessions during the week, students have one session at the IT room and one session with a native teaching assistant. This experiment occurs in the second term of the school year (from February to April) throughout 6 weeks. There is a 2-week training period followed by a 2-week experiment. Both groups study the same content units marked by the book throughout the 4 weeks.

#### 3.4.1 Training period (first two weeks)

The experimental group was the only group that did this training period aimed at introducing them with the teaching approach at hand. Whereas the experimental group carried out this training period for two weeks, the control group studied a book unit following the same traditional methodology they had been following in the first term of the school year. During this period, not only two different methodologies were followed but also the input nature and contents (except grammatical aspects, as both groups studied the use of the modal verb 'can')<sup>1</sup>.

#### 3.4.2 Experiment (last two weeks)

Once students were introduced to this new methodology, both groups studied the same contents (which were agreed upon based on a book unit's content which has not been studied yet) and finally did the same exam to determine which group had learnt more and was more motivated towards learning. The objectives of this unit were mainly structure-based. The grammar key point for the unit was to learn how to identify the past simple form in order to use it properly. Students were required to learn the past simple form of the verb 'to be' as well as some irregular forms of verbs such as 'to go, to see, to buy, to read, and to give'. In terms of vocabulary, students were expected to learn a few nationalities (Spanish, Brazilian, Swiss, Japanese, French) as well as vocabulary related to the field of vacation and tourism.

Students in the control group followed the same teaching methodology than the one used in the previous trimester. Classes were mainly based on the Student's book and Workbook. The teacher conducted the classes in Spanish, and English was only used when reading the activities aloud. Speaking in the target language was rarely encouraged, except from the class in which the native teaching assistant helped once a week. The student's book activities mainly consisted of explicit grammar and vocabulary exercises (i.e. filling in the gaps, matching words with expressions, multiple choice questions for reading and listening comprehension activities) which resemble the type of question items in the final unit exam. The instructor faced multiple interruptions on a daily basis which normally turned into class disruptions, which was not conducive for the learning experience.

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<sup>1</sup> Please, see Annex 2 to read a description of the activities practiced and the DST aspects applied for the teaching period.

Students in the experimental group followed the new methodology based on principles derived from DST. The student's book and workbook were never used and class materials were provided daily. The grammar key points of the unit (past tense forms) were studied implicitly through the use of realia such as popular video songs on YouTube, watching movie clips, reading real (unabridged) usage of the target language. Examples of class activities are now provided.

- Games to learn vocabulary. Students learnt the name of countries through a class competition using a real map. Students had to guess the location of countries in the map so that learning was contextualized. Demonyms were learnt afterwards, when the list of countries had been learnt. Another game was used to learn the means of transportation. Again, students were always provided an image of the means of transportation together with their names so that associations could be made. In order to contextualize activities, students created quizzes in which they had to define the route between countries or cities or other destinations. The other students had to identify the correct means of transportation to travel those distances.
- Speaking and writing about a past holiday. Students were provided a guidebook to create a package holiday to New York City answering the following questions:
  - How many days did you stay?
  - What did you carry on your luggage? (money, passport, clothing...)
  - Where did you sleep? Tell the name of your hotel.

Sightseeing:

- What did you see in New York? Did you take any trip or excursion? How much were tickets for places you visited?
- Did you use any means of transport? (plane/train/boat...)
- How much was the package holiday?

Again, this activity had some context and realia. Students had to look for real information to reply to those answers and negotiate meanings with other students, as they were not supposed to be doing those trips alone. The vocabulary on those questions was presented explicitly (a list to learn by heart) to students in the Control Group. Students in the Experimental Group had to interact with one another in order to answer questions. Since iteration is a key in Dynamic Usage-based approach to teaching, after having answered those questions, students had to come to the blackboard and explain their trips and other students had to judge whether those trips were a good deal or overpriced.

- Reading real and natural language. Students had to read real guidebooks found on the Internet (NYC The Official Guide; Lonely Planet) in order to deal with the contents of this unit. Thus, they learnt essential vocabulary for this topic implicitly. Students also read information about hotels in Booking.com in order to know how much they had to pay in hotels. Students were also encouraged to spot past tenses in verbs in the input they read.

