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Extensive Reading and Grammatical Development
A Case Study within SLA

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D-level Essay

Abstract

This is a case study focusing on the effects of extensive reading. The study mainly deals with grammatical development and the relationship between input and output, but it also discusses learning strategies. The study aimed to answer the following question: *To what extent, and in what ways, does extensive reading affect output and grammatical performance?*

The essay analyses the grammatical performance of a Spanish speaking PhD student in chemistry, whose main exposure to English was scientific literature during the study period. Accuracy tests were used in combination with free writing.

The study did not find any direct, unquestionable relationship between extensive reading and grammatical development. Instead it shows the difficulty of separating input and output. However, the study indicates that output may be an effective tool for improving grammatical performance and that some focus on form may be necessary, at least for the grammatical development of adults. Furthermore, the study indicates that teaching may influence grammatical performance and, therefore, the presentation of grammar needs to be carefully considered.

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1. Introduction

Extensive reading has been advocated by many linguists, most notably Stephen Krashen, as an effective medium for language acquisition. According to Krashen (1993), extensive reading not only improves reading comprehension and increases vocabulary, but also improves grammatical performance and output (p. 12). However, many of the studies claiming to support Krashen (e.g. Lao, & Krashen, 2000; Lituanas, Jacobs, & Renandya, 2001; Mason, & Krashen, 1997; Rodrigo, Krashen, & Gribbons, 2004), build on comparison between groups where extensive reading has not been the only variable factor. Many extensive reading programmes contain elements other than extensive reading, for example discussions about the reading, book reports, instructions on reading strategies, information on the benefits of extensive reading for SLA (second language acquisition) etc. Therefore, it is hard to know whether the stated improvements derive from extensive reading alone or to what extent other factors have been involved.

This case study aims to eliminate elements other than extensive reading as far as possible and its theoretical starting point lies within Dynamic Systems Theory (DST). According to DST, language is a complex system where all input affects the language system, although the changes may be so subtle that they are not detectable (De Bot, Lowie, & Verspoor, 2005, p. 16). Thus, DST predicts that extensive reading will affect the language system¹, but not how, or whether it will be noticeable.

¹ Here, the focus is on the language system of an individual. This system can for example consist of different languages (French, Italian etc.), different varieties (e.g. Standard Swedish, Västgötska – the accent of the Swedish region Västergötland) and different registers (spoken, written, formal, informal, jargon etc.). Furthermore, each language, variety and register has its own subsystems of grammar, vocabulary and pronunciation etc. These systems can be divided further; e.g. grammar has its own subsystems of plural formation, question formation etc (De Bot, Lowie, & Verspoor, 2005, p. 16). It should also be noted that DST regards the individual as “a dynamic subsystem within a social system . . .”, which means that cognitive, social and environmental factors are all part of the system and interact with each other (De Bot, Lowie, & Verspoor, 2007, pp. 14, 19).

This paper will analyse a Spanish speaking PhD student's a) written 'Interlanguage'² and b) answers in accuracy tests, in order to establish whether his reading of scientific articles and books in English affects his written output and grammatical performance. In addition, the paper will explore the strategies used by the subject to complete the tasks.

1. 1 Aim

This case study aims to answer the following question: *To what extent, and in what ways, does extensive reading affect output and grammatical performance?*

2. Theoretical Background

The starting point of this case study lies within Dynamic Systems Theory, but ideas from Error Analysis will also be used in the analysis of the subject's output. In addition, since this paper deals with the relationship between input and output, Stephen Krashen's 'input hypothesis', Richard Schmidt's 'noticing hypothesis' and, Merrill Swain and Sharon Lapkin's 'output hypothesis' will be included in the discussion. However, before presenting these theories/hypotheses, a brief overview of the main trends in language acquisition may be useful.

2. 1 Main Trends in Language Acquisition

In the 1940s and 50s, behaviourism was the dominant learning theory. In short, behaviourism regards learning as a consequence of habit formations, where individuals are formed primarily by the environment. Language is thought to be learnt through imitation, encouragement of

² *Interlanguage* was coined by Larry Selinker and refers to the language used by a L2 learner. Interlanguage contains systematic errors, which can tell something about the developmental stage of the learner. The interlanguage changes with the development of the learner (Lightbown, & Spada, 2006, pp. 80, 201).

correct production and repetition until the correct language has become a habit. Consequently, one can as easily learn incorrect language and install bad habits if the model is inappropriate or by self-education. Therefore, one of the important tasks of the teacher is to prevent students from making errors (Lightbown, & Spada, 2006, p. 10).

Behaviourist theory was challenged by Noam Chomsky in 1959. Chomsky claims that the ability to learn a language is innate. Humans have a 'Language Acquisition Device' (LAD), which contains universal language principles. Through this device, children can "discover for themselves the underlying rules of a language system on the basis of the samples of a natural language they are exposed to" (ibid., p. 15). Thus, according to this hypothesis, input is all that children need to acquire a language.

Although Chomsky is still influential, environmental factors, especially interaction, are more in focus today and the view on innate abilities has slightly changed. Many theoretical movements, for example Functionalism, Information Processing and Connectionism, do not believe that a special 'Language Acquisition Device' is necessary to explain language acquisition (De Bot et al., 2005, pp. 31-33; Saville-Troike, 2012, Kindle Locations 791-816). Especially in SLA, the existence of a LAD is problematic, since very few L2 learners reach native level and the difference between learners is considerable. Instead, most theories stress the remarkable general ability to learn that humans have. Learning a language is, according to them, not essentially different from learning other skills and they point to the parallelism between children's cognitive development and language acquisition. This hypothesis has been supported by research that uses computer simulations. When computers have been 'taught' a language, they have generalised from the input and produced language they have not been exposed to in a way similar to how children use language. Computers even tend to make the same kind of errors as children (Lightbown, & Spada, 2006, pp. 19-23, 38).

The theory that will be presented in the next subsection, Dynamic Systems Theory, has its origin in mathematics, but has spread to many other fields (De Bot, Lowie, & Verspoor, 2007, p. 8). It was first used in language acquisition by Diane Larsen-Freeman in 1997 (De Bot, Lowie, & Verspoor, 2005, p. 30).

2. 2 Dynamic Systems Theory

Dynamic Systems Theory (DST) hypothesises that language is a complex, dynamic system, which is constantly changing and reorganising itself. All parts of the system, i.e. all sub-systems, are interconnected, either directly or indirectly. As a consequence, any influence on any part of the system will cause the whole system to reorganise itself as the parts interact with each other (De Bot et al., 2005, pp. 14-17, 22). For example, a Swede, who does not have a special interest in grammar, may not be aware of the existence of subjunctives, since subjunctives have almost disappeared in Swedish³. However, s/he may well be able to use those that still exist without knowing the grammatical term or function. Then, his/her English teacher may eventually introduce subjunctives and the student would realise that “if I were” corresponds to the Swedish “om jag vore”. Thus, this discovery of the existence of subjunctives would create new subsystems not only in English, but also in Swedish. Furthermore, *vore* would leave its old subsystem and, in doing that, perhaps more subjunctives would be discovered. This does not necessarily happen immediately: it could well be a slow, gradual process. Moreover, when the Swede has realised that *leve*, *måtte* and *finge* also are subjunctives, s/he might come to the conclusion that Swedish subjunctives end in *e*. Furthermore, the Swedish student would have to revise a previously learnt English rule, i.e. that *were* is only used after *we*, *you* and *they*, or nouns that can be replaced by these pronouns. S/he would also need to create a new sub-category for verbs which can be followed

³ In English, subjunctives seem to be disappearing too (Leech et al., 2009, p. 70).

by subjunctives in English, either through memorising or through looking for a pattern and hypothesising a rule. The learning of subjunctives means that mandative expressions and if-clauses are likely to be in focus for a while. Thus, these constructions, with all the lexical items they happen to contain, including pronunciation of them, will be activated while others will be less active for a while. How successful the student is in incorporating subjunctives in his/her language system may both affect, and be affected by, motivation. Increased or decreased motivation will affect further learning etc. As this example illustrates, one change sets off a chain reaction⁴.

However, not all input leads to immediately detectable changes. Some changes are too small to be noticeable or are only noticeable over time. In DST, periods with unnoticeable changes, i.e. when the system is relatively stable, are called ‘attractor states’. There are also states in the system that are not preferred, and these are called ‘repeller states’. De Bot et al. (2007) explain the movement of the system by analogy with a rolling ball:

[The ball is] rolling over a surface with holes and bumps, with the ball's trajectory as development, the holes as attractor states and the bumps as repeller states. The holes can be shallow or deep, and the deeper the hole is, the more energy is needed to get the ball out of the hole and make it move on to the next hole. (p. 8)

Thus, the entire input may not contain enough ‘energy’ to move the ball out of the hole. The ball may move just a little and then stay in the hole. It may also roll slowly or quickly between the holes. The latter would correspond to periods when the language system undergoes rapid changes. During such periods, a great deal of internal variation can often be observed. Thus, in DST, periods of variation are interpreted as a sign that the system is reorganising itself. This description of a dynamic language system is not only valid for

⁴ Perhaps, it should be stressed that the chain reaction described in the example is just one of many possible ways an individual may react to the given input.

individuals' language systems, but also for the language as a whole, e.g. English as it has been used and is used, or for any other subsystem, e.g. a certain variety of English (De Bot et al., 2005, pp. 14-17, 22).

The present study will focus on the language system of an individual in the process of second language acquisition. As described above, this system is constantly changing. It can be affected by all sorts of factors, non-linguistic (e.g. motivation, age, attitudes) as well as linguistic factors (e.g. input through reading, conversation, teaching or output through writing and talking) (ibid., p. 16). Although other theories also acknowledge the influence of these different factors, they often focus on them separately and stress some of them more than others. Linguistic approaches focus largely on whether language is primarily innate or learnt and the relationship between L1 and L2. Psychological approaches focus on internal factors such as cognitive processes in the brain and biological age-related restrictions. Social approaches focus on external factors as interaction, identity and motivation in relation to both the immediate and the broader social context (Saville-Troike, 2012, Kindle Locations 213-220, 800, 833-839). However, according to DST, all these factors interact and any claim that one single factor has caused an observed change is necessarily a simplification (De Bot et al., 2005, p. 15).

As mentioned before, change is often preceded by a period of great variation. The learner may, for example, unsystematically use plural forms both correctly and incorrectly during a period. This variation may be a sign that development is taking place and is therefore of particular interest to DST research. The period when one form is used systematically would consequently be the attractor state.⁵ However, it is also important to notice that language

⁵ If the form does not conform to the standard language, it may often be referred to as 'fossilisation' in SLA research (De Bot et al., 2005, p. 17), especially when the language user is no longer considered a language learner. However, the distinction between learner and user does not seem appropriate in DST as use (or non-use) also affects the system. Furthermore, de Bot et al. (2005) point out that "[t]he notion of a language as a dynamic system that changes continually even though it develops relatively stable 'attractor stages' conflicts with the idea of an individual ever reaching an 'end state' . . ." (p. 22).

attrition is as much part of a changing system as are development and acquisition (ibid., p. 14). When a language is not used, the access to, for example, vocabulary gradually declines but, once the language is used again, the speed with which words are retrieved increases (ibid., p. 25). The same phenomenon can be observed within an individual's actively used L1, too. A word that for some reason has not been used for a long time may be forgotten. For example, someone who took violin lessons thirty years ago may not remember all the technical terms, although he once used them every week for five years. These, and other language phenomena, such as cross-linguistic influence⁶, have been explained through different models of how the mental lexicon is organised.

The Bilingual Interactive Activation (BIA) model shows how lexical items are interconnected, thus forming a network. The consequence of this is that

the activation of one lexical item may interactively affect the level of activation of all the lexical items it is attached to. Multilingual interactive activation may occur as a result of overlap in meaning, overlap in form or any other characteristic lexical items may have in common. From this perspective, code switching and cross-linguistic priming effects can logically be accounted for. A speaker may come up with a lexical item from another language simply because that item has a much higher level of activation, for instance resulting from its higher frequency. (ibid., p. 46)

For example, trains in Ecuador are old-fashioned and used for tourism, not for regular traffic, while in France, the railway system is well developed and frequently used in everyday life. Although an Ecuadorian living in France knows the Spanish word for railway station, he may tend to use the French word even when he speaks Spanish. This is likely to be caused by the

⁶ Another common term is transfer or interference, which refers to the fact that L1 affects SLA. However, research has shown that the L2 affects the L1 too and 'cross-linguistic influence' is used to stress this finding. How L2 can affect L1 was demonstrated in the 'subjunctive example', although there are many more subtle effects, for example that the speed of processing in L1 is slightly slower for bilinguals (ibid., p. 23).

fact that he has spoken/heard more about railway stations in French than in Spanish, so the French word has a higher level of activation.

Another reason for a higher level of activation is time related, i.e. what has been used recently is more active than what has not been used for a while (ibid., p. 47). Thus, the degree of activation is predicted to affect the retrieval of words. A beginner or someone who has not used an L2 in recent times may have to retrieve the L2 word through the L1, while a proficient speaker who uses the L2 actively may go directly from concept to L2 (ibid., pp. 47-48). For example, when shown a picture of a peach, a not very proficient speaker may need to find the word in his L1 before he can translate it into English, while a proficient speaker may go straight from the picture to the English word. Likewise, a proficient speaker can think in L2 when using it, while a less proficient speaker may need to think in his L1 and translate into L2. Furthermore, the importance of activation explains why someone who has stopped using his/her L1 can have greater problems finding his/her words in L1 than in L2 (ibid., p. 23) or why adopted children can replace an L1 with an L2 (ibid., pp. 116-122). It also explains why the L2 initially may show little effect on the L1, as the 'subset' of the L2 language is limited, consequently leading to less interaction (ibid., p. 46).

