Implicit and Explicit Instruction: What Type of Knowledge is Promoted?

An Empirical Study Investigating the Effects of Processing Instruction, Metalinguistic Rule Instruction and Textual Enhancement

By

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Declaration

I declare that this thesis is my own work. I also declare that no parts of this thesis have been submitted for the award of a degree elsewhere.

The length of this thesis does not exceed the regulation including footnotes, references and appendices.

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Abstract

Research has shown that input is essential to second language (L2) learning, but input alone may not always be enough for learning to occur. Specifically, adult learners need a pedagogical intervention such as form-focused instruction in order to gain proficiency in the L2. Form-focused instruction varies in its levels of explicitness as it comprises implicit types of training such as input enhancement and more explicit interventions like processing instruction. The effectiveness of implicit and explicit form-focused instruction has not been conclusive. Namely, there is contradicting evidence about whether both implicit and explicit form-focused instruction promote implicit or explicit knowledge respectively or whether each promotes both types of knowledge. There is also no certainty about the types of target forms that are more likely to be learned through implicit or explicit instruction.

The present study addresses these shortcomings by reporting the main findings of a lab experiment conducted over a six-week period with university students learning English in Mexico. A pool of 124 learners of English as a foreign language participated. The linguistic target chosen for this study was the use of three prepositions: *in*, *on* and *by* which co-occur in the context of forms of transportation. Measures of implicit and explicit knowledge were used before and after giving all participants three training sessions to assess their progress. A delayed posttest was used to measure if any of the treatments had any long-term effects.

Participants were randomly assigned to four different training conditions which varied in their degrees of explicitness. All participants except for those assigned to the control condition received exposure to textual enhancement. The textual enhancement condition did not involve any explicit type of instruction. The metalinguistic instruction

condition comprised an explanation of three target rules in addition to textual enhancement. The processing instruction condition consisted of an explanation of the target rules plus the completion of structured input activities prior to exposure to textual enhancement.

The current study investigates the type of knowledge that both implicit and explicit form-focused instruction promote. It also provides evidence of the delayed effects of each training condition. In addition to using the pre-posttest offline measures, this study also analyses participants' output produced during the training sessions. The results reveal that processing instruction, the most explicit treatment, fostered the most learning whereas textual enhancement, the implicit treatment, was less effective. Namely, textual enhancement led to explicit knowledge of the three target prepositions, and it facilitated the acquisition of implicit knowledge of the preposition *by*, but it did not promote implicit knowledge of the prepositions *in* and *on*. On the other hand, both explicit treatments (metalinguistic instruction and processing instruction) promoted implicit and explicit knowledge of the three target prepositions. In addition, there was less knowledge decay across time due to the explicit treatments. The findings are discussed in terms of the theoretical and pedagogical implications.

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Chapter 1: Introduction

1.1 Context of the Study

Second language acquisition (SLA) has had a wide range of teaching approaches over time. These have varied in the degree of emphasis on meaning or form as their primary goal. While approaches such as the audiolingual method have focused on learners' accurate acquisition of forms (R. Ellis, 2006), other approaches such as the communicative approach have concentrated primarily on enabling learners to become proficient at communicating in the target language (see Krashen & Terrel, 1983). In many cases, the methodologies implemented in the field of SLA have been based on contradicting premises about how language is acquired.

There has been ample debate about the role of instruction in the process of second language (L2) acquisition. Specifically, there has been controversy about whether instruction is necessary in order for learners to acquire target forms (see Spada, 2013). Another issue that is subject to debate is the following: assuming that instruction is necessary or beneficial, what are the aspects of an L2 that require instruction? Should all target forms be taught or are there some target forms that can be discovered by the learner incidentally?