- Watching Good Will Hunting. Students kept on finishing the entire movie, as they already knew parts of the movie because of the activities in the previous unit. Students had to identify past tenses in the movie. Again, these cross-modal activities increased students' motivational levels.

Finally, students from both groups were tested on the unit. The unit exam (See Annex 1) was familiar for all groups because it was the same type of explicit and structural written comprehension test they were accustomed to (Use of English, reading and listening comprehension). The following table shows the different parts of the exam.

Part of the exam	Activity	Marks	
Use of English and grammar	1- Past tense verbs. Fill in the blanks with the correct form of the verb (5 items)	10	50
	2- Vocabulary and past tense verbs. Fill in the blanks with the correct form of the verb (5 items)	10	
	3- Vocabulary: nationalities. Fill in the blanks (5 items)	10	
	4- Vocabulary. Fill in the blanks (5 items)	10	
	5- Grammar and vocabulary: Multiple choice questions (5 items)	10	
Reading	6- Multiple choice questions (5 items)	25	
Listening	7- Multiple choice questions (5 items)	25	

Table 1. Description of the unit exam.

#### 4. DATA ANALYSIS AND DISCUSSION OF RESULTS

In this section we will provide an inferential statistical analysis of the data obtained from the comparison of exam results in the experimental and control groups. Then, we will discuss these results.

##### 4.1 Data analysis

Both the experimental group and control group took an exam which consisted of Use of English (50%), Reading (25%), and Listening (25%). Both groups were examined under the same conditions, that is, they took the exam the same day during class time (55 minutes) after the same number of English sessions. They were accustomed to this type of examination, namely, based on comprehension and explicit knowledge of grammar and vocabulary, because they had already taken exams exactly like this one for three units from the course prior to this study. Moreover, the two groups' performance in the previous trimester was quite similar (see Figure 1). The control group's mean was 5,40 and the experimental group's was 5.38.

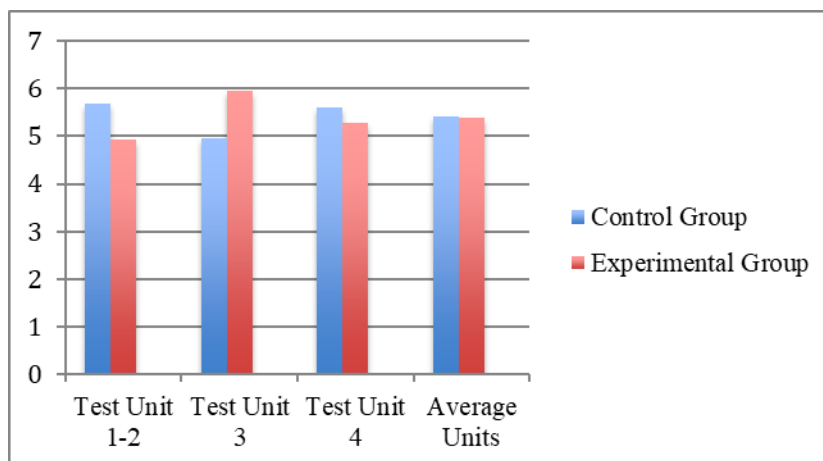


Figure 1. Test units results from the previous trimester.

The main aim of the research was to prove how a small change in the teaching process could really alter the learning process results. In this case, we wanted to demonstrate that applying a teaching methodology based on Dynamic Systems Theory could help improving grades. To answer this question, the experimental group (only 26 students) was trained through this methodology for 2 weeks (4 sessions of 55 minutes) whereas the control group (22 students) simply followed their students' book. After the training period, both groups studied the same contents, which were determined by the next students' book syllabus. However, the control group once again followed the student's book while the experimental group covered the same contents following this new teaching methodology. Therefore, two main variables were being considered. The independent variable was the type of teaching methodology employed and the dependent variable was the learning, manifested by exam results (see Figures 2 to 5).