Subsets consist of items that have characteristics in common, e.g. formal/informal, word class, language, phonetic or visual similarity. One can also think of the lexical items as tagged for various features, e.g. formal/informal, word class, language, phonetic or visual similarity to other words. Thus, every lexical item will belong to various subsets simultaneously (ibid., p. 46). For example, *shall* might be tagged for formal⁷, modal auxiliary verb, English, phonetic and visual similarity with *shell*, semantic similarity with *will* etc. Thus, any activation of any of these subsets will automatically activate *shall* to some degree. A multilingual brain will have further subsets; for example, a Swede may have connections to

⁷ Although some people may have certain usage of *shall* tagged as informal.

the Swedish correspondent *ska*, or even the old-fashioned and more formal *skall* and also to near homophones in Swedish as *Kjell* and *käll* etc. In this way, it is also easy to see why any lexical item that is added or changed, or even used, causes the whole system to reorganise itself, albeit not always to a detectable degree.

During language acquisition, tagging and re-tagging are likely to occur several times as lexical items can obviously be ‘insufficiently’ and/or ‘incorrectly’ tagged leading to ‘errors’ or at least unconventional use. For example, before irregular plurals are learnt, all nouns can be tagged for forming plural with – *s* leading to unconventional forms like *mouses*, *foots* and *childrens*. When learning irregular plural, *mouse* and *foot* need to have their plural forms re-tagged and *childrens* needs to be re-tagged from singular to plural. As would be expected, these deviations from the standard norms are systematic (when this particular subsystem is in an attractor state), which has also been observed in Error Analysis, the focus of the next subsection.

2. 3 Error Analysis

Error Analysis (EA) is partly a continuation and partly a rejection of the Contrastive Analysis Hypothesis (CAH). CAH developed during the 1960s and builds on behaviourist theories. CAH hypothesises that L2 learners will transfer their habits from L1 to L2. Consequently, a contrastive analysis between L1 and L2 will make it possible to predict which problems the learners will have. However, it has turned out that not all the errors predicted by CAH are made. Furthermore, some errors learners do make cannot be explained by L1 transfer. Instead, some errors are more like FLA (first language acquisition) errors and many L2 learners make the same errors, although they do not share the same L1. For this reason, and also because behaviourist ideas are no longer regarded as sustainable, CAH has largely fallen out of use. Instead, Error Analysis emerged in the 70s (Lightbown, & Spada, 2006, pp. 34-35, 78-79). Pit

Corder, who is one of the major advocates for EA, argues that “errors provide evidence of the system of language which a learner is using at any particular point in the course of L2 development, and of the strategies or procedures the learner is using in his ‘discovery of the language’” (Saville-Troike, 2012, Kindle Locations 1165-1166). Thus, while CAH compares L1 and L2 in order to predict problems and prevent learners from making errors, EA describes and analyses the errors learners actually make in order to better understand learning processes and assess learners’ interlanguage (Lightbown, & Spada, 2006, p. 80).

When carrying out an error analysis, the researcher follows certain steps. First, errors in a learner sample are identified. Here, Corder distinguishes between systematic ‘errors’ and ‘mistakes’ (caused for example by tiredness) and the mistakes are not analysed further. Then, the errors are described and explained. In the explanation, a distinction is drawn between ‘interlingual errors’ caused by cross-linguistic influence and ‘intralingual errors’ which can be related to development, e.g. overgeneralisation of rules (Saville-Troike, 2012, Kindle Locations 1205-1225) or simplification, e.g. omission of function words or inflections (Lightbown, & Spada, 2006, p. 81). The last step is to evaluate how the errors affect “intelligibility, or social acceptability” (Saville-Troike, 2012, Kindle Locations 1205-1225). For example, a Swede might make the errors *mouses*, *foots* and *childrens* in a piece of writing. The error seems systematic and it cannot be related to L1 as Swedish does not form plural with – s. This indicates that s/he has learnt the regular plural formation, but that s/he overgeneralises the plural rule. Thus, this is an intralingual error. Furthermore, it can be suspected that the learner thinks *children* is singular. Intelligibility is not likely to be a major problem, but social acceptability may be, depending on context.

Although EA can inform researchers of what learners do and do not know, there are some pitfalls that have been noticed. For example, it can be hard to judge whether learners have omitted inflections because they do not exist in their L1 (interlingual error) or if it is a

case of simplification (intralingual error). Furthermore, in focusing only on errors, some information of learner knowledge and learner strategies may be overlooked. One such strategy is avoidance. An error may be absent because learners avoid using structures they find difficult. Another interesting aspect is that L2 teaching (or lack of teaching) can influence what kind of errors a learner makes (ibid., 1205-1225).

Error Analysis and Contrastive Analysis have led to compilations of common errors among students with the same L1 background, for example Swan and Smith's *Learner English* (2001), which will be used in this study.

While Error Analysis deals mainly with output and what it can tell about learning processes, other theories focus on input, the most famous perhaps being Krashen's 'input hypothesis'.

2. 4 Krashen's 'Input Hypothesis'

According to Krashen (1985), there are mainly two conditions for language acquisition⁸ to take place: input needs to be comprehensible and the acquirer needs to be "so involved in the message that he temporarily 'forgets' he is hearing or reading another language" (pp. 3-4). In fact, Krashen claims that, if these conditions are met, "acquisition is inevitable . . . unavoidable and cannot be prevented" (ibid., p. 4). Thus, according to Krashen, focus on form should be avoided. Instead, input needs to reach the 'Language Acquisition Device', which will process the input and extract the rules subconsciously (ibid., pp. 2-4).

Therefore, Krashen promotes reading on a topic that interests the acquirer as one efficient method for SLA. When reading on a familiar topic, the reader can use his/her

⁸ Krashen makes a distinction between acquisition and learning. Acquisition is subconscious and leads to automatic language use; the user 'feels' or 'hears' whether the language is correct or not. Learning, on the other hand, is conscious. Learning is explicit knowledge of the rules of a language. Such knowledge can only be used when there is enough time for the person to consciously monitor his/her production. According to Krashen, acquisition is far more important than learning, although learning can be helpful in certain contexts, like formal writing (Krashen, & Terrell, 2000, pp. 18-19, 26). In this essay, there will be no clear distinction between acquisition and learning, because it is hard to classify a subject's output, especially written output, since the subject has time for monitoring, but does not necessarily use it.

previous knowledge of the topic to understand the text, and the “input hypothesis predicts that if the reading is comprehensible, the relevant structures . . . and vocabulary will be present” (Krashen, & Terrell, 2000, p. 136). With the term “relevant structures”, Krashen is referring to structures that the reader is ‘ready’ to acquire as Krashen believes that structures are acquired in a certain order which is natural and equal, or at least very similar, to all language learners, i.e. the ‘natural order hypothesis’. Another reason why a familiar topic of interest is advantageous is that the reader is more likely to focus on the content than the form if s/he finds the text interesting, which is crucial for language acquisition (Krashen, 1985, p. 74). Moreover, Krashen advocates concentrating on one topic in the beginning as there will be “natural repetition of vocabulary and syntax as well as familiar context” (Krashen, & Terrell, 2000, p. 137). Reading will not only improve reading comprehension, but also other language aspects, including grammar (Krashen, 1993, p. 12). Another advantage is that no teacher or conversational partner is needed (*ibid.*, p. 84).

Krashen’s hypotheses have been questioned by several linguists. The ‘input hypothesis’, for example, is questioned by Schmidt and, Swain and Lapkin.

2. 5 Schmidt’s ‘Noticing Hypothesis’ & Swain and Lapkin’s ‘Output Hypothesis’

Schmidt hypothesises “that some level of attention is required to be able to notice something, and that noticing is crucial in obtaining new information or uptake” (De Bot et al., 2005, p. 8). In SLA research, this is often referred to as ‘intake’ to distinguish it from ‘input’, which can be defined as all information available in a given context (*ibid.*, p. 8). As De Bot et al. point out, an L2 learner focusing on the meaning may not pay attention to language form unless it is necessary for understanding the message. If the grammar in the input is not noticed, it is not likely to become intake (*ibid.*, p. 11). Thus, Schmidt’s ‘noticing hypothesis’ seems to be

diametrically opposed to Krashen's idea that grammar is best acquired when the learner is focused only on the message.

Swain and Lapkin seem to align themselves with Schmidt on this issue and they have further developed Schmidt's idea in their 'output hypothesis'. According to Swain and Lapkin, output can trigger the grammar to be noticed as learners, when producing the language, encounter problems that make them aware of gaps in their knowledge (ibid., pp. 168-69). In modifying their output, learners may shift "from semantic to grammatical processing" (ibid., p. 176). Furthermore, research⁹ has shown that the strategies used in production and comprehension are not necessarily the same. Krashen points out that, when extracting the meaning of a text or an utterance, the reader or listener can rely on vocabulary, context and knowledge of the topic (ibid., p. 169). Gary and Gary approach this from the opposite perspective, observing that, in comprehension, it is often possible to ignore grammar which is, to a relatively large extent, redundant (ibid., p. 169). Production, on the other hand, forces the writer or speaker to pay attention to grammar as Swain and Lapkin argues (ibid., p. 169).

3. Methodology and Data

Although DST claims that it is impossible to isolate one factor involved in language acquisition/learning, it is still possible to eliminate or at least reduce the importance of some factors. In order to measure the effects of extensive reading, the subject should preferably satisfy the following criteria: s/he should not be involved in language classes during the time of the study; s/he should have as little other exposure to the target language as possible (e.g. live in a country where the target language is not widely used in society, where films usually are dubbed etc.); s/he should spend a considerable amount of time on reading in the target language during the research period. Furthermore, to test Krashen's hypothesis that

⁹ De Bot et al. (2005) mention Van Dijk and Kintsch (1983).

'comprehensible input' and focus on meaning make acquisition inevitable, it would be an advantage if the subject was not a language student, but needed the target language in order to succeed in his/her studies in another discipline. This would increase the probability that focus was on meaning rather than form and that motivation was maintained throughout the whole study. In addition, this would automatically mean that the subject concentrates on one topic, a strategy which Krashen recommends using at lower levels.

Tests were principally designed to elicit knowledge of grammar and the tests were given at several points during the study. The intention was to compare the grammar from the beginning, middle and end of the study in order to detect development or lack thereof.

3. 1 Case Study Subject

The subject, who will be referred to as T, is a PhD student in chemistry. He comes from Ecuador, but had been studying in France for almost three months at the start of this case study. His native language is Spanish, but he is also quite proficient in French. He communicates in French with his tutors and colleagues and his doctoral thesis can be written in French. However, the scientific literature he is required to read is mainly in English. These texts are his principal source of exposure to English during the period of the present case study. T estimates that he spends about 2-3 hours per day reading scientific literature, including weekends. Other exposure to English includes films and music (although not to any large extent) and a holiday trip abroad in weeks 27-29. (Because he travelled with Spanish-speaking friends, he still used Spanish more than English.)

In Ecuador, T studied English at primary and secondary school, approximately from the age of ten to the age of eighteen. The classes focused mainly on grammar and writing exercises. In the courses T took as an adult, grammar was also more in focus than communication. In 2006, T studied English two hours daily for almost five months (group

lessons), although he studied French at the same time and says he was more motivated to learn French and was better at French¹⁰. The reason he studied languages was that he could not find a job after his engineering degree and hoped that languages would make his CV more attractive. He also planned to apply for scholarships abroad. The same year, T entered an international exam but, realising it was too difficult for him, he never finished it. Thereafter, he did not study English until 2011 when he studied three hours a week for two months at a private institute (group lessons). The motivation was the same as in 2006 and the reason he left his studies was that he had found a job.

T says that his motivation to learn English has not been very strong and he compares it to a medicine that needs to be taken, i.e. T does not enjoy studying English, but he can see the advantages of knowing it. However, he says that his motivation has increased since he started his PhD studies. This is not only because he needs English in order to understand the literature, but also because he hopes that he will be able to write articles and perhaps his thesis in English. He thinks that proficiency in English would give him better opportunities in the labour market or perhaps the possibility to undertake post-doctoral research in the US or Sweden. Thus, T's motivation is principally instrumental¹¹.

3. 2 Materials

Materials consisted of 'free writing' and three kinds of accuracy tests: 'scrambled sentences', 'judgment of grammaticality' and 'fill in the gaps'. These tests were complemented with two 'head' tests in week 8 and 'translation' tests in weeks 8 and 37 (see Table 1). The 'free writing' was used in order to elicit T's interlanguage in general. However, to obtain a variety

¹⁰ T actually raises the same issue discussed by SLA researchers, i.e. whether motivation creates a higher ability, or whether ability creates a higher motivation (Lightbown, & Spada 2006, p. 56).

¹¹ In SLA, motivation is traditionally divided between integrative and instrumental motivation. The former refers to an interest in the language and the culture and a wish or need for integration, the latter refers to an immediate, practical need (Lightbown, & Spada, 2006, p. 64).

of sentence structures, T was asked to write three questions, two sentences that contained a negation and ten sentences of free choice. T was not allowed to use dictionary or computer. He also had to write with a pen so that changes could be traced, as these might indicate hesitation and strategies such as avoidance.

	Week 1	Week 2	Week 3	Week 4	Week 8	Week 37
Free writing	X	X	X	X		X
Scrambled sentences	X			X	X	X
Judgment of grammaticality	X			X	X	X
Fill in the gaps	X			X	X	
Head tests (1 & 2)					X	
Translation test					X	X

Table 1. Overview showing the weeks in which the tests were performed.

The ‘scrambled sentences’ (see Appendix 1) were chosen from scientific articles on chemistry, although sometimes shortened or slightly changed. The scientific articles were used in order to make the test as closely related as possible to T’s input and the alterations were done both to facilitate the scrambled format¹² and to increase variation. The words were written down on flash-cards for better visibility. The aim was to ascertain how words were grouped together and in which order they were placed (e.g. if noun phrases were generally built before verb phrases and if noun phrases contained determiners, modifiers and nouns from the start or if some elements were added at a later stage) and which words caused the

¹² That the scrambled sentences were of a suitable length and difficulty was tested with two proficient English speakers with scientific backgrounds (although not in chemistry). They solved most sentences quickly, although they sometimes had to guess due to unknown terminology. The only sentence they did not manage to solve was eliminated from the test.

most confusion, thus hopefully revealing something about T's interlanguage and his strategies. To further capture the strategies, T was instructed to think aloud during this test¹³.