These questions continue to steer substantial amounts of research in the field of SLA (see Cox, 2017; Shintani, 2013; Spada, 1997b). While the above questions can only be partially answered with the existing evidence from empirical studies, the field has advanced in that it has reached consensus on key principles. One of these is that subliminal learning of an L2 is not possible. Moreover, it is widely accepted in the field of SLA that it is beneficial for learners to notice formal aspects of the L2 (Leow, 2013; 2015; Schmidt, 1990; Robinson, 1995). According to Schmidt, allocating focal attention to specific aspects of an L2 allows learners to notice specific linguistic features. Schmidt (2010, p. 726) defined noticing as the "conscious registration of attended specific instances of language". For example, if a learner of German reads a text and consciously realizes that some nouns follow the article *das* and other nouns follow the article *der*, the learner is noticing formal features of the L2 regardless of whether he/she can understand why these articles are different. Although there is disagreement on the necessary role of noticing, it is also widely accepted that the more learners notice, the more likely they are to learn (see Schmidt's, 1993 noticing hypothesis). Additionally, there has been extensive empirical research supporting the beneficial role of noticing in L2 acquisition (see Faretta-Stutenberg & Morgan-Short, 2011; Hama & Leow, 2010; Hanaoka, 2007; Leow, 1997; Leow & Donatelli, 2017; Lindseth, 2016).

It is often the case that instructors of English as a foreign language (EFL) teach learners a target form by providing them with an explanation of the rules. Students are then given practice exercises that require them to use the target forms orally or in writing. Sometimes learners are able to improve their use of the target forms in untimed written tests, but they may not be able to know how and when to use them in circumstances that require spontaneous use of the L2 (see R. Ellis, 2009; Hulstijn & Hulstijn, 1984; Hulstijn & de Graff, 1994; Krashen, 1985). It is thus important for language instructors to implement additional pedagogical interventions which may enable learners to use the target language in unplanned situations.

Research in L2 acquisition has revealed that some forms can be learned through extensive exposure and without any overt explanation from the teacher. For example, Jahan and Kormos (2015) found that providing repeated exposure to the modal auxiliary verb *will* enabled learners to produce this form more accurately. Similarly, Song and Sardegna (2014) revealed that due to extensive exposure to prepositions in English, learners were able to increase their noticing of the target forms and to correct those that were wrong. Also, Szudarski and Carter (2016) discovered that by using a pedagogical approach that did not involve any type of explanation of the target forms, learners were able to recall and recognize verb-noun and adjective-noun collocations in English. However, there are still questions about this issue that remain unanswered. For instance, it is still unknown what characteristics a form must have in order for it to be eligible for implicit instruction which does not include the explanation of formal rules. It is also not certain whether mere exposure to formal aspects of the target language can ultimately result in the type of knowledge that is required for learners to communicate accurately in the L2.

The aforementioned questions are of great concern to teachers of English as a foreign language in many different countries. Mexico, the country where the current study was carried out, is not an exception. In Mexico, depending on the language instructor or on the school's policy, foreign language instruction can be taught with primary emphasis either on meaning or on form. In some universities English as a foreign language is commonly perceived as any other academic subject, and students are expected to learn rules about the language and to practice grammar rules and vocabulary through drilling exercises. Instructors that focus mostly on grammar have relied on the use of drills with the purpose of having learners practice particular target forms. Their premise is that after extensive drilling, learners will be able to use the target forms accurately not only during the completion of grammar exercises but also for communication purposes (see Chastain, 1971; Paulston, C. B., & Bruder, 1976; for an explanation of how automatization was thought to be achieved through drilling).

In contrast, some language institutions in Mexico implement a communicative approach through which learners are expected to use the target language for conveying and understanding meaning (for an example of a communicative approach, see Krashen & Terrel, 1983). The result of this type of instruction is that after years of studying English, learners may feel confident enough to speak the target language with native or non-native speakers, but they typically lag behind in terms of grammar accuracy (Harley, Cummins, Swain, & Allen, 1990). Because they have little or no exposure to English outside of class, some learners do not practice the target language enough or they do not get sufficient feedback. As a result, they reach a stage in their language proficiency in which they can communicate, but they make mistakes frequently.