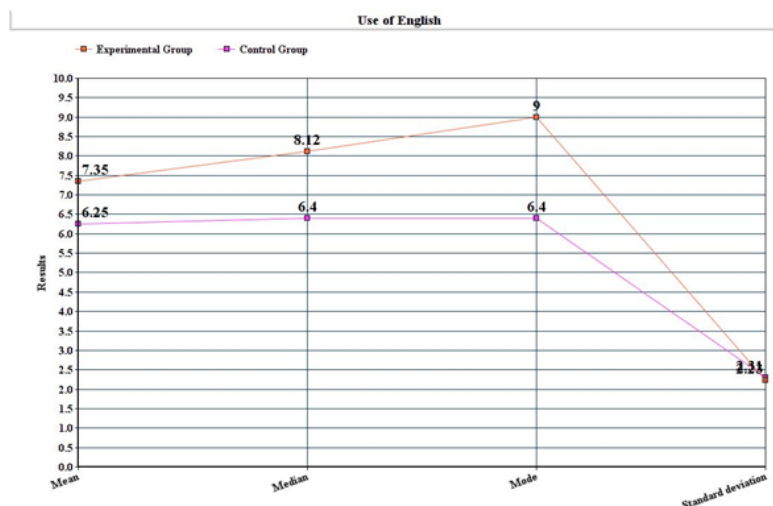


Figure 2. Use of English and grammar exam results.

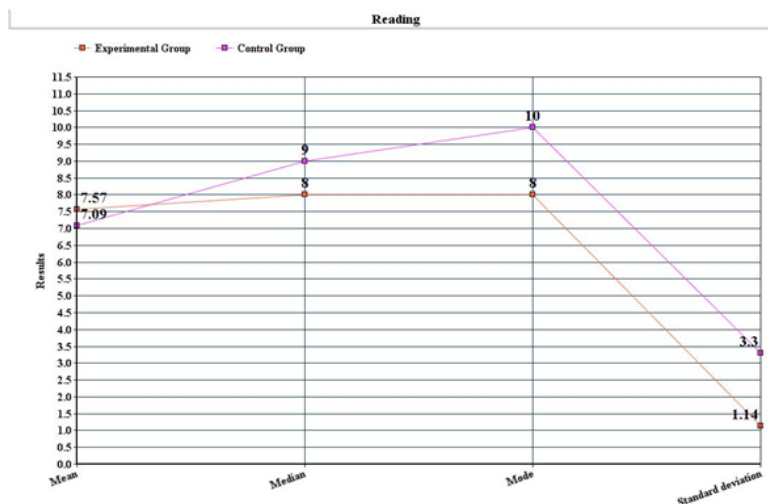


Figure 3. Reading exam results.

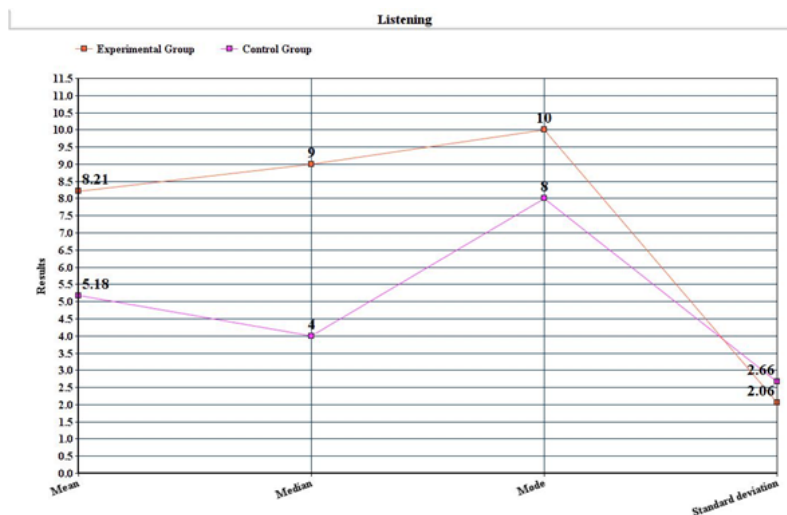


Figure 4. Listening exam results.