The sentences used in the 'judgment of grammaticality' test (see Appendix 2) were chosen from chemistry articles for the same reason as above. Although the main aim was originally word order and heads¹⁴, some inflection errors were added in order to distract T from the focus of the study. T was requested to find the errors and explain them orally. Therefore, it did not seem necessary to balance the sentences, i.e. to have the same number of correct and incorrect sentences on each phenomenon as is otherwise recommended (Mackey, & Gass, 2012, Kindle Locations 1191-1238). However, the test contained both correct and incorrect word order/heads, distributed randomly in order to see whether T would choose 'either or' or if he might reject/accept both the correct and the incorrect constructions. The intention was to reveal how much T paid attention to form and how much he knew about word order and heads.

The last test was a 'fill in the gaps' test (see Appendix 3). As in the other tests, the text was from a chemistry article. A list of words was given to use in the gaps and there were more words than gaps in order to avoid the risk of any word being chosen just because it was the only one left. The gaps were also made the same size so that T would not use the length of the empty line as guidance for the length of the missing word. Furthermore, the test was designed so that it would be possible to solve only through grammatical knowledge¹⁵. The aim of this test was to identify which strategies T used: meaning, or form, or a combination.

¹³ The idea to use the 'think aloud technique' was inspired by Swain and Lapkin's study of immersion students in Canada 1995. Swain and Lapkin's asked students to 'think aloud', i.e. to report on their thoughts while they were solving the task (De Bot et al., 2005, p. 171).

¹⁴ 'Heads' in this study refer to heads in noun phrases, adjective phrases and compounds. Spanish and French are left-headed languages while English is right-headed. This means that a word such as 'renewable energy' in Spanish will be 'energía renovable' (all translations between Spanish and English are made by the writer of this essay). Although heads might be considered related to word order, they will be treated separately in this study.

¹⁵ This was tested by an English student, who managed to solve the test without any special knowledge of chemistry.

The first of the complementary ‘head’ tests built on the week 8 ‘judgment of grammaticality’ test (see Appendix 2). T was requested to explain the meaning of all combinations of head and modifier, both those in correct and those in incorrect order. This was intended to show if the meaning was affected by the placement of the head.

The second ‘head’ test was a list of invented compounds (see Section 4.2, Table 2) inspired by studies described by Eve V. Clark (2009, Kindle Locations 7027-7040). T was asked to say which of two compounds, XY or YX, was a kind of an X and also what strategy he had used to make his decision.

The ‘translation’ test in week 8 (see Section 4.3, Tables 4-8) was added to elicit more data regarding T’s use of bare infinitives versus ‘to-infinitives’, building on observations from the ‘free writing’ (see Section 4.3). T was requested to translate 34 Spanish sentences into English. The sentences were constructed to contain known vocabulary. Five well-known infinitives: *tomar*, *comer*, *estar*, *usar*, *poder* were selected to elicit either: *take*, *eat*, *be*, *use* and *can*, or *to take*, *to eat*, *to be*, *to use* and *(to) can*. The same infinitives were used the other way round to elicit either: *tomar*, *comer* etc. or *a tomar*, *a comer* etc.

The ‘translation’ test in week 37 (see Appendix 4) was partly designed to elicit data on infinitives, and partly to check the use (or non-use) of omitted pronouns and head order. The test contained only 15 sentences to enable all the tests to be completed in one day.

3. 3 Procedures

This case study began in February 2013. Data was collected in weeks 1, 2, 3, 4, 8 and 37 of the study. All tests were performed in T’s home and Spanish was used for all instructions and discussions. Originally, the study was intended to finish after week 8, but then an extra collection of data was added in week 37. The consequence of this change was that the subject was given the correct answers to the tests he took in week 8 and those results were, to some

degree, discussed. This may, of course, have affected the results for week 37 and this needs to be taken into account when discussing the results.

The first week started with 'free writing'. T was instructed to write a total of fifteen sentences and, of these, three should be questions and two should contain a negation. He was given the example that he could write about his week at the laboratory, about things he had done, or had not done, some questions he had asked his tutors or would have wanted to ask them. No time limit was set and T spent approximately 35 minutes completing the fifteen sentences. Then, the data was collected, but no comments were made.

Thereafter, the first 'scrambled sentences' test took place (see Appendix 1). T was given the flash-cards for one sentence at a time in scrambled order. He was informed whether the sentence was a question or not. In addition, T was asked to 'think aloud' and the process was sound recorded. However, T had problems thinking aloud and, at T's suggestion, the process was video recorded instead. When T seemed to hesitate, he was asked why he had hesitated. Sometimes, he was also asked about the word class and/or meaning of the word or the meaning of the whole sentence. Thus, T's answers to these questions, and the video recording, replaced the thinking aloud procedure. T was not given the correct answers after the test as that could have affected the next test he was to perform and also the tests he would be requested to perform in the following weeks.

The 'judgment of grammaticality' test (see Appendix 2) was given the following day. T was instructed to find any kind of error and to mark incorrect sentences. Afterwards, T was asked to read the sentences, one at a time. If there was no mark for incorrectness, T was asked if he believed the sentence to be correct. If there was a mark, he was asked to explain the error/s and which changes he wanted to make. These explanations were recorded. After the test, T was not given the correct answers – this for the same reason as stated above.

In the 'fill in the gaps' test (see Appendix 3), T was instructed to choose words from the list. He was also informed that there were more words than gaps, but he was not told that it was possible to solve the test only through considering the grammatical forms. After he had finished, T was asked about his strategies. This conversation was recorded. Then, T was given the correct answers, as it seemed that it would not affect the outcomes of the future tests, as this was principally a method to elicit strategies.

In the second and third week of the study, only the 'free writing' was performed. The procedure for this was the same as above. In the fourth week of the study, the tests of the 'scrambled sentences', the 'judgment of grammaticality' and the 'fill in the gaps' were performed again. The tests contained new sentences, but with similar constructions. An error that had attracted attention from the 'free writing' was added, namely omitted pronouns. Otherwise the tests were designed to be at the same level rather than progressive. The only difference in procedure was that the 'scrambled sentences' were video recorded from the beginning. Furthermore, the 'free writing' was done the following day.

After these four weeks, a period of analysis followed and new tests were designed to clarify some issues that had arisen concerning heads and infinitives. During this period, T was given no tests or 'free writing', but continued to read his scientific articles.

In the eighth week of the study, the same kind of tests as in weeks one and four were performed. However, there were some slight differences in procedures. This time, the errors were briefly discussed after each test and, therefore, the order of the tests was changed. The first test in week eight was the 'judgment of grammaticality' test (see Appendix 2). Some sentences were borrowed from previous tests while some were new. There was also a main focus on two features: omitted pronouns and heads. Another difference in procedure was that T had to judge whether there was an error and explain the error of every sentence directly after reading it, instead of reading and marking all of the sentences first and providing the

explanation afterwards. Directly after this test was completed, T undertook the two complementary ‘head’ tests.

In the first test, T was requested to explain the meaning of all combinations of head and modifier that occurred in the ‘judgment of grammaticality’ test (see Appendix 2). This was done in the order they occurred, so correct and incorrect heads were mixed. Nothing was mentioned about heads or the purpose of the test. Questions were phrased like “What does *behaviour kinetic* mean?” The answers were recorded.

In the second test, T was shown all the five compound pairs at the same time (see Section 4.2, Table 2). First, the two compounds in the first pair were read, *flower cat* and *cat flower*, and he was asked what *flower* means and what *cat* means to ensure that the words themselves would not cause problems. Then, he was asked which of the two combinations, *flower cat* or *cat flower*, could be a kind of a flower. The same procedure was repeated with the other four pairs. T seemed fairly confused by the test but, when attempting the last pair on the list, he seemed suddenly to understand what was required. He then asked to be allowed to attempt the test from the beginning again, which was accepted. The whole test was recorded.

After the ‘head’ tests, the ‘scrambled sentences’ test followed. Some sentences were reused from previous tests and some were new. The only difference in procedure (but an important one) was that each sentence was discussed before continuing to the next sentence. This, of course, means that T had the possibility of using any knowledge gained from previous sentences in the subsequent ones.

In the ‘fill in the gaps’ test, which was undertaken the following day, there were no changes in procedure.

The ‘translation’ test replaced the ‘free writing’ in week 8. T was instructed to translate 34 Spanish sentences into English. The first 20 sentences were translated one day and the rest two days later. The intention of the delay was that he would not start to copy from previous

sentences or understand the focus of the test. After all the sentences were completed, T was asked to translate five Spanish infinitives into English. A few days later, T was asked to translate the same infinitives from English to Spanish. The intention of the delay was to avoid the possibility of T answering in the same Spanish form as had originally been given simply because of imitation.

In week 37, the following tests were performed: ‘free writing’, ‘scrambled sentences’, ‘judgment of grammaticality’ and ‘translation’. All tests were conducted on the same day and in the order above.

The instruction for the ‘free writing’ was different from previous times. T was asked to write about his project as if addressing a colleague or writing a methodology section in an article. In addition to this, he was asked to write five sentences about his holiday. The purpose of these two different tasks was to elicit both scientific and colloquial language, since previous ‘free writing’ contained a mixture of the two. However, it seemed reasonable to emphasise the scientific language, since the input from reading comes in that register.

The ‘scrambled sentences’ test and the ‘judgment of grammaticality’ test were performed in the same way as those in week 4, i.e. without giving any answers or clues.

The instruction for the ‘translation’ test was the same as in week 8. After T had completed the translation, he was requested to read the sentences aloud. Then, he had the opportunity to comment on his translation and explain why he had sometimes left two alternatives.

4. Results

In the error analysis, many errors showed up. The majority seems to be interlingual errors, for example “*My project of these*¹⁶ [*thesis*] . . .”. As Norman Coe points out, Spanish speakers

¹⁶ *These* seems to be an example of code-switching, from French *thèse*.

often use of-constructions where English prefers compounds, because there is a similar construction in Spanish “*Mi proyecto de tesis*” (Swan, & Smith, 2001, p. 99). However, there are also a few typical intralingual errors, for example “*In this week I haven’t **speaked** sufficientaly [sic] . . .*”, where *speak* is treated as a regular verb. This essay will focus on two interlingual errors, ‘omitted pronouns’ and ‘heads’, and one error that can be interlingual, intralingual or caused by teaching, ‘infinitives’. Furthermore, the essay will focus on what these errors might tell about learning processes. Therefore, correct usage of these structures will also be included.

4. 1 Omitted Pronouns

According to Coe, omitted pronouns can be a problem for Spanish speakers as “[s]ubject personal pronouns are largely unnecessary in Spanish/Catalan because the verb ending indicates person and number” (Swan, & Smith, 2001, p. 105). In the ‘free writing’, T omits pronouns only in one kind of construction:

Ex. 1 “*Is possible to avoid more time for the presentation because I need to required/recompilation more information?*” (Week 1)

There is a total of three constructions of this kind, all questions and all from week 1. It should also be noted that, in the corresponding Spanish phrase, there is only one option, i.e. omitting the pronoun.

In the ‘judgment of grammaticality’ tests from weeks 1 and 4, T accepts both constructions: “*It is not possible...*” and “*Is not possible...*”. Furthermore, he accepts constructions like: “*Not is known how...*”, although he takes away the *t* in *not*¹⁷. However, in week 8, T recognises that the fourth sentence “*Was not possible to use...*” is wrong and changes it to: “*It was not possible...*”. While changing the sentence, T says that it seems as if

¹⁷ T says at several occasions that *not* can never begin a sentence and *no* can never be inside a sentence. However, he translates the sentence into “No es conocido...”, which corresponds to “It is not known...”. Thus, it seems as if T treats *no* and *not* as allomorphs in complementary distribution.

the subject is missing (see Appendix 2). Thereafter, T discovers the two other omitted pronoun sentences in the test. First, he changes “*Is not possible to extract...*” to “*It is not possible to extract...*”. On doing this, he comments that in Spanish the subject is not necessary in these cases, but that, unfortunately, it seems that it is in English. He also says that this is what he has been taught in school¹⁸.

Another observation that may be significant is that he first changes “*Is not possible*” to a question “*Is it not possible?*” and thereafter finds “*It is not possible*”¹⁹. The next error, some sentences later, “*Not is known how...*” T changes to “*No it is not known how...*”²⁰. He comments that it is the same error as above. Furthermore, he says that the sentence is incomplete, naked, and he seems more and more confident that he is right, although he has still not been given the correct answers.

In week 37, two sentences in the ‘translation’ task were constructed to elicit “Is it possible...” (see Appendix 4, Sentences 1 and 8). In sentence 1, T gives two alternatives: the first correct and the second with the pronoun omitted. When asked why he has given two answers, T says that the first one is more correct, but that people also use the second one. However, in sentence 8, T has only written the correct form, although *it* is evidently added afterwards.

4. 2 Heads

The second error in focus is ‘heads’. Coe writes that “[a]djectives and nouns typically postmodify head nouns” in Spanish and he further informs the reader that “[t]his makes noun phrases like *Cambridge University Bridge Club* particularly difficult [as in Spanish] the elements of the phrase would more naturally be expressed in the reverse order” (Swan, &

¹⁸ As T uses the word ‘*escuela*’, it is likely that he refers to primary school.

¹⁹ This happens on several other occasions. See for example Appendix 6, the comments on “*There is a increase considerable*” and Tables 6a and 6b in Section 4.3.

²⁰ T now translates this into “No, no es conocido...”, i.e. the first ‘no’ corresponds to the English ‘no’ as in the opposite to ‘yes’. The second ‘no’ corresponds to ‘not’, i.e. “No, it is not known...”