Grammar is not just the only area in which learners of English as a foreign language fossilize errors. After taking several years of English classes, students still lack pragmatic awareness in English (Kasper & Rose, 2002; Kasper & Schmidt, 1996). That is, they do not know what to say or how to respond in situations that require fluent and spontaneous use of English. Pragmatic awareness is also commonly absent in students' writing. It seems that learners in Mexico are expected to infer some grammar and pragmatic forms from the input that they receive. For example, in the case of prepositions, language instructors do not typically explain to students the wide range of meanings that each preposition can carry depending on the context in which it is used. Hence, students do not learn how to use some prepositions very accurately even at high-intermediate levels. Instead, they may rely on analogies based on their first language (L1) which in many cases do not correspond to the same meaning in English.

1.2 Statement of the Problem

An issue that has been relevant to both SLA theory and practice has been how instruction plays a role in helping learners acquire the knowledge that is necessary to communicate fluently and accurately in an L2. On the one hand, learners need to know facts about the language, also labelled declarative knowledge. On the other hand, they also need to be able to use the L2 under time pressure and with little effort; this is labelled procedural knowledge (see DeKeyser, 1997; Ullman, 2015). Explicit knowledge can be declarative if learners are able to verbalize the rules of particular features in the L2, and implicit knowledge can be procedural if learners spontaneously know how and when to use a specific formal aspect of language. It is of central importance for SLA to discover the necessary elements that are required in order for learners to acquire both explicit declarative knowledge and implicit procedural knowledge.

Even though the goal is for learners to acquire both types of L2 knowledge, there is little evidence indicating how this can be accomplished. Explicit instruction tends to lead to explicit knowledge according to Shintani, Aubrey, and Donnellan (2016), and implicit instruction can in some cases lead to implicit knowledge (see DeKeyser, 2008; Leung & Williams, 2012). However, there is no certainty that explicit instruction can result in some implicit knowledge or that implicit instruction can result in some explicit knowledge. Few studies have tested whether explicit instruction can promote any type of implicit knowledge in addition to explicit knowledge. One exception is Akakura (2012) who found that explicit instruction can result in both explicit and implicit knowledge. Other studies such as Lyster (1994) and Muranoi (2000) have found that explicit instruction provided during a task in which learners have to focus on meaning can promote accuracy in unplanned speech. This suggests that explicit instruction can be beneficial to both implicit and explicit knowledge. Even less research has been done investigating whether implicit instruction can lead to some explicit knowledge in addition to implicit knowledge.

The role of explicit instruction in L2 acquisition has been extensively explored

(Goo, Granena, Yilmaz, & Novella, 2015; Loewen & Sato, 2017; Norris & Ortega, 2000; Spada & Tomita, 2010), and many questions still remain unanswered. Some questions that are central to the field of SLA, and which many language instructors ask are: at which level of proficiency is explicit instruction more promising? With which types of target forms should explicit instruction be used? Which types of target forms do not require explicit instruction? An additional important question in language instructors' agendas is: can explicit instruction ultimately result in the type of knowledge that is needed for learners to communicate effectively?

Another question among language teachers is whether their students can gain metalinguistic knowledge as a result of mere exposure to target forms. Evidence appears to show that explicit instruction is more effective than implicit instruction when the goal is for learners to become able to verbalize a rule governing the use of a target form. This is an important issue for L2 acquisition because metalinguistic knowledge has been found to be beneficial for learners not only for the purpose of knowing about the target language, but also to acquire higher levels of attainment (see Sanz & Morgan-Short, 2005).

1.3 Aim and Scope

Using a computer interface as part of the assessment and treatment delivery, the current study aimed at shedding some light on the impact of implicit instruction on adult second language learners. In addition, it sought to offer an insight about the effectiveness of explicit instruction when it is combined with implicit instruction in order to boost learning. It also attempted to compare the effectiveness of two explicit interventions. The findings will be discussed in terms of the theoretical and pedagogical implications for SLA.