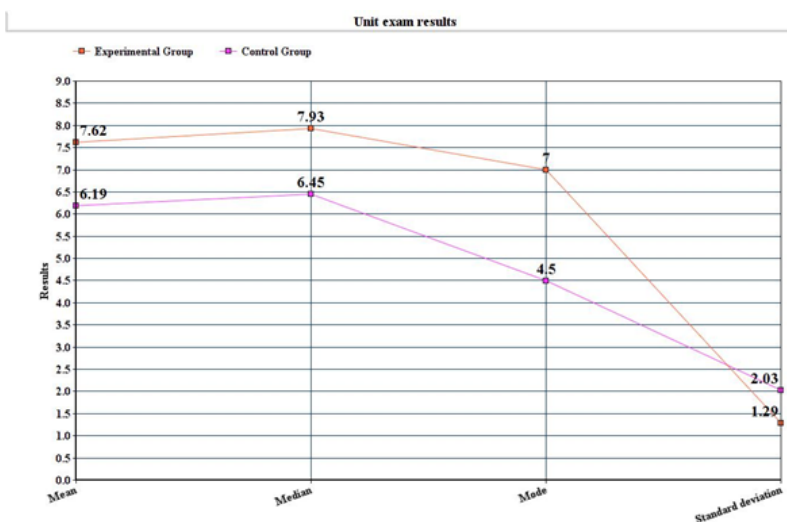


Figure 5. Unit exam results.

Two non-parametric tests were performed in this research, followed by calculating the effect size of the results obtained. Firstly, A Kolmogorov-Smirnov test was performed to measure the divergence of the sample distribution from the normal distribution. Secondly, since the distribution of the exam results is not perfectly normal (Skewness > 3.23 and Kurtosis 9.94), the Mann-Whitney U-test was performed to compare the two groups' scores obtained in the Use of English and grammar, reading and listening exams, as well as the final exam grade.

When considering the unit exam as a whole (Figure 5), the result being significant at  $p < .05$ , the two groups of learners are found to differ significantly from each other in terms of their unit exam grades ( $p < .00001$ ). Now, if we compare the results of the two groups for each part of the exam, we also find similar results in the Use of English and grammar exam ( $p < .00001$ ) and the listening exam ( $p < .001$ ). On the contrary, the grade differences in the reading exam results are not significant ( $p = .59612$ ).

Finally, when computing the Effect size, the Eta-squared showed different results for each exam. From the lowest to the highest, the reading exam results showed no Effect Size (.0002). The Eta-squared showed a small, almost intermediate, Effect Size (.058) in the unit exam. Finally, a large Effect Size was shown in the listening exam (.145) and in the Use of English and grammar exam (.224).

#### 4.2 Discussion of results

The purpose of this study was to implement teaching activities derived from Dynamic Systems Theory and to prove that this methodology, as opposed to a traditional structure-based teaching, could enhance students' performance even in the old-fashioned explicit comprehension-based English exams. The results presented in Figures 2 to 5 showed a better performance in the exam by the experimental group (7.62 vs. 6.19 in the unit exam), who had followed the new methodology for 4 weeks.

The previous outcome was replicated in the three parts of the exam. The control group's average grade on the Use of English and grammar exam was 1.10 points lower, 0.46 points lower in the reading exam, and 3.03 points lower in the listening exam than the experimental group's mean. Nevertheless, as our Effect size test demonstrated when comparing the two group's general performance in the unit exam, the results just had a small, almost intermediate, significance when combining reading, listening, use of English and grammar. In any case, the results are promising. Considering the previous trimester's average grade for the two groups (5.40 for the control group and 5.38 for the experimental group), the control group's mean in this last unit has increased by 0.79 points, whereas the experimental group's mean has increased by 2.24 points. These results can be due to the variable 'new teacher', which was common to both groups.

Now, contrary to what was expected, it seems that multimodal input does not significantly enhance reading comprehension ( $p = .59612$ ;  $\eta^2 = .0002$ ). The reason why these results are not significant could be that students may need more exposure to this type of input or that students do not only need to be exposed to crossmodal input but to be examined under the same conditions as well, facing input that does not simply come from written information.