Smith, 2001, p. 99). Looking at the data, T mostly pre-modifies the heads, but there seems to be a significant amount of post-modification too, especially in week 4 (see Figure 1).

As Figure 1 shows, there are no post-modified heads in week 1 (see Appendices 5, 6 and 7 for a complete survey of the heads and modifiers used by T). However, in the ‘scrambled sentences’ test, T changes the order of the head (*processes*) and the modifier (*chemical*) several times before he finally settles on the pre-modified order: ‘*chemical processes*’ (see Appendix 6).

In weeks 2 and 3, the occurrences of post-modified heads increase (see Figure 1 and Appendix 5). For example, *students* is pre-modified in week 2 (“PHD [sic] students”), but post-modified in week 3 (“students foreingers [sic]”).

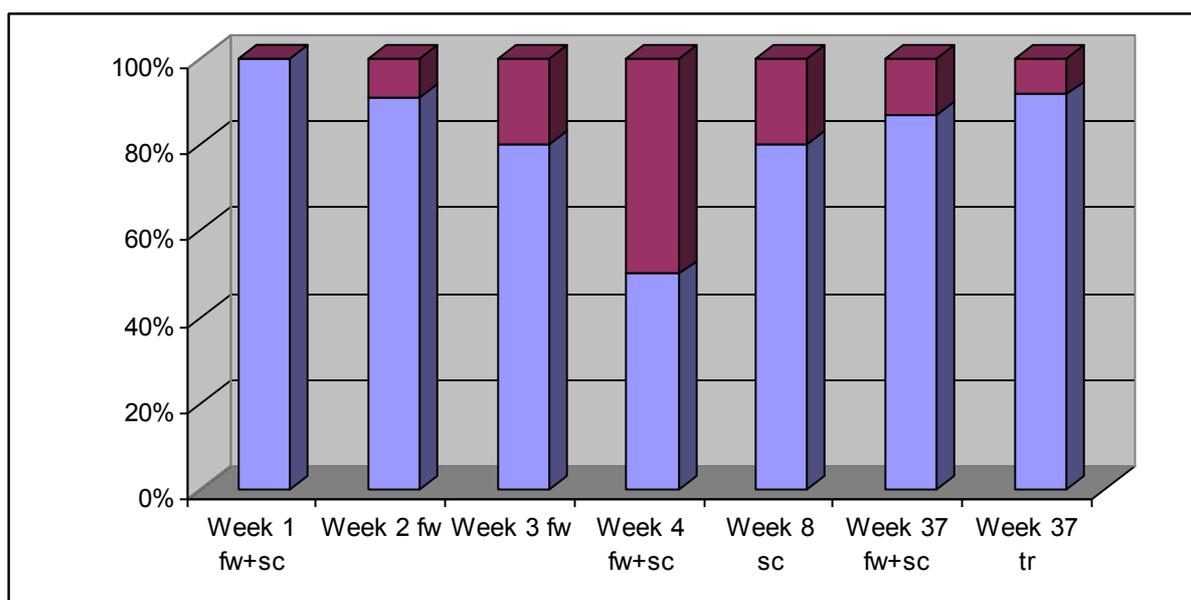


Figure 1. The proportions of pre-modified heads (blue) to post-modified heads (purple) in the different weeks. fw = ‘free writing’, sc = ‘scrambled sentences’ and tr = translation

In week 4, the variation reaches its peak. As can be seen in Appendices 5 and 6, post-modified heads occur to approximately the same extent in both ‘free writing’ and ‘scrambled sentences’. It should also be noted that these two tasks were not performed the same day. In

the ‘free writing’, *synchrotron* is both pre-modified (“European Synchrotron”) and post-modified (“Synchrotron French”), as is *course* (“French course”/“course impedance”)²¹. T also uses some longer constructions: “methods hard templating and soft templating” and “kinetic process oxide/reduction [sic]”. In the latter, *process* is the head, so it is, in fact, both pre-modified and post-modified²². Another occurrence of a head that is both pre-modified and post-modified is found in the ‘scrambled sentences’ test the same week (see Appendix 6, “carbon films deposited”). In the ‘scrambled sentences’, there is also a variation of ‘heads’ that are quickly placed together with their modifiers and those where the order is changed several times. T’s comments indicate that he has a vague knowledge that English and Spanish place their modifiers in opposite order, but he only seems to use that knowledge on some occasions and when there are three words involved, e.g. “wider potential range”, it causes him problems. Another source of problems is when Spanish can use both pre-modified and post-modified position (see Appendix 6 for a complete list of comments).

In week 8, the results from the ‘scrambled sentences’ test indicate that the variation has diminished. However, when looking at the video recorded process, this picture changes (see comments in Appendix 6). Only three of the ten ‘heads’ are placed correctly without hesitation, and at least in one case (“oxidation/reduction peaks”), T says he knows due to knowledge of the subject, i.e. it is not knowledge of the underlying rule that guides his choice. In five other cases, T changes the order of the cards several times before deciding on the correct order (see Appendix 6, the comments on “promising material”, “topographical alteration”, “redox activity”, “considerable increase” and “particularly surprising”).

In week 37, the variation has diminished even more. In the ‘free writing’, one error is in French: “Prix Nobel”²³, but there are also examples of words that are sometimes pre-modified and sometimes post-modified: “water ultrapure”/“destiled [sic] water” and “carbon

²¹ Thus, *French* is used in both pre-modified and post-modified position.

²² In Figure 1, such heads are counted as post-modified.

²³ ‘Prix Nobel’ means ‘Nobel Prize’. This error may be regarded as code-switching rather than a head error.

materials”/”solution carbon” and one example of a head that is both pre-modified and post-modified: “carbon films nanostructured” (see Appendix 5). In the ‘scrambled sentences’ test, T places 13 of the 14 ‘heads’ correctly, 8 without hesitation and 5 with different degrees of hesitation (see Appendix 6). Sometimes, he explains that it is the opposite order of Spanish that guides him in his choice. The adjective phrases: “consistently different” and “relatively large” cause hesitation, because T wants to place them in pre-modified order, i.e. “consistently different” and “relatively large”, but then these phrases are not opposite to Spanish, which also happens to prefer pre-modified order in these cases. Therefore, T considers changing the order to make it follow the ‘opposite to Spanish’ rule. However, instead, he decides to use what he calls “the sound rule”²⁴, i.e. he reads the sentence with the two alternatives and chooses what sounds correct²⁵. T also points out that he understands the sentences, although he is not sure of the order and states that, for him, understanding is more important than the order. He also says that “Google translator”²⁶ can probably provide the correct order.

In a few cases, T misinterprets unknown adjectives as adverbs or nouns and, therefore, places the words incorrectly, e.g. “different areal”. This has been regarded as a vocabulary problem and not as a ‘head’ problem. Thus, “different areal” has been counted as correct, since T guesses that *areal* means the same as *area* and defines it as a noun. In the translation task, 8 out of 9 ‘heads’ are correct (see Appendices 4 and 7). The only error appears in the only three word combination, “material very important”. It should also be noted that no adjective phrases are used in the translation task.

In the ‘judgment of grammaticality’-tests from weeks 1, 4 and 37, T does not detect any head errors at all. However, in week 8, he detects two errors: *‘behaviour kinetic’* and *‘parameters principal’*. Nevertheless, he fails to detect the closely related *‘information*

²⁴ T calls it ‘la regla de sonido’, which in English would be “the sound rule”.

²⁵ Although T has not referred to this strategy before, when asked, he says that he has used it many years.

²⁶ T refers to ‘Google translate’.

kinetic’ and *‘behaviour different*’ (see Appendix 2). After completing the test, T is asked to explain the meaning of all the pre-modified and all the post-modified heads in the order they appear in the test. T’s explanations show that he chooses the correct head independent of its placement and he does not react to the heads being sometimes to the left, sometimes to the right.

The second ‘head’ test also shows that T is unaware of the fact that a language is either right-headed or left-headed (see Table 2). T never refers to the order of the two words as the basis for his choice.

Which word could be a kind of a...		Comments
Flower	Flower cat Cat flower	T rejects <i>‘Cat flower’</i> as a possibility as he thinks that it should be <i>‘Cat’s flower’</i> if it was a flower.
Tree	Head tree Tree head	T translates <i>‘head tree’</i> as <i>‘cabeza del arbol’</i> (head of tree) while traducing <i>‘tree head’</i> as <i>‘arbol cabeza’</i> , thus concluding that <i>‘tree head’</i> is incorrectly written and <i>‘head tree’</i> is the correct answer. Then, he thinks for a while and concludes that <i>‘tree head’</i> means <i>‘cabeza del arbol’</i> .
House	Wine house House wine	T chooses <i>‘wine house’</i> quickly on the grounds that it means <i>‘casa de vino’</i> . But he also says <i>‘house wine’</i> is a kind of house, but incorrectly written.
Restaurant	Dog restaurant Restaurant Dog	T says that he tries to hear what sounds most correct, what sounds like something he has heard before. Then he compares with X (unintelligible) restaurant to give his answer.
English	University English English University	T knows that <i>‘Ecuador University’</i> is a university and thus concludes that <i>‘University English’</i> must be the answer and that it might refer to the English language as such.

Table 2. Results from the ‘head’ test. Yellow/bold is the final choice T makes.

4.3 Infinitives

The third error concerns infinitives. According to Coe, infinitives can be problematic, because “Spanish and Catalan have an infinitive marker (*a*), but its distribution does not square fully with English *to* . . .” (Swan, & Smith, 2001, p. 104). However, it is doubtful that *a* in Spanish can be considered an infinitive marker, since it is used only in certain constructions, for example *periphrastic future*, *periphrastic conditional* and with the verb *volver*. Of these three structures, only the periphrastic future is of interest here. Spanish has two future forms: simple future and periphrastic future. Simple future is used when talking about the future in general, and it is often used when talking about a future far away from the present, while periphrastic future is generally close in time and/or expresses intention. Simple future is formed by conjugation of the Spanish infinitive, e.g. ‘*ir*’ (to go) becomes ‘*iré*’ in first person singular, ‘*irás*’ in second person singular, ‘*iremos*’ in first person plural etc. Thus, both person and number are included in the future verb form itself and there is no need to use pronouns, although in most cases it is possible. The periphrastic future is formed by conjugation of ‘*ir*’ in present indicative + *a* + infinitive, e.g. ‘*voy a Infinitive*’ in first person singular, ‘*vamos a Infinitive*’ in first person plural etc. (Falk, Sjölin, & Lerate, 1994). It is this ‘*a*’ that Coe claims is an infinitive marker (Swan, & Smith, 2001, p. 104), which this essay will question. Fred F. Jehle (2008) offers an alternative analysis, namely that periphrastic future is formed by “[a] present tense form of the verb **ir** (to go) plus the preposition **a** plus an infinitive” (*The Future Tense*, para. 3). It seems reasonable to consider *a* as a preposition, since some verbs use *de* or *que* in a similar manner²⁷. Consequently, it is questionable whether errors that concern the use of infinitive markers should be classified as interlingual errors. This will be discussed further in Section 5.3.

²⁷ *A*, *de* and *que* are prepositions in other contexts. *A* usually corresponds to the English preposition *to*.

We will to use a coupling method...	10/2	I go to use carbon as material.	25/2
The next week I go to present ...	10/2	The characterization will be make ...	25/2
These project will be applicated...	18/2	The carbon will be syntesised by...	25/2
In the future I expected that the Spanish languish will be the most...	18/2	The carbon will be deposited on ...	25/2
I will be on vacation the next week.	18/2	The electroactivity of carbon electrode will be achieved by...	25/2
First I go to write about...	25/2		

Table 3. Future sentences found in ‘free writing’ with infinitives highlighted. Numbers refer to dates.

Spanish (In square brackets, the hypothesised translation as these examples are from the ‘free writing’.)	English (i.e. T’s production)	Dates: Sentence number
[Pienso ir a Bonn City la próxima semana para visitar a algunos amigos.]	I think to go Bonn City the next week for to visit any friends.	10/2
[Pienso tomar ...]	I think to take ...	18/2
Pienso ir a Paris mañana para visitar a algunos amigos.	I think to go to Paris tomorrow for visiter ²⁸ to friends.	22/3:1
Pienso tomar vacaciones la semana que viene.	I think (to take) ²⁹ I will start/be on vacation the next week.	22/3:10
Pienso ser profesor el próximo año para tener dinero por mis estudios.	I think, I will be proffesor the next year four have money for my studies.	22/3:19
Pienso ir a Paris mañana para trabajar .	I think, I will be to Paris tomorrow for working .	13/10:2
Pienso escribir la tesis en ingles.	I think, I go to write the rapport/thesis in English.	13/10:9

Table 4. Production of *pienso* (*I think*). The colours are used to make clear which Spanish words correspond to which English words. Infinitives are in yellow and bold. Note that at some points the infinitive in Spanish has been translated into other kinds of structures, but the English correspondent has been kept in yellow, although it might not be an infinitive.

T’s production of infinitives in ‘free writing’ (see Table 3, Table 4: Sentences 1 and 2, and Table 5: Sentence 1)³⁰ led to the hypothesis that T uses the infinitive marker *to* whenever he translates a Spanish infinitive. Furthermore, the usage of bare infinitives was hypothesised

²⁸ *Visiter* is French, but T thought it was English.

²⁹ Words in brackets are crossed out by T, but are here included when relevant.

³⁰ Note that all spelling errors in the tables are T’s.

to derive from translations of simple future. To try these hypotheses, translation tasks were designed. The results can be seen in Tables 4-8³¹.

Seemingly, T translates word-for-word in the first sentences in Table 4³². Then, in sentence 22/3:10, a change occurs and he starts to use the expression ‘*I think I will*’ instead. A similar change can be seen in Table 5, where the incorrect usage of infinitive marker suddenly disappears (see 24/3:9-13/10:14).