There are limitations in the scope of the current study. For example, while there is research on implicit and explicit instruction that focuses on the effects of written and oral input (see Lyster, 1994; Muranoi, 2000; Nguyen, Pham, & Pham, 2012), the current study will only focus on written input and output. Also, whereas some research investigates different types of instruction within the context of a classroom (Benati, 2005; Ellis, Loewen & Erlam, 2006; Spada & Lightbown, 1999; Spada, Lightbown & White, 2005; White & Ranta, 2002), the current experiment will be laboratory based. Therefore, the findings will not necessarily concord with those of previous studies done in classrooms.

1.4 Significance of the Study

This study has both practical and theoretical significance. First, the purpose was to test the effectiveness of three different treatments with varying degrees of explicitness. This issue is of great relevance for instructed second language acquisition because as Rodríguez-Silva and Roehr-Brackin (2016) explained, second language instructors have limited instruction time, so they need to make informed decisions about when learners are better off discovering the rules of target forms incidentally, and when explicit instruction is needed.

Also, there is still no consensus about the long-term effects of both implicit and explicit instruction, and this is a matter of importance for second language teachers. The current study aims to shed light on this issue because ultimately, one of the language teachers' goal is that students retain their learning across time. Additionally, it seeks to provide an insight into this matter by testing if the knowledge acquired through both implicit and explicit treatments will be retained over a two-week period after the training has ended.

The theoretical intended outcome of this study is to contribute to the field of SLA by increasing the existing knowledge about the benefits of providing L2 learners with explicit instruction prior to implicit training. This is of major concern because there is still no agreement or certainty about the type of knowledge that results from a pedagogical training comprising both an explanation of the target forms and implicit exposure to the linguistic targets. Therefore, learning more about what learners are able to do with the knowledge gained from this type of instruction could provide important insights in the field of SLA.

1.5 Overview

This thesis elaborates on issues related to theory, piloting of instruments, the main experiment and the findings of both the pilot and the main experiment. In order to provide more clarity, it comprises six chapters which are distributed in three subsections. Section one provides the theoretical and methodological rationale for conducting the main experiment, and it includes the pilot study and its findings. Section two focuses only on the main experiment and on its outcomes. Section three provides a general discussion supported by the results in both the pilot and in the main experiment. Based on this rationale, I will illustrate how the chapters are distributed in the three sections.

In chapter 2, I provide a review of current theory on implicit and explicit instruction. I also discuss the relevance of studies that have sought to investigate the effectiveness of explicit instruction and implicit instruction. In chapter 3, I explain the methodology that was implemented for the pilot study along with its findings, and I discuss them in light of previous research. In addition, I discuss the implications that the pilot study had on the main study.

Chapter 4 describes the population and explains the methods that I followed in order to collect data for the main study. It also explains in detail the changes that were made to the design of the main study as a result of the findings from the pilot study. Moreover, it displays the findings from the main study. Specifically, it describes the statistical tests that were used in order to assess the learning effects of each group, and it provides an explanation of the findings considering the existing related research, and it addresses the theoretical and practical implications of the results.

Chapter 5 discusses the differences and similarities between the findings from the pilot study and the main study, and it provides theoretical accounts for the differences. Finally, chapter 6 explains how each aim of the study was met, and it elaborates on the relevance and significance of meeting the intended objectives. It concludes by suggesting future directions.

Chapter 2: Literature Review

Two constructs in SLA are fundamental in order to understand the implications of learning a second language: implicit and explicit knowledge (R. Ellis, 2008). This chapter begins by defining and explaining these two concepts. Then it provides an overview of four types of form-focused instruction, and it explains the need for further research. In addition, it describes the findings from artificial language studies investigating implicit and explicit instruction. Finally, this chapter closes by discussing the theoretical implications of research on implicit and explicit instruction.