As mentioned before, the difference of the exam results between the experimental and control groups for the listening part of the exam was significantly higher ( $p < .001$ ). Moreover, the Eta-squared showed higher results for the Effect size ( $\eta^2 = .224$ ). The results of our study demonstrate a more rapid positive consequence when implementing a more dynamic and active methodology in which students can interact with the multimodal materials they are exposed to. The reason why listening has substantially improved as opposed to reading comprehension may be due to a poor treatment of this particular skill in traditional structure-based programs based on written input in which oral skills are not properly addressed.

Similarly, students seem to be much benefited from this methodology when dealing with use of English and grammar comprehension. The experimental group significantly outperformed the control group by 1.10 points ( $p < .00001$ ), which is even more notorious considering that all students were facing explicit grammar and vocabulary tasks. This study has thus shown that the practice of explicit teaching of grammar and vocabulary should not be as extended as it still is in Spain.

## 5. CONCLUSIONS

The present study has addressed how students of 1<sup>st</sup> of Compulsory Secondary Education in a public high school in Madrid have responded to treatment based on Dynamic Systems Theory, which is based on Chaos Theory and Usage-based linguistics. The resulting methodology presupposes that foreign language teaching should be implicit, based on real language (non-adapted) and cross-modal so that it allows students as systems to interact with other students, the materials, and the learning context.

Three main conclusions are obtained from this study. The first one is that implicit teaching can be, at least, as good as explicit teaching. Students obtained better results in explicit tasks of use of English and grammar when following an implicit exposure to those aspects rather than addressing them explicitly in the classroom through the student's book. Secondly, cross-modal activities can help students improve their language competence much better than unimodal input. Thirdly, working with corpora and real language rather than language abridged by a student's book can also be beneficial for students.

The outcome obtained in the exam unit after two weeks of training period in the new teaching methodology followed by two weeks applying the treatment into groups of students of 1<sup>st</sup> Compulsory Secondary Education pinpoint promising results. The students receiving treatment did better than their control group peers but those grades were not as high as expected due to the scarce time of practice through this methodology (only one month). Students need exposure and time in order to develop language learning. Entrenchment and storage takes time and two weeks is not probably enough time to really acquire certain grammatical and lexical contents.

Further research in DST applied to EFL should try to put more DST principles into teaching practice not just in primary school but also in higher education. Future studies also need to take the time of exposure into account (or even more variables), comparing control groups and experimental groups' performance over a longer span of time that can demonstrate how linguistic entrenchment manifests over a semester or an academic year. Further research could thus account for a DST's non-linearity

approach to language development in EFL, thus helping create more adequate student-centered cross-modal implicit activities that resemble the real process of language learning.

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## ANNEX 1. Unit exam.

### 1 Complete the sentences with the correct past form of the verbs given (5x2=10 marks).

- 1 It \_\_\_\_\_ (be) very sunny yesterday.
- 2 We \_\_\_\_\_ (not be) tired after the walk along the beach.
- 3 The water \_\_\_\_\_ (be) very cold at the swimming pool.
- 4 How many people \_\_\_\_\_ (be) on the plane?
- 5 The train to Scotland \_\_\_\_\_ (be) very fast.

### 2 Complete the sentences with the correct past form of these verbs (5x2=10 marks).

**go see buy read give**

- 1 We \_\_\_\_\_ shopping and \_\_\_\_\_ a lot of food for the party.
- 2 The teacher \_\_\_\_\_ us our homework.
- 3 I \_\_\_\_\_ two books when I was on holiday.
- 4 Jack \_\_\_\_\_ some beautiful fish when he was in Egypt.

### 3 Complete the sentences with the correct nationalities (5x2=10 marks).

- 1 A person from Brazil is \_\_\_\_\_.
- 2 A person from Spain is \_\_\_\_\_.
- 3 A person from Switzerland is \_\_\_\_\_.
- 4 A person from Japan is \_\_\_\_\_.
- 5 A person from France is \_\_\_\_\_.