Spanish	English (i.e. T’s production)	Dates: Sentence number
[¿Puedo tomar vacaciones?] ³³	Can I to take vacation?	25/2
¿Puedo tomar una foto?	Can I to take a picture?	22/3:5
¿Puedes estar en el laboratorio a las ocho mañana?	(Can you) Do you can to be in the laboratory at 8 am tomorrow?	22/3:12
¿Puedo estar un año más en Francia?	Can I to be one more year in France?	24/3:2
¿Puedes llevar tu computadora?	Can you take up your computer?	24/3:9
¿Puedes venir mañana para ayudar a mi hermano?	Can you go tomorrow for help to my brother?	24/3:13
¿Puedo tomar un café?	Can I take a coffe?	13/10:10
Puedo ver que esta solución ácida tiene un comportamiento diferente?	I can see this acide solution have a different comportement.	13/10:14

Table 5. Production of *puedo/puedes* (*I can/you can*). Same colour codes as in Table 4.

³¹ Note that all spelling errors in the tables are T’s.

³² When asked if he thinks in Spanish or English, T says that he thinks in Spanish and then translates into English. In the ‘fill in the gaps’ tests and the ‘scrambled sentences’ tests, T often whispers the Spanish translation to himself.

³³ This sentence was found in ‘free writing’. Therefore, the Spanish sentence is the supposed starting point.

Spanish	English (i.e. T's production)	Dates: Sentence number
Vamos a usar una microbalanza en este experimento.	We go to use a microbalance for this experience.	22/3:2
Vamos a estar en Alemania en una hora.	We will be in Germany in one hour.	22/3:11
Voy a escribir una letra a mi madre.	I am going to write a card to my mother.	22/3:20
Voy a estar en vacaciones en mayo.	I'm (going to [be]) being on vacation in may.	24/3:7
Voy a usar el mismo film de carbon mañana.	I am going to use the same carbon films tomorrow.	13/10:7
Vamos a probar una técnica diferente.	We go to try a different technique.	13/10:11
Estos electrodos activos vamos a usar en un experimento importante.	Theses active electrodes will use in another important experience.	13/10:12

Table 6a. Translations of periphrastic future. Same colour code as in Table 4. The 'a' is grey as there are different opinions whether this is part of the infinitive or not. In the English sentences, it is debatable whether *to* belongs to the infinitive or whether it should be *going to + bare infinitive*. However, for the purpose of this analysis, the former is much more useful.

Spanish	English (i.e. T's production)	Dates: Sentence number
¿Vas a ir al trabajo mañana?	Are you going to work tomorrow?	22/3:8
¿Vas a estar aquí el jueves?	Are you going to be here this thursday?	22/3:17
¿Cuánto tiempo vas a estar en Suecia?	How many long do you will be in Sweden?	24/3:3
¿Vas a comer en la universidad hoy?	Are you going to eat at university today?	24/3:5
¿Vamos a salir con este carro?	Are we going to exit with these car?	24/3:12
¿Cuánto tiempo vas a trabajar hoy?	How many time are you going to work today?	24/3:14
¿Vas a estar en el laboratorio todo el día?	Will you be/would you ³⁴ be in the laboratory everyday?	13/10:13

Table 6b. Translations of periphrastic future in questions.

As can be seen in Tables 6a and 6b, T mostly translates the periphrastic future with 'going to' or 'go to', although there are some instances of will + bare infinitive. Note that T in

³⁴ When asked why he has left two alternatives, T says that he thinks *would* is more polite in questions.

sentence 22/3:2 (see Table 6a) translates word-for-word ‘vamos’ = ‘we go’ rather than using the expression ‘going to’. However, when translating the question in 22/3:8 (see Table 6b), he uses ‘going to’ for the first time³⁵ and continues to do so in the next question (22/3:17). Thereafter, he starts using the ‘going to’ construction also in declaratives (22/3:20).

Spanish	English (i.e. T’s production)	Dates: Sentence number
En el futuro será más fácil viajar de un país a otro.	In the future will be more easy to travel between different countries.	22/3:3
La caracterización será hecha con técnicas nuevas.	The characterization will be made with news techniques.	22/3:4
Estaré en Suecia la semana que viene.	I will start/be in Sweden the next week.	22/3:9
En el futuro seré profesor de química.	In the future I will be a professeur of chemistry.	22/3:13
El carbon será depositado con esta técnica.	The carbon will be deposited with this technique.	22/3:14
Usaré un Nuevo método.	I will use a new methode.	22/3:18
En el futuro trabajaré en una empresa petrolera.	In the future I will work in (the) Petroleum Entreprise.	24/3:1
Trabajaré la próxima semana.	I will work the next week.	24/3:6
En el futuro viajaremos a los Estados Unidos para visitar a mi familia.	In the future we will travel at United State for visiter to my family.	24/3:8
El artículo será escrito en inglés.	The article will be (written) wrote in English.	13/10:3
En el futuro el carbón será un material muy importante.	In the future the carbon will be a material very important.	13/10:4

Table 7a. Translations of simple future. Same colour codes as in Table 4. Purple and bold are simple future.

³⁵ It may seem as if T uses present progressive to express future here, but considering that there are no other instances of this form, it is more likely that T uses an incomplete form of ‘going to’, perhaps because “**Are you going to go** to work tomorrow?” sounds awkward due to the double use of ‘go’. “**Vas a ir** al trabajo mañana?” was actually a translation mistake from the author. The intended form was “**Vas a trabajar** mañana?”, which would have corresponded to “**Are you going to work** tomorrow?”, with ‘to work’ as a verb.

Spanish	English (i.e. T's production)	Dates: Sentence number
¿Cuánto tiempo estarás en Ecuador?	How time do you will started [stay?] in Ecuador?	22/3:6
¿ Tomarás vacaciones?	(Will) Do you will be on vacation?	22/3:7
¿Cuánto tiempo estarás en vacaciones?	How long time do you will be on vacation?	22/3:15
¿ Pasarás el examen?	Do you will (passe) aprouved [pass] the examen?	22/3:16
¿ Quitarás Francia?	(Are) Do you will quitte [leave] France?	24/3:4
¿Cuánto tiempo trabajarás aquí?	How long time do you will work here?	24/3:10
¿ Estarás feliz con ella?	Do you will be happy with her?	24/3:11
¿Cuánto tiempo estarás en Paris?	How time will you be in Paris?	13/10:6

Table 7b. Translations of simple future in questions.

As Tables 7a and 7b show, T translates simple future with *will + bare infinitive* or occasionally *will + past participle*. The latter appears to occur when he translates verbs incorrectly as in *started* (perhaps meaning *stay*) and *aprouved* [sic] (meaning *pass*).³⁶

Spanish	T's translation	English (given a few days later)	T's translation
Tomar	To take	To take	Tomar
Comer	To eat	To eat	Comer
Estar	To be	To be	Estar/Ser ³⁷
Usar	To use	To use	Usar
Poder	Can (hesitating whether it should be <i>to can</i> , but finally decides on <i>can</i>)	Can	Poder

Table 8. Translations of infinitives

³⁶ Will + past participle is also a common structure in scientific texts.

³⁷ *To be* has two options in Spanish, *ser* and *estar*.

As seen in Table 8, T consistently uses the infinitive marker *to* when translating from Spanish into English. When doing the opposite translation, no infinitive marker is used, although he is given the English words with infinitive markers.

5. Analysis and Discussion

First, this section will follow the structure of the result section, i.e. omitted pronouns, heads and infinitives. Thereafter, a fourth subsection will analyse interrogatives and declaratives, since they are related to all the result sections. Finally, the last subsection will discuss the findings.

5.1 Omitted pronouns

Looking at T's 'free writing' it seems clear that omitted pronouns are not a major problem for him. It only happens in the construction: "*Is possible*" (see Section 4.1, Ex. 1). It is striking how similar this expression is to the corresponding Spanish one: "*Es posible*". This seems to indicate that Spanish interferes with English here only when the expressions are almost identical.

To try this hypothesis, two omitted pronouns are added to the week 4 'judgment of grammaticality' test: one similar to T's production, i.e. "*Is not possible...*" and one less similar, i.e. "*Not is known...*". The prediction is that T will react to the less similar one, but not to the similar one. However, T does not react to either of the missing pronouns, but instead changes "*Not is known...*" to "*No is known...*", thus making the phrase more similar to Spanish "*No es conocido*" (see Section 4.1, Footnote 17 for further information on 'no/not'). Therefore, a construction in past tense: "*Was not possible...*" is included in the week 8 test³⁸ (see Appendix 2). It seems that this construction, which is equal in meaning, but

³⁸ The negation is moved in order to avoid that T focuses on his 'no/not-rule'.

different in form³⁹, triggers the retrieval of an old rule from T's English classes and he appears to have made a breakthrough. T not only finds and can correct the two other errors included, but can also explain why. Thus, it seems that structures that are very similar interfere more. This seems reasonable if words form subsets with words that have phonetic and visual similarity as suggested by DST. Furthermore, the difference between '*es posible*' and '*is possible*' is less salient than the difference between '*era posible*' and '*was possible*'. A salient difference is easier to notice than a non-salient one and as the 'noticing hypothesis' predicts, only what is noticed can become intake. Thus, this study implies that learning can be facilitated through increasing contrast. Furthermore, it is compatible with both DST and the 'noticing hypothesis'. However, Krashen's theories do not seem to give any reasonable explanation for why T accepts "*Is not possible...*", but rejects "*Was not possible...*".

5. 2 Heads

The week 1 'free writing' gives the impression that heads have been mastered. However, after the different tests, the other 'free writings' and the 'head' tests, it seems clear that this is not the case (see Section 4.2). T's comments indicate that he has a vague idea that English and Spanish are opposite in the placement of certain words, but he does not seem to be aware of exactly how and when. Thus, in cases where Spanish has several options, T is left to guess. Furthermore, he only uses the 'opposite' strategy spontaneously at times. At other times, he seems to be guessing or trying to find the right answer through focusing on meaning rather than form.⁴⁰

³⁹ The corresponding expression in Spanish is "*No era posible*".

⁴⁰ That meaning is T's main strategy can also be seen in the 'scrambled sentences' and the 'fill in the gaps' tests. In the 'scrambled sentences' tests, T manages to figure out the intended meaning of almost all the sentences long before he decides on the order of the words, and also independently of whether his production is grammatically correct or not. In the 'fill in the gaps' tests, he reads the whole text first and tries to understand it and predict what word is missing. When he does not know the meaning of a word, he is mostly guessing where to place it. Only occasionally does he refer to the grammatical form to motivate his choice.

This focus on meaning is also found in the second ‘head’ test, although some other strategies are revealed too (see Section 4.2, Table 2). One strategy is to compare the given compound⁴¹ with other compounds he knows in English (see Table 2, “university English/English university” and “dog restaurant/restaurant dog”), another is to rule out one alternative as incorrect (see Table 2, “flower cat/cat flower”, “head tree/tree head” and “wine house/house wine”). Although it is unclear whether T has understood the ‘head’ test⁴², the test shows that T has not extracted any systematic rule for heads yet⁴³. This may imply that, when T chooses the correct order without hesitation in the ‘scrambled sentences’ test, it is because he has learnt the compounds (or word combinations) as chunks rather than as two parts put together through (conscious or subconscious) knowledge of a rule. This assumption is further supported by T’s comment on ‘*oxidation/reduction peaks*’, i.e. that he knows the order due to knowledge of the subject (see Appendix 6, Week 8). This can explain why there are relatively many correct heads in the ‘free writing’ as T here has the possibility of using words he knows and avoid words that he is unsure of how to use. Furthermore, it might explain why there are more errors in week 3 and 4 than in the two previous weeks, as T may gradually move away from using formulae in his writing. Since the number of errors is approximately the same in the ‘free writing’ and the ‘scrambled sentences’ test in week 4, and these two tests were performed on different days, it is possible to reject the likelihood that the higher number of errors was due to temporary external factors, such as tiredness. Superficially, improvement is shown in week 8. However, a closer look at the process reveals that a great deal of insecurity remains. In week 37, less variation is found, even when the process is considered.

⁴¹ In N + N compounds, it is more difficult to use the ‘opposite rule’ since the equivalent to the compound XY in Spanish would be ‘Y de X’ rather than simply YX, which normally is the case in Adj + N compounds or noun phrases.

⁴² Perhaps it would have been better to use pictures instead of just words, as in the tests described by Clark (2009, Kindle Locations 7027-7040). The compounds could also have been chosen with more care so that they would have been more likely to exist. Examples in Spanish could also have been used to assure that T had understood the exercise. However, this might have triggered the ‘opposite rule’ and then, perhaps not revealed other possible strategies and T’s focus on meaning rather than structure.

⁴³ It should be noted that the two errors T detects in the ‘judgment of grammaticality’ test are noun phrases containing Adj + N, the easiest structure to merely reverse.

Nevertheless, T still expresses that he feels insecure about the order and that the ‘opposite rule’ is hard to apply when Spanish has several options (see Appendix 6), i.e. he has not yet worked out that ‘heads’ in English are pre-modified. Therefore, the high number of correct answers in week 37 may be due to acquired vocabulary rather than acquired grammar, e.g. *quartz crystal* (see Appendix 5) may have been learnt as a chunk rather than as two separate words combined correctly because of grammatical knowledge. However, a more systematic use of the ‘opposite rule’ may also have contributed to the improvement.

No systematic use of the ‘opposite rule’ is found in the ‘judgment of grammaticality’ tests. In fact, T does not seem to use the rule at all. In weeks 1, 4 and 37, T does not find any of the head errors and, in week 8, only two errors are detected. Furthermore, the two detected errors, *‘behaviour kinetic’* and *‘parameters principal’*, are very similar to other errors that go undetected: e.g. *‘information kinetic’* and *‘behaviour different’* (see Appendix 2). The fact that T accepts head errors much more than he makes them, both in production (‘free writing’/‘translation’) and semi-production (‘scrambled sentences’), might be explained by DST, the ‘noticing hypothesis’ and the ‘output hypothesis’.