2.1 Implicit vs. Explicit Instruction and their Effect on Implicit and Explicit Knowledge

The distinction between implicit and explicit instruction refers to the training conditions by which learners are given exposure to input in the L2 (R. Ellis, 2009a). Henceforth, input will refer to "the language that learners are exposed to in communicative events; language that they are attempting to comprehend" (VanPatten, 2016, p. 654). According to Spada (2014), implicit instruction does not comprise any rule explanation from the teacher or any rule search from the learner (see also Hulstijn, 2005). More specifically, implicit instruction is a type of training that attempts to teach a language feature without learners consciously thinking about what they are learning (Shintani, 2015). According to Godfroid (2016), an example of implicit instruction is when learners are given a task that requires them to focus on meaning, but they are also expected to infer a specific formal feature from the task. Implicit instruction has also been a major focus in the field of cognitive psychology under the assumption that once learners get extensive exposure to instances of the material to be learned, they can understand it without consciously attempting to do so (see Reber, Kassin, Lewis, & Cantor, 1980).

Explicit instruction, on the other hand, aims at having learners consciously attend to the learning target (R. Ellis & Shintani, 2013). It can comprise the metalinguistic explanation of a target form prior to completing a meaning based task, or it can consist of a deliberate instruction to pay attention to a language feature in order to infer its underlying rule (Norris & Ortega, 2000; 2001). According to Schmidt and Frota (1986), some features within the input are not readily noticeable to the learner, so explicit instruction can potentially make them stand out. Therefore, an important aspect of explicit instruction is not only that it attempts to explain a specific target form, but also that it tries to direct learners' attention to an aspect of the L2 that would otherwise be difficult for learners to notice (Schmidt, 1990; Skehan, 1998).

There is ample interest in the field of SLA about how implicit and explicit instructional approaches impact the acquisition of implicit and explicit knowledge respectively. This interest originates because ultimately, both implicit and explicit knowledge of a target language are desirable in order for learners to cope with the demands of using the L2 proficiently (R. Ellis, 2005). While there is still debate on the effects of implicit and explicit instruction (see N. Ellis, 2015; Faretta-Stutenberg & Morgan-Short, 2011; Godfroid, 2016; Kachinske, Osthus, Solovyeva, & Long, 2015; Leow & Donatelli, 2017; Leung & Williams, 2012; Morgan-Short, Steinhauer, Sanz, & Ullman, 2012; Rogers, 2017; Williams, 2005), overall there is general consensus that implicit and explicit language learning cannot occur without exposure to comprehensible input in the L2. However, there is still no agreement on whether some level of noticing of the forms in the input is required. On the one hand, according to Tomlin and Villa's (1994) model, it is possible for L2 learning to take place if an individual simply detects the stimuli or the input without necessarily being aware of the experience or without being able to explain the stimulus or information that was detected. On the other hand, according to Schmidt (1993), in order for learning of a target form to take place, learners need to notice at the level of apperception not only the input in general, but also specific features that are related to the target form. Schmidt (1990) defined noticing as paying increased focal attention to the input, so it is important to emphasize that according to this definition, noticing requires awareness. Schmidt (1994; 2001) later made a distinction between two levels of awareness (see also Leow, 2015 for a recent review). The first is awareness at the level of noticing which requires the perception of stimuli or information, and it comprises no analysis or metalinguistic awareness. The second is awareness at the level of understanding, and such awareness requires analyzing the connection between meaning and form, and it can occur during or after exposure to the input.

The role of awareness in SLA has been subject to debate. For example, according to Schmidt (2010), awareness at the level of noticing is necessary in order for L2 learning to occur, but awareness at the level of metalinguistic analysis or understanding is “facilitative but not required” (Schmidt, 2010, p. 725). Therefore, this implies that different levels of awareness may lead to different levels of knowledge. According to Izumi (2013, pp. 26-27), “one may notice only form without connecting it with meaning or function. Noticing only form may be sufficient for learning perceptual aspects of novel words, but not for learning to use the forms for communication”. In the same vein, Schmidt (2001) had also proposed that if the goal is for learners to communicate in the L2, they need not only to notice the linguistic targets in the L2, but also to understand their form-meaning mappings or the meaning that is produced by specific target features. The specific benefits of detecting, noticing or understanding a target form are still inconclusive.