### 4 Complete the sentences with these words (5x2=10 marks).

**guide book luggage package trip sightseeing**

- 1 We went on a \_\_\_\_\_ holiday to Greece last summer. It was great.
- 2 Unfortunately, I lost my \_\_\_\_\_ at the airport. It went to a different country!
- 3 The \_\_\_\_\_ to the pyramids took three hours.
- 4 I don't like \_\_\_\_\_ in cities. I get bored.
- 5 In the \_\_\_\_\_, there were pictures of all the museums.

**5 Choose the correct alternatives to complete the text (5x2=10 marks).**

**My favourite holiday**

My favourite holiday was when I was about five years old. My mum and dad (1) \_\_\_\_ me and my brother, James to Sweden for Christmas. I remember the (2) \_\_\_\_ on the boat. It took two days, and I felt very ill, but it (3) \_\_\_\_ very exciting! The boat was fantastic!! When we arrived in Sweden, the weather was terrible. It was very cold, and there was a lot of snow. (4) \_\_\_\_ England, we don't usually get snow at Christmas, so it was wonderful for James and me. We drove for a long time, all through the night, and then we arrived at this small house. It was beautiful. There were about five little houses and a shop. In the house, there (5) \_\_\_\_ a TV! We couldn't watch films, so we played games with Mum and Dad. Also, we played a lot outside in the snow. It was the best holiday of my life!

- |   |           |             |            |
|---|-----------|-------------|------------|
| 1 | A taked   | B took      | C made     |
| 2 | A travel  | B excursion | C journey  |
| 3 | A was     | B is        | C were     |
| 4 | A On      | B In        | C Of       |
| 5 | A weren't | B wasn't    | C couldn't |

**6 Read the online comments from people who stayed at a hotel. Answer the questions (5x5=25 marks).**

A

Last month, I stayed at the Stella Hotel with my wife and two children. We had a fantastic holiday. We loved the hotel and the people were very kind and nice to us. We went swimming every day from the lovely beach. It was only two minutes from the hotel. The rooms in the hotel were very comfortable, and the food in the dining room was good. The children enjoyed the chips and pizza! I prefer meals from the country I'm visiting, but there weren't any Spanish dishes on the menu. But that wasn't a big problem.

B

For us, the Stella Hotel wasn't very good. I went with two friends, and we stayed in the same room. The room was very small, and the bathroom was dirty! We couldn't see the sea from the window. We sometimes went to the beach, and that was good. We went swimming there because there were a lot of children in the hotel pool. It was very noisy. The people at the hotel couldn't answer our questions very well, and there weren't any excursions. We wanted to visit some interesting places, so we took a taxi. It wasn't very expensive! We saw some lovely villages and on the Friday we went to a big town.

C

The Stella Hotel is a beautiful hotel with lots of trees and flowers. It's near the beach, but the beach wasn't very nice. Also, there weren't any shops near the hotel. We wanted to buy some presents for our friends at home, but we couldn't. We could buy postcards, but they were all pictures of the hotel! The hotel was very busy, but after dinner in the evening it was boring. There wasn't any dancing or music. We chatted to people in the hotel and wrote postcards every evening! There were TVs in the rooms, but the programmes were in Spanish, and we couldn't understand them!

- 1 Who stayed in the hotel every night? \_\_\_\_
- 2 Who visited places away from the hotel? \_\_\_\_
- 3 Which person wanted different food? \_\_\_\_
- 4 Which person went swimming a lot? \_\_\_\_
- 5 Who wasn't happy with the room? \_\_\_\_

7  **Listen to the conversation and decide if the statements are true (T), false (F) or not mentioned (NM) (5x5=25 marks).**

- |   |  |        |
|---|--|--------|
| 1 | The tickets to New York were expensive.      | T/F/NM |
| 2 | They saw the Statue of Liberty from the sea. | T/F/NM |
| 3 | The plane was late taking off.               | T/F/NM |
| 4 | Julie had a seat by the window.              | T/F/NM |
| 5 | Kathy enjoyed the food on the plane home.    | T/F/NM |