Since T reads literature on chemistry in French, Spanish and English, he is used to seeing both pre-modified and post-modified heads. Therefore, according to DST, both variants are likely to be highly activated in his mental lexicon. Furthermore, the similarity between many scientific words, e.g. *‘negative electrode’* and *‘electrode negatif’*, would mean that the words are ‘tagged’ for similarity. The fact that T can explain the meaning correctly, independently of whether the heads are pre- or post-modified, shows that reading comprehension is not disturbed by the different forms and that the difference is not even noticed.

As predicted by the ‘noticing hypothesis’, the input which has not been noticed does not become ‘intake’ and therefore T does not react to the head errors. The ‘output hypothesis’ is

also supported by these data as, several times during the ‘scrambled sentences’ tests, T says that he does not know which order the head and modifier should have (see Appendix 6). These comments show that T does notice that he has gaps in his knowledge, which is what the ‘output hypothesis’ claims, namely that output can help the learner to notice. Thus, it could be that T’s slight improvement in the week 8 ‘judgment of grammaticality’ test is a consequence of the output he has produced during weeks 1-4 rather than an effect of input although, as DST claims, the two factors cannot be isolated and both are likely to contribute to some extent. One finding that supports the proposition that output has been a stronger factor than input is that T does not detect any head errors in the week 37 ‘judgment of grammaticality’ test, even though he has received approximately 350 hours⁴⁴ of input between the test in week 8 and the test in week 37. If input were the cause of improvement in week 8, an even greater improvement would have been expected in week 37. Thus, there is no support for Krashen’s ‘input hypothesis’ in this data. On the other hand, the ‘input hypothesis’ cannot be rejected either because, even though T has had plenty of ‘head’ input, and the data in this essay shows that T focuses strongly on meaning, he may not have reached the stage in the ‘natural order’ where ‘heads’ are acquired.

Regarding Error Analysis, this study confirms that an error analysis may not offer a sufficient basis upon which to judge the knowledge of a learner. The study of the process revealed insecurity that may not have been suspected from mere results. Furthermore, in a traditional error analysis, the variation of left-head and right-head usage shown in the ‘free writing’ might have been overlooked as mistakes rather than errors⁴⁵, especially since most of them appear in the same week. Even though DST does not deny the existence of mistakes, it claims that variation can be a sign that the language system is in an unstable phase, i.e. a development phase. As T is fairly unsystematic in his errors and hesitates frequently before

⁴⁴ Two hours per day in approximately 25 week (37 weeks - 4 weeks of vacation - the first 8 weeks of the study)

⁴⁵ For the distinction between mistake and error, see Section 2.3.

deciding in which order to place the words, it seems likely that his sub-system of heads is in a developing stage rather than in an attractor stage. The fact that week 37 is more stable than weeks 4 and 8 may indicate that T is gradually reaching an attractor stage, although this attractor stage does not include a full understanding of the underlying rule of heads.

As to the evaluation of ‘head’ errors, T himself does not consider these errors very serious (see comments in Appendix 6), and for his most urgent needs, i.e. to read articles, he seems to be right as the placement of heads does not appear to affect his reading comprehension. Certainly, that attitude may also affect learning, at least when considering DST, the ‘noticing hypothesis’ and the ‘output hypothesis’ as T seems to choose not to pay much attention to the form as long as he understands the meaning.

5. 3 Infinitives

As may be observed in the ‘free writing’, T’s usage of infinitives, or rather infinitive markers, often deviates from Standard English usage (see Table 3, Table 4: Sentences 1 and 2, and Table 5: Sentence 1). According to Coe, these errors emerge because both Spanish and English have infinitive markers, but their usage does not completely correspond to each other (Swan, & Smith, 2001, p. 99), i.e. that T’s errors are caused by ‘negative transfer’ from Spanish and thus are interlingual errors. However, this essay questions this explanation and sets up two hypotheses: a) the instances where T uses bare infinitives derive from Spanish simple future, and b) T uses the English infinitive marker *to* whenever he translates a Spanish infinitive into English.

The data seems to support the first hypothesis. All the sentences in the translation tasks that are given in simple future are translated into *will + bare infinitive* or occasionally *will +*

*past participle*⁴⁶ (see Tables 7a and 7b). Although, admittedly, there are a few cases where periphrastic future has been translated into *will + bare infinitive* (see Table 6a and 6b), in the vast majority of cases, periphrastic future is translated into ‘going to’ or, in the early data, ‘go to’⁴⁷. There is, of course, more than one possible explanation as to why T uses the bare infinitive after *will*. Following Coe’s proposition (namely that ‘*a*’ is an infinitive marker), it could be the lack of ‘*a*’ in the Spanish simple future that causes positive transfer. However, it may also be the fact that there are no infinitives at all in Spanish simple future that leads to the bare infinitive. This will be discussed further later on.

The second hypothesis also has strong support in the data. T does not only use ‘to-infinitives’ when ‘*a*’ precedes the infinitive in Spanish as in ‘*vamos a usar...*’⁴⁸, which T translates into ‘*we go to use...*’⁴⁹ (see Table 6a), but also when the infinitive follows other words, as in ‘¿*Puedo tomar una foto?*’ / ‘*Can I to take a picture?*’ (see Table 5), and ‘*Pienso ir...*’ / ‘*I think to go...*’ (see Table 4). There is also reason to believe that ‘*for to visit*’ comes from a word-for-word translation of ‘*para visitar*’, although the attempts to elicit that phrase in the translation tasks did not succeed, because T translates into French (*visiter*) instead of English (see Tables 4 and 7a). Another strong indication that T associates English infinitives with the infinitive marker is that when given Spanish infinitives without ‘*a*’, he consistently translates them into ‘to-infinitives’ in English (see Table 8). When T is given ‘to-infinitives’ in English a few days later, he translates them into Spanish infinitives without ‘*a*’. If T perceives ‘*a*’ as a Spanish infinitive marker, one would expect the ‘to-infinitive’ to trigger the use of ‘*a*’ + *infinitive*, but this is not the case. Thus, the fact that T never considers translating

⁴⁶ The use of past participles seems to coincide with incorrectly translated verbs. Thus, it could be that focus on finding the correct vocabulary causes less focus on the form of the verb. Another explanation may be that *will + past participle* is a common structure in scientific articles and may therefore be highly activated in T’s language system. DST predicts that high activation causes more interference. There is also the possibility of interaction between these two factors.

⁴⁷ When asked, T says that there is no clear-cut difference between the two future forms; instead, their usage overlaps.

⁴⁸ All infinitives will be in bold.

⁴⁹ Should be: ‘*We are going to use*’. In present indicative ‘*vamos*’ means ‘*we go*’.

the English ‘to-infinitives’ into ‘*a*’ + *infinitive* in Spanish, together with the fact that T translates Spanish ‘a-less’ infinitives into English ‘to-infinitives’ strongly indicates that ‘*a*’ should not be regarded as an infinitive-marker in Spanish, but as a preposition as Jehle (2008) suggests (*The Future Tense*, para. 3)⁵⁰. Provided this is true, the lack of infinitives in Spanish simple future, rather than the lack of ‘*a*’ is likely to explain why the ‘to-infinitives’, do not appear together with *will* as suggested in the previous paragraph. Another contributing factor for the correct ‘will-constructions’ may certainly be that scientific literature uses ‘will-constructions’ much more than ‘going to-constructions’, ‘I think’-constructions or ‘can I/I can-constructions’, i.e. T has had a considerable amount of ‘will-construction’ input. It may also be the case that simple future constructions in school have been translated into ‘will-constructions’. Furthermore, it seems likely that school has caused the strong association of English infinitives with their infinitive-marker, perhaps in verb conjugation drills such as “tomar – to take – take – took – taken, comer – to eat – eat – ate – eaten” etc., since neither input nor Spanish can explain why T translates Spanish infinitives into English ‘to-infinitives’.

So far, T’s translation of infinitives has been treated as homogenous, but the data shows some variation. However, there is almost no variation in the first four weeks, i.e. before the translation task⁵¹ (see Table 3, Table 4: Sentences 1 and 2, and Table 5: Sentence 1). This may imply that it is the translation task that causes the variation, i.e. that T’s output causes his output to change. The changes can be observed in three structures: ‘*pienso*’/‘*I think*’, ‘*puedo*’/‘*I can*’ and ‘*voy a*’/‘*I am going to*’.

In the ‘free writing’, T consistently translates *pienso* + *infinitive* into *I think* + ‘to-infinitive’ and this is also the case in the first translation task sentence (see Table 4). This

⁵⁰ However, ‘*a*’ as a preposition often, but not always, corresponds to the English preposition ‘*to*’, which may cause confusion for non-native Spanish speakers, and also cause Spanish speakers to use ‘*to*’ in situations when other prepositions should be used in English.

⁵¹ The hypotheses described above were built on this early data.

appears to be a word-for-word translation, where the infinitive, as hypothesised above, always takes the infinitive marker in English. In sentence ‘22/3:10’, something interesting seems to happen. T starts the sentence as before, *‘I think to take’*, but then crosses out *‘to take’* and writes *‘I think I will start/be...’*. Thereafter, he uses the *I think I will + bare infinitive* – construction, except in the last sentence, *‘I think, I go to write’*. However, it should be noted that there is no infinitive marker after *‘I think’*. It seems likely that he aims for *‘I think, I’m going to write...’* rather than falls back into the original error⁵². This change from *I think + ‘to-infinitive’* to *I think I will + bare infinitive* is sudden. In fact, it happens the same day, only a few sentences apart. Since T has no input in between, it seems likely that it is the output that has triggered the change, i.e. using the language activates structures once learnt/acquired.

T’s production of *‘puedo’/‘I can’* almost echoes the *‘pienso’/‘I think’* development. T consistently translates *puedo + infinitive* into *can I + ‘to-infinitive’* until the second day of the week 8 translation task. The first example on the second day follows the old pattern, but then, a few sentences later, T starts to use *can I + bare infinitive* and continues to do so also in week 37. As the change is sudden and T has received no input between the two patterns, output is likely to have caused the change as discussed in the previous paragraph.

The third change happens with *‘voy a’/‘I am going to’*, and although there are some similarities to the other changes, there are some differences too. Already from the start, one obvious difference is that the error does not directly concern the infinitive marker, since the infinitive marker should be used in English in this case. However, the reason why T uses the infinitive marker here is likely to be the same as in the previously discussed structures, namely word-for-word translation. That is also the plausible explanation for the error, the *‘go to’*-construction, since *‘voy’* means *‘I go’* and *‘vamos’* *‘we go’* (in present indicative, which is the relevant usage here). In the ‘free writing’ in weeks 1-4, there are three instances of the

⁵² This sentence will be discussed together with other ‘going to’- constructions later on.

construction *I go + 'to-infinitive'* and it is likely that *voy a + infinitive* is the starting point T has used to produce these sentences (see Table 3). As in the cases described in the two previous paragraphs, the change is sudden and takes place in one day during the translation task. What differs is that the change seems to be triggered by an interrogative (see Tables 6a and 6b). When writing the sentences in chronological order, the change looks like this: “*We go to use...*” → “*Are you going...?*” → “*Are you going to be...?*” → “*I am going to write...*”. The second day of the week 8 translation task, T uses ‘*going to*’ instead of ‘*go to*’. However, in week 37, both structures are used, only a few sentences apart: “*I am goint [sic] to use...*” → “*I think, I go to write...*” → “*We go to try*” (see Table 6a and Table 4: the last sentence). These findings seem to support the conclusions drawn above, i.e. that output rather than input has caused the change. Since T’s input consists almost only of written, scientific language, there is relatively little input containing ‘*I think...*’, ‘*I can...*’ or ‘*I am going to*’, so it would, in fact, have been surprising if the data had indicated that input was the main cause of change. However, the importance of these three changes is that they show that changes can take place quite quickly without direct input. The ‘output hypothesis’ predicts that output can make learners shift from “semantic to grammatical processing” (De Bot et al., 2005, p. 176). Perhaps, this is what happens when T suddenly changes his structures. Another possibility is that the activation of certain words and structures in T’s language system causes other words and structures to be activated too, structures once learnt or acquired that have been inactive for a long time. There is also the possibility that both these phenomena are at work simultaneously. Input may also indirectly be involved, since input may activate the whole English language system.

5. 4 Interrogatives and declaratives

In Section 5.3, the *'going to'*-structure was assumed to be triggered by an interrogative. Of course, this assumption may be wrong. It may be mere coincidence that T starts using the *'going to'*-structure for the first time in an interrogative and thereafter replaces his earlier version *'go to'* with *'going to'* in declaratives. However, what led to this assumption was other observations in the data. For example, in the last 'judgment of grammaticality' test, T changes "*Is not possible*" to "*Is it not possible*" before he retrieves the correct version "*It is not possible*" (see Section 5.1). Another example can be found in the second 'scrambled sentences' test (see Appendix 6: "There is a increase considerable"). Here T decides fairly quickly that "*is a increase*" should go together, but the three remaining words, *there*, *is* and *considerable*, cause him problems. After a while, T says that he only knows how to make it a question. When asked to do so, he produces "*Is there a increase considerable?*". Thereafter, T is asked if he can change the question into a statement and he quickly changes the order of *there* and *is*, thus producing "*There is a increase considerable*". Although the sentence is not correct, it is interesting that the placement of *there* is solved through first producing an interrogative.

Since there are at least three examples of when interrogatives help to produce declaratives, it seems to have some significance. It could perhaps be that interrogatives and declaratives activate slightly different 'paths' in the mental lexical network since they start with different words (in the examples above the interrogatives start with verbs and the declaratives with subjects)⁵³. For example, in the case of "*Are you going...?*" (see Table 6b), it may be that *are* triggers the *-ing* form, since T seems to associate the *-ing* form with the present tense of *to be* (see Appendix 6, Comments on "material promising" and "particularly surprising"). Although there is not enough data in this study, there are at least some

⁵³ This is valid for English. Other languages may not have those differences between interrogatives and declaratives.

indications that a variety of declaratives and interrogatives may facilitate re-learning for some learners, and it would be interesting to investigate if similar observations have turned up in other studies.