**ANNEX 2. Description of sessions for the experimental group during the training period.**

Session	Activity	Time	DST aspects
1	<u>Listening comprehension and grammar</u> - Students listen (thrice) to the song "Secret Love Song" by Jason Derulo and Little Mix and do 2 activities individually. 1. Write down all the sentences containing a "can" Verbal Phrase they hear in the song. 2. Explain the love story problem presented in the song	12'	- Students are exposed to authentic language input. - Students are exposed to a song they like, which boosts motivation. - Grammar is introduced implicitly.
	<u>Grammar &amp; Vocabulary</u> - Students are given some common actions at their age (i.e. "dancing, playing sports, playing an instrument", etc.) and they say whether they can or can't do them.	8'	- Students interact with grammar by linking these actions to their own daily life experience.
	<u>Speaking</u> 1. In groups of 4, students discuss which activities they think their peers can or can't do. 2. Groups of 4 now compete against other groups in the classroom to try to guess who in each of the groups can or can't do the actions from the previous activity.	35'	- Students now interact with other students about the subject matter. - Implicit grammar instruction.
2	<u>Listening</u> - The instructor introduces the Holocaust to students through a PPT. - Students then have to take a pop quiz to prove they have understood the presentation.	20'	- Multimodal input for the listening activity.
	<u>Reading</u> - Students read some selected pages from the graphic novel <i>Maus</i> by Art Spiegelman (2003). - Students then have to take a pop quiz to prove they have understood the text.	25'	- Students are exposed to authentic language input. - Multimodal input for the reading activity.
3	<u>Reading</u> - Students read some selected pages from the graphic novel <i>Maus</i> by Art Spiegelman (2003).	12'	- Students are exposed to authentic language input. - Multimodal input for the reading activity.

	<u>Speaking</u> - In small groups of 3-4, students now try to represent the pages they have read. They don't need to learn the lines by heart as they can read them aloud. - Then all groups represent the scene in front of the classroom. The teaching assistant helps them with pronunciation.	43'	- Students interact with their learning materials and with other students.
4	<u>Listening</u> Students watch three scenes from the movie <i>Good Will Hunting</i> (1997). They watch each scene twice. One of the scenes is a description of a character who just left her boyfriend.	20'	- Students are exposed to authentic language input. - Multimodal input for the listening activity.
	<u>Writing</u> In the computer lab, students will write individually a description of a fictitious boyfriend/girlfriend who just left them. They can look for vocabulary in Word Reference but they can't use Google Translate.	35'	- Interaction with materials as they practice the target language reproducing a model they have just learnt in a movie.
5	<u>Listening</u> Students watch three scenes from the movie <i>Good Will Hunting</i> (1997). They watch each scene twice. One of the scenes is a first therapy session.	20'	- Students are exposed to authentic language input. - Multimodal input for the listening activity.
	<u>Writing, Grammar &amp; Vocabulary</u> Students are provided with a dialog taken from one of the scenes in the previous activity in which they face a first therapy session. Students must complete some sections in which they must describe somebody and say the things they can/can't do.	25'	- Implicit grammar - Interaction with the materials provided.
	<u>Speaking</u> Students are arranged into pairs and choose which dialog written by them will be performed. They perform this dialog together for the first time.	10'	- Students interact with the materials they create.
6	<u>Speaking</u> Students practice the dialog created in the previous session.	10'	- Students interact with the materials they create and with a peer.
	<u>Speaking</u> - In pairs, all students now perform the dialogs in front of the class. - The teaching assistant helps them with pronunciation.	45'	- Students interact with their learning materials and with other students.
7	<u>Pop-quiz</u> Students take a pop-quiz in which they must describe somebody and say things this person can/can't do.	40'	None
	<u>Organizational issues</u> Students go through their exams done in the previous week.	15'	None
8	<u>Speaking</u> Students practice their dialog together for the last time.	5'	- Students interact with their learning materials and with other students.
	<u>Speaking exam</u> - Students perform their dialogs in front of the class. - Students assess their peers' performance.	50'	- Students interact with their learning materials and with other students.