5. 5 Discussion

According to DST, all input affects the language system. Consequently, DST predicts that extensive reading will affect an individual's language system, although it is not clear how or whether the change will be detectable, i.e. whether the effect is strong enough to cause the system to progress from an attractor stage. Furthermore, DST predicts that a detected change cannot be related to one single factor, since different factors interact with each other, e.g. extensive reading may interact with any other kind of language input, language output, motivation, the methods used to measure the effects etc. The present study supports these statements. Extensive reading was almost the only source of input for the subject during the study period and it would therefore be easy to conclude that any development shown is related to this input. However, a closer look indicates that the methods used to measure the effects of extensive reading have had an important impact on the results. Indeed, at times they have almost certainly been the major cause of development, since the reading material does not contain the necessary input (see Section 5.3). At other times, it is harder to judge whether it is the input, or the output, that has been the more important factor (see Section 5.2). However, if input has been the stronger factor, it appears to have been so in the form of vocabulary rather than grammatical development. Since these findings concern input and output, it seems relevant to discuss them in relation to Krashen's 'input hypothesis', Schmidts's 'noticing hypothesis' and Swain and Lapkin's 'output hypothesis' too.

Krashen predicts that acquisition, including grammatical structures, will take place if there is sufficient input and the acquirer is focused on the meaning, not on the form. The subject in this study is strongly focused on meaning, has plenty of input (except in the case of

certain infinitives) and should therefore be the ideal acquirer. However, when considering grammatical development, no clear, unquestionable relationship can be seen between input and development in the present study. Where improvement appears to have some relation with input, it seems to be related to vocabulary rather than grammar. Of course, this result could be explained by the ‘natural order hypothesis’, i.e. that the structures included in this study lie too far away from the subject’s present level. Therefore, the ‘input hypothesis’ cannot be rejected either. However, Krashen’s hypotheses do not explain why much of the development took place during the different tests or during the translation tasks, i.e. without any added input. Thus, this study does not support a proposition that extensive reading alone leads to improved grammatical performance, at least not for adults who focus strongly on meaning.

In contrast, both the ‘output hypothesis’ and the ‘noticing hypothesis’ find support in the present study. The ‘output hypothesis’ predicts that output affects grammatical development more than input. This hypothesis is supported as, despite the fact that the proportions between input and output in the study are uneven and strongly favour input, much of the development takes place during the output tasks. If input had been the stronger factor, the development should have taken place between the tests, especially between the week 8 and week 37 tests. Furthermore, the ‘output hypothesis’ claims that output makes the learner aware of gaps in his/her knowledge, which is confirmed by this study. The ‘noticing hypothesis’ claims that input needs to be noticed in order to become ‘intake’. This is clearly supported as development is stimulated by increasing the contrast between L1 and L2 (see Section 5.1). Thus, it seems that noticing and focusing on form, rather than merely focusing on meaning as Krashen advocates, are advantageous for grammatical development. The effect of increasing contrast may also be explained by DST. According to DST, lexical items form subsets with other items that are similar in some ways. Thus, DST predicts that there will be more

interference when words or structures are similar, since activation of one lexical item will lead to the activation of the whole subset. However, it needs to be pointed out that neither the ‘noticing hypothesis’ nor the ‘output hypothesis’ are incompatible with DST.

The implication for SLA is that, although extensive reading may be valuable for many aspects of language learning/acquisition, it may not be the most effective way of improving grammatical performance, at least not for adult learners who focus strongly on meaning. However, this study cannot exclude the possibility that input has effects on development. It could well be that all the hours of input has activated the whole subsystem of English, leading to retrieval of previously learnt/acquired grammatical structures, which is later reinforced and developed during the output tasks. In addition, increased vocabulary may have a positive effect on output performance, leaving more working memory⁵⁴ for focusing on form. Thus, this study cannot say that extensive reading is not beneficial for grammatical performance, only that output, and/or attention to form and not only meaning, seems to be crucial for grammatical development. This implication is also supported by studies in SDA (Second Dialect Acquisition) where students, who have had years of input without acquiring/learning the second dialect through teaching that focuses on form, improve their grammatical performance in their second dialect (Pandey, 2000; Yiakoumetti, 2006).

Regarding Error Analysis, this case study supports the critique that strategies such as avoidance can make EA a poor reflection of learners’ knowledge. Furthermore, this study shows that correct results may conceal great insecurity and incorrect or incomplete knowledge of grammar rules, and that learnt/acquired vocabulary (chunks) may be difficult to separate from learnt/acquired grammar. Therefore, teachers and researchers may need to be cautious about drawing conclusions merely on students’ results.

⁵⁴ “The cognitive ‘space’ in which we actively process new information or information that is currently in focus” (Lightbown, & Spada, 2006, p. 206).

There are also some other observations that might be relevant for teaching. Firstly, this study indicates that increased contrast can make differences more salient for learners and thus facilitate ‘intake’ (see Section 5.1). Secondly, it seems that a variety of declaratives and interrogatives may facilitate re-learning for some learners, perhaps because starting with a verb instead of a subject activates a different ‘path’ in the mental lexical network (see Section 5.4). However, there are only a few examples in this study and further studies are needed to explore the relationship between interrogatives and declaratives, both in practical learning situations and in theory. Thirdly, errors may be caused by teaching (see Section 5.3). This indicates that teaching is an important part of learners’ language usage and that it matters when and how grammar is introduced⁵⁵. Too much focus on one aspect, e.g. ‘to-infinitives’, may give students an incorrect idea of how the structure is used in L2. Of course, all usage cannot be introduced at the same time and it seems reasonable to focus on main usage first and introduce exceptions later. However, the frequency of usage needs to be taken into account and bare infinitives can hardly be called exceptions in English. The choice between ‘to-infinitives’ and bare infinitives is complex for any L2 learner, but less focus on the ‘to-infinitive’ as the norm or perhaps simultaneous introduction of both forms, may at least make students aware that both forms exist and are common. If students are aware of this, they are more likely to notice when the different forms are used and, according to the ‘noticing hypothesis’, input, if noticed, can lead to intake⁵⁶. However, whether more equal attention to the two infinitive forms, or simultaneous introduction of them, has a positive effect on learners’ usage, would need to be established by means of studies on large groups of students. Although the present study only discusses infinitives, there may be several other grammatical

⁵⁵ According to Krashen and Terrell (2000), the main effect of teaching grammar in school is providing students with comprehensible input (p. 57), but this study indicates that grammar teaching has effects also on grammar performance. T’s translation between Spanish and English infinitives does not seem to contain monitoring, i.e. T’s usage is automatic.

⁵⁶ However, it must be admitted that there is no proof in T’s case that teachers have focused too much on ‘to-infinitives’. It could also be an effect of discrepancy between intended intake and factual intake, i.e. what the teachers have taught and what T has learnt.

features or other aspects of language that cause confusion in a similar manner. One example from the data is the *-ing* form, which causes problems because of strong association with present progressive (see Appendix 6, “material promising”, “sections following”, “particularly surprising”, “promising material” and “increasing electrolyte concentration”). Another example, which may be especially interesting with Spanish-speaking English-learners, is the no/not usage (see Section 4.1, Footnote 17).

A weakness of this study is that the methods used to elicit grammatical performance and output appear to have had more impact on the results than the extensive reading that it set out to explore. It is perhaps the case that the effect of the testing could have been reduced if the tests had been performed over a longer period of time and with less frequency, e.g. five times during a period of two years, or even using only pre-test and post-test. On the other hand, if this study had used only pre-test and post-test, the increased variation in week 4 would not have been noticed. Another weakness is that the results in week 8 were briefly discussed with the subject and the possibility cannot be excluded that this has had an effect on the results in week 37. However, that would further mitigate against the supposed effects of input. A third weakness is the second ‘head’ test, which could have been better designed. Pictures would have made the test clearer.⁵⁷ It would have been easier for T to understand what possible meaning a strange expression like *flower cat* could have had. Then, the possibility of T choosing a word merely because it sounds like something that could exist might have been avoided. On the other hand, this strategy indicates T’s focus on meaning and he might have used the same strategy with pictures, e.g. that it is more likely that a flower resembles a cat, and therefore has ‘cat’ included in its name, than that a cat which has been decorated with flowers would get a special name. However, more carefully invented compounds could have reduced that problem. Furthermore, the examination of ‘heads’ should perhaps have been

⁵⁷ Pictures were used in the test described by Clark (2009, Kindle Locations 7027-7040).

divided into different categories, e.g. N + N compounds, Adj + N in noun phrases and Adv + Adj in adjective phrases to ensure that an equal number of each type was included in the different tests and the translation task.

6. Conclusion

This case study aimed to answer the following question: *To what extent, and in what ways, does extensive reading affect output and grammatical performance?* The theoretical starting point was Dynamic Systems Theory, although Error Analysis, Krashen's 'input hypothesis', Schmidt's 'noticing hypothesis' and Swain and Lapkin's 'output hypothesis' were also considered. The case study subject was a PhD student in chemistry. His main exposure to English during the study period was reading of scientific literature. The subject was requested to write sentences of free choice in order to provide interlanguage data. Furthermore, three accuracy tests were designed to elicit the effects of extensive reading. These tests were later complemented with two other tests and translation tasks in order to obtain more data on the investigated grammatical structures.

This study did not find any direct, unquestionable relationship between extensive reading and grammatical development. Although grammatical development took place, it often did so during the output tasks instead of between the test weeks. When development did appear between the test weeks, it is unclear whether the improved results are related to grammatical development or vocabulary. Furthermore, if they are related to grammatical development, it is still unclear whether they are an effect of extensive reading, or triggered by previous tests. Therefore, this study can neither confirm nor dispute that extensive reading has influence on output. Furthermore, input may have had important indirect effects on output that were not measurable by the tests. However, the study indicates that noticing and focusing on form, rather than merely focusing on meaning, are beneficial, or even crucial, for grammatical

development. Consequently, this study supports the ‘noticing hypothesis’ and the ‘output hypothesis’, while being less certain about the ‘input hypothesis’, especially the claims that focus on meaning is essential and that teaching grammar can only affect monitored production. The findings are also compatible with Dynamic Systems Theory. Regarding Error Analysis, this study shows that EA has several flaws.

Various learning strategies were found in the study, most of them related to meaning, but some to form. It should also be noted that the study subject was more motivated to improve comprehension than accuracy. Thus, it cannot be excluded that extensive reading has greater effects on grammatical development when subjects are interested in accuracy. However, that would then indicate some degree of focus on form while reading.

The main obstacle encountered in the study was that the methods used to elicit grammatical performance and output appear to have had more impact on the results than the extensive reading, thus making it hard to draw any reliable conclusions about the effects of extensive reading.

However, what has been perceived as the main obstacle may also be interpreted as indicating that output is an effective way of improving grammatical performance and that extensive reading may need output as a complement to be effective, rather than being effective by itself, at least for adult learners who focus strongly on meaning. Further studies with similar subjects are needed in order to compare the effects of extensive reading alone, output alone, and a combination of both reading and output although, admittedly, complete isolation of input and output is unrealistic.

Another finding from this study that would be worthy of investigation is the effect of presenting grammar structures, such as ‘to-infinitives’ and bare infinitives, in sequence or simultaneously, in order to ascertain whether this leads to any difference in performance.

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Appendix 1

Scrambled sentences week 4 (here in correct order)

This technique has been used for many years.

The carbon deposited films were characterized by XPS.

The results are summarized in Table 1.

They make chemical processes more efficient.

This indicates a high degree of surface roughness.

This value reflects hydration.

Figure 1 shows a typical response.

There is a considerable increase.

The deviation is not fully understood.

There is no contamination in the solution.

The oxidation/reduction peaks do not appear.

Is carbon a promising material?

Why did the background currents decrease?

Does carbon have a wider potential range?

Appendix 2

Judgment of grammaticality test week 8

(Heads in yellow/bolds, modifiers in blue/italics and omitted pronouns in grey/underlined. These were added for the readers and not part of the test given to T.)

Ponga una cruz antes de las oraciones incorrectas. Si sabe que es el error (o los errores como hay varios errores en algunas oraciones) por favor subraya la palabra. Si algunos errores son más fáciles explicar oralmente, no necesite subrayar. Hay diferentes tipos de errores: a veces necesita cambiar palabras, a veces mover, a veces quitar y a veces añadir. Ponga atención que algunas oraciones son preguntas!⁵⁸

1. Standard electroactive **species** were used to investigate the **behaviour** *kinetic* of model redox **species**.
2. The **parameters** *principal* are summarised in Table 1.
3. The capacitance was similar in both electrolytes.
4. Was not possible to use NTP for these test.
5. How is the **composition** *chemical* defined?
6. Every **material** *crystalline* has its own *X-Ray* **pattern**.
7. Is not possible to extract any **information** *kinetic* or estimate the *electroactive* **area**.
8. Further studies are necessary to clarify this effect.
9. Not is known how the materials will to perform in the *aqueous* **phase**.
10. The *film* **mass** *typical* was 20 ug.
11. *Large mass* **changes** do not occur during **scans** *anodic*.
12. The electrolyte not contain cations.
13. Both *cyclic* **voltammograms** and **curves** *mass-potential* were obtained simultaneously.
14. Experiments in *acid* **solutions** revealed a **behaviour** *different*.

⁵⁸ Put a cross before the incorrect sentences. If you know the error (or the errors as there are several errors in some sentences), please underline the word. If some errors are easier to explain orally, you don not need to underline the word. There are different kinds of errors: sometimes you need to change the words, sometimes move, sometimes take away and sometimes add. Pay attention, some sentences are questions!

Appendix 3

Fill in the gaps test week 1

Llena los vacíos con estas palabras. Hay más palabras que huecos. (Fill in the gaps with these words. There are more words than gaps.)

Palabras (words):

never	because	the other of
have been	addition	everywhere
stability	due to	located
together with	the other one	firstly
through	widespread	one of
each		

Zeolites are microporous aluminosilicates with well-defined crystal structures that have found _____ applications, _____ their particular ion exchange properties, acidity, catalytic activity, thermal _____ and shape selectivity. Owing to their remarkable characteristics, _____ their commercial interest, there has been much progress in the synthesis of zeolites and several new framework topologies _____ prepared.

MCM-22 zeolite (MWW framework type) was _____ synthesized by Mobil in 1990 and has a very original structure. Its framework topology is comprised of two independent bidimensional pore systems, _____ accessible through 10 MR openings _____ on the ab-plane. _____ the pore systems is formed by sinusoidal channels delimited by 10 MR (4.1 Å x 5.1 Å) with intersections of (6.4 Å x 6.9 Å). _____ is constituted by large supercages with 12 MR (inner diameter 7.1 Å and 18.2 Å height) each connected to six others _____ 10MR windows (4.0 Å x 5.5 Å). In _____, the outer surface of crystals presents large 12 MR pockets (also denominated as hemicages or cups) which correspond to half supercages (diameter of 7.1 Å, depth of 7.0 Å) (Silva Matias, 2008, p. 3).

Appendix 4

Translation task week 37

Traducza estas oraciones (Translate these sentences). [Note that spelling errors are also T's.]

1. ¿Es posible usar otro método? Is it possible to use another method/is possible to use another method?
2. Pienso ir a Paris mañana para trabajar. I think, I will be to Paris tomorrow for working.
3. El artículo será escrito en inglés. The article will be (written) wrote in English.
4. En el futuro el carbón será un material muy importante. In the future the carbon will be a material very important.
5. Hay muchos problemas con este equipo. There are many problems with this equipo/device.
6. ¿Cuanto tiempo estarás en Paris? (How time did you) How time will you be in Paris?
7. Voy a usar el mismo film de carbón mañana. I am goint to use the same carbon film tomorrow.
8. ¿Es posible estimar alguna información cinética? Is it possible to estimate (some) any cinetic information?
9. Pienso escribir la tesis en inglés. I think I go to write the rapport/thesis in English.
10. ¿Puedo tomar un café? Can I take a coffee?
11. Vamos a probar una técnica diferente. We go to try a different technique.
12. Estos electrodos activos vamos a usar en un experimento importante. Theses active electrodes will use in another important experience.
13. ¿Vas a estar en el laboratorio todo el día? Will/would you be in the laboratory everyday?
14. Puedo ver que esta solución ácida tiene un comportamiento diferente. I can see this acide solution have a different comportment.
15. Los parámetros principales están descrito en este libro. The principales parameters are described in this book.

Appendix 5

Heads produced in the ‘free writing’. Yellow/bolds are heads and blue/italics are modifiers.

Numbers refer to which weeks these words were produced.⁵⁹

<i>These</i> [thesis] project	1	<i>Most important</i> languish	1
<i>PHD</i> project	2, 3, 37	<i>English</i> Languish	3
<i>PHD</i> students	2	<i>mother</i> Languish	3
Students <i>foreingers</i>	3	<i>Sweden</i> foot [food]	37
<i>Doctorate</i> degree	1	<i>Sweden</i> people	37
<i>Fuel</i> Cell	2, 4	<i>Latinoamerican</i> people	1
<i>Experimental</i> partie	1	<i>european</i> people	1
<i>high</i> CaCO3	1	<i>european</i> crisis	1
<i>Scientific</i> world	1	<i>country</i> culture	1
<i>coupling</i> methode	2	<i>People</i> culture	37
Methods <i>hard templating and soft templating</i>	4	<i>Loisirs</i> [leisure] preference	37
size <i>differents</i>	4	Prix <i>Nobel</i>	37
<i>relevated</i> [relevant] information	2	<i>Gouverment</i> Palace	37
the laboratory <i>SOLEIL</i>	4	<i>International</i> meeting	3
Laptop <i>more performance</i>	2	<i>French</i> citoyenne [citizen]	3
<i>Second Hands</i> magazines	2	Synchrotron <i>French</i>	4
<i>Social</i> Security	1	<i>European</i> Synchotron	4
<i>Social security</i> card	2	<i>French</i> course	4
<i>“origin”</i> software	3	Course <i>impedance</i>	4
Water <i>ultrapure</i>	37	<i>impedance</i> course	2

⁵⁹ Note that spelling errors are also T’s.

<i>destiled</i> water	37	<i>impedance</i> analysis	2
<i>AC</i> electrogravimetry	2, 3, 4, 37	<i>piezoelectric</i> effect	3
<i>AC</i> electrogravimetric technique	37	interface <i>electrode/electrolyte</i>	3
<i>EQCM</i> technique	37	<i>negative</i> electrode	4
<i>Electrochemical quartz crystal microbalance</i>	37	<i>Kinetic</i> process <i>oxide/reduction</i>	4
<i>quartz</i> crystal	37	<i>Thin</i> film	37
<i>electrochemical</i> characterization	37	<i>carbon</i> films	37
<i>Electrochemical impedance spectroscopy</i>	37	<i>carbon</i> films <i>nanostructured</i>	37
<i>Storage</i> device	37	<i>Best carbon</i> films	37
<i>Storage</i> device applications	37	<i>carbon</i> materials	37
<i>Au</i> surface	37	<i>solution</i> <i>carbon</i>	37
<i>thermique</i> treatment ⁶⁰	37	<i>Masse</i> insertion/expulsion	37
<i>Cyclic</i> voltametry	37	<i>Masse</i> variation	37
<i>plotter figures</i> voltammogrammes	37	<i>potential</i> variation	37
<i>plotter</i> current	37		

⁶⁰ T has first written *treatment thermique* and then crossed it out and corrected.

Appendix 6

Heads produced by T in the ‘scrambled sentences’-tests. Yellow/bolds are heads and blue/italics are modifiers.

Word combination	Week	Comments
chapter IV-VII ⁶¹	1	T is considering whether ‘ <i>chapter IV-VII</i> ’ should be like in Spanish or the opposite way, i.e. ‘ <i>IV-VII chapter</i> ’, but finally says he prefer the same order as in Spanish.
chemical processes	1	T plays around quite a few times with the two words, before he settles on the pre-modified order.
Carbon films deposited	4	T is quick to put ‘ <i>carbon films</i> ’ together (carbon films play a central part in his thesis), but <i>deposited</i> causes him problems. He tries it in a pre-modifying position, but changes it to a post-modifier. He also says that he is sure the sentence works without <i>deposited</i> . When asked he can tell that it is an adjective.
chemical processes	4	T puts the words in order without hesitating (cf. week 1).
Typical response	4	T first puts ‘ <i>response typical</i> ’, but then changes it. When asked why, he says that English is the other way round.
There is a increase considerable	4	On an early stage T decides that ‘ <i>is a increase</i> ’ should go together, but the other words are confusing him. He says he know how to make it a question though. When asked to do so he puts ‘ <i>Is there a increase considerable?</i> ’ Then he is asked to change it into a statement and now he quickly changes the order of <i>there</i> and <i>is</i> .
Understood fully	4	T says that ‘ <i>understood fully</i> ’ and ‘ <i>fully understood</i> ’ are both possible in Spanish. Therefore, he cannot use his ‘English is the other way round’-rule.
Oxidation/reduction peaks	4	The words are right from the beginning.
Material promising	4	T is confused by the <i>-ing</i> ending and says that it usually goes with <i>is</i> . At the end he decides that here <i>promising</i> will go with <i>material</i> and he tries both ‘ <i>material promising</i> ’ and ‘ <i>promising material</i> ’ several times.

⁶¹ This example is included to show T’s insecurity regarding which words are reversed in English.

background currents	4	The two words are put together without hesitation.
Wider potential range	4	First T puts ' <i>range potential</i> ' and then he changes to ' <i>potential range</i> '. He says that he does not know what <i>wider</i> means. Later on, after struggling with other words, he decides that <i>wider</i> is the same form of word as <i>better</i> and puts it in front of ' <i>potential range</i> '. At that time he points at the three words and comments that he does not know the internal order of these words and he tries ' <i>wider potential range</i> ' and ' <i>wider range potential</i> ' several times. He also comments that it does not seem very important in which order they go. When asked about the possibilities in Spanish he says that in Spanish it would be ' <i>rango de potential</i> ' and it should therefore be with <i>of</i> in English. Since there is no <i>of</i> , he decides that <i>potential</i> should go before <i>range</i> .
electrochemical behaviour	8	It should be noted that the week 8 test is done differently (See Section 3.3). The two words are put together without hesitation.
Sections following	8	<i>Following</i> is moved around, but is never put before <i>sections</i> .
particularly surprising	8	T first puts ' <i>surprising particularly</i> '. The <i>-ing</i> ending confuses him and he wants to have it close to <i>is</i> , saying that <i>-ing</i> always goes with <i>is</i> (cf. week 4). He says that <i>particularly</i> is an adverb and compares with another sentence where the adverb goes before the verb. He finally sets on ' <i>particularly surprising</i> ' for "una tontera del ingles" (app. the 'silliness' of English).
Considerable increase	8	T moves the two words around commenting that he does not know which should go first. He is asked about the word classes and after some hesitation decides that <i>increase</i> is a noun and <i>considerable</i> an adjective. As this does not seem to help him much, he is asked if the adjective goes before or after the noun.
Oxidation/reduction peaks	8	No hesitation. When told that he does not seem to hesitate, T says he knows due to knowledge of the subject.
Redox activity	8	The words are moved several times. When asked how it would be in Spanish, he decides on ' <i>redox activity</i> ' commenting that it should be the other way round in English.

Film deposited	8	At first <i>deposited</i> is put before <i>film</i> , but T quickly changes it.
Topographical alteration	8	T first puts ' <i>alteration topographical</i> '. Then he holds the two cards in his hand for a while, thinking. When he puts the words in correct order he appears to do it with some hesitation.
Promising material	8	T moves the words a lot before deciding on ' <i>material promising</i> ' although he has translated it into ' <i>material prometedor</i> '. Not until he is asked about word classes does he change the order.
fully understood	8	No hesitation (cf. week 4).
Redox responses	37	It takes some time before T places <i>redox</i> in front of <i>responses</i> , but he never considers putting <i>redox</i> after <i>responses</i> . The correct noun phrase should have been <i>broad redox responses</i> , but since T does not know what <i>broad</i> means, he guesses it is an adverb and places it in front of a verb.
Initial cycle	37	No hesitation. T mentions how it would be in Spanish and feels sure it is the other way round in English.
consistently different	37	T is worried that the order is the same as in Spanish. He says he must apply the 'sound rule', i.e. he reads the whole sentence aloud with the two different possibilities trying to hear what is correct ⁶² . Directly afterwards, he says <i>different consistently</i> sounds wrong. Then, he tries several times and becomes more insecure. He says in Spanish <i>consistently</i> could be in several positions. He also points out that he understands the sentence, although he is unsure of the order.
average pore size	37	T first puts <i>size poor</i> , hesitates, but changes to <i>poor size</i> , translating aloud into Spanish and applies his 'opposite rule'. Later, he finds <i>average</i> and places it before <i>pore size</i> .
relatively large	37	T comments that it is the same problem as in <i>consistently different</i> , but decides to leave it in the same order, even though he is not sure.
electrochemical properties	37	No hesitation.
difference significant	37	No hesitation. T focuses on other problems in this sentence. However, after he has begun the next sentence, he comments that

⁶² Although T has not referred to this strategy before, when asked, he says that he has used it many years.

		he understands this sentence, although he is unsure of the order. He says understanding is more important for him and that “Google translator” ⁶³ can probably do the order.
samples densities different areal	37	T shifts between <i>samples densities/different areal</i> and <i>samples areal/different densities</i> . He thinks <i>areal</i> is the same as <i>area</i> , but he is not sure. Even though the answers are incorrect, there is no head order problem.
increasing electrolyte concentration	37	First, T puts <i>concentration electrolyte</i> . Then, he says <i>increasing</i> is a noun, putting it before <i>concentration electrolyte</i> . The whole sentence is difficult for him, but he is sure <i>concentration</i> and <i>electrolyte</i> go together. Although, almost straight after that he says it is probably in the opposite order and corrects it.
AC electrogravimetry	37	No hesitation (cf. ‘free writing’).
powerful dynamic technique	37	The first placement is <i>technique dynamic powerful</i> , then <i>dynamic technique powerful</i> , then <i>powerful dynamic technique</i> . T hesitates, but points to <i>technique</i> and says it is a noun. He concludes that the order of <i>dynamic technique</i> should be ok, again applying his ‘opposite rule’. He says what he does not like is <i>powerful</i> and he plays around with the card before and after the other two words. He classifies <i>powerful</i> as an adverb and says he does not know where to put adverbs. “Están como quieren” (appr. ‘They go where they want’). T compares with previous sentences and decides he wants <i>powerful</i> before.
high porosity good mechanical properties	37	He puts <i>high porosity</i> and <i>mechanical properties</i> as two different pairs at an early stage. <i>Good</i> is also put in the pre-modified position and his main problem is whether he should interchange <i>high</i> and <i>good</i> . He comments that he has never heard <i>good porosity</i> , but <i>high porosity</i> . Although, when he tries to remember he becomes insecure. Then, he says that for chemists the porosity is more important and because of that he decides on <i>high porosity</i> .

⁶³ T refers to ‘Google translate’.

Appendix 7

Results from the 'translation'. Yellow/bolds are heads and blue/italics are modifiers.⁶⁴

<i>Different</i> countries	8	<i>different</i> technique	37
<i>Petroleum</i> Enterprise	8	<i>active</i> electrodes	37
<i>News</i> techniques	8	<i>important</i> experience	37
<i>Material</i> <i>very important</i>	37	<i>acide</i> solution	37
<i>carbon</i> films	37	<i>different</i> comportement [behaviour]	37
<i>cinetic</i> information	37	<i>principales</i> parameters	37

⁶⁴ Note that spelling errors are also T's.