Cognitive psychology has also classified two types of awareness (see Block, 2007). Phenomenal awareness, as stated by Williams (2013), is not available for verbal report, and it tends to fade away. On the other hand, access awareness is reportable, and it requires the learner to be selective about what to be aware of in the input. This characteristic is also defined as focal attention. The role of phenomenal and access awareness in L2 learning are still being investigated, and there is still no clear conclusion about whether awareness at some level is necessary or whether it simply facilitates L2 learning.

Based on the beneficial role of awareness, it is important to define the distinction between implicit and explicit knowledge and between implicit and explicit learning. According to N. Ellis (2005), when second language learners focus on the meaning of the message that is being conveyed, and when they speak spontaneously in a conversation, they rely on implicit knowledge. Similarly, implicit knowledge is also used in order to understand a message at a fluent speed, without errors (Schmidt, 1992) and in circumstances where time is restricted (Anderson, 1983; R. Ellis, 2005). As Akakura (2012, p. 10) explains, implicit knowledge "may be accessed instantaneously during spontaneous comprehension or production". According to Bowles (2011), a person can use implicit knowledge automatically and without recognizing that she is capable of performing a particular task. For example, while playing a sport, it may be possible for a person to throw a ball without noticing all the muscle movements that the body needs to make in order for the task to be completed. In this sense, implicit knowledge is intuitive as it does not require monitoring (Erlam, 2003).

On the other hand, there are other circumstances in which learners may rely on explicit knowledge, which operates in a more controlled manner (see Lindseth, 2016) and requires awareness. An example of one of many instances when explicit knowledge is used is when there is a communication problem and learners try to consciously think about language. Also, explicit knowledge is needed in order to understand and to produce meta-language. That is, every time that a person thinks or talks about language rules, explicit knowledge is required (Anderson, 2005; R. Ellis, 2004; Hulstijn, 2005). In this sense, explicit knowledge of a second language is declarative, defined by Roehr-Brackin (2015) and Roehr and Gánem-Gutiérrez (2009) as the knowledge available for report and by R. Ellis (2009) as knowledge that comprises facts about language. The aforementioned examples illustrate how the type of knowledge used by learners is greatly determined by the nature of the tasks in which they engage. For instance, tasks that require learners to use the language intuitively tap mainly implicit knowledge. On the other hand, tasks that require learners to think about language and to focus on metalanguage tap primarily explicit knowledge.

In addition, implicit and explicit knowledge can easily be confused with implicit and explicit learning. It is important to make a distinction between type of knowledge and type of learning as these are constructs that will be used recurrently in this study. The following paragraphs will explain the difference between the two concepts. Implicit and explicit learning refer to a process and implicit and explicit knowledge refer to a product (R. Ellis, 2009; Leow, 2015; R. Schmidt, 1994). According to DeKeyser (2003), implicit learning occurs without awareness. In the same vein, Reber (2011) emphasizes that implicit learning does not require effort from the learner and that it is unconscious and procedural. Zhang (2015, pp. 22-23) additionally describes implicit learning as "learning without any metalinguistic awareness".

Explicit learning, on the other hand, occurs consciously and deliberately (Rebuschat, 2013; Williams, 2009), and it requires metalinguistic awareness (DeKeyser, 1994; Zhang, 2015). In addition, explicit learning "involves the formation and memorization of rules about the structure of language" (R. Ellis, 2015, p. 418). Thus, it requires effort from the learner and it is declarative. That is, explicit learning can be useful for learning factual knowledge about the language. The distinction between implicit and explicit learning should not be conflated with incidental and intentional learning. Whereas the above dichotomy between implicit/explicit learning relates to the learner's awareness level of formal language features at the moment of exposure to the L2, the distinction between incidental learning and intentional learning refers to whether or not the learner has the intention to learn formal features of the target language (Frensch, 1998; Stadler & Frensch, 1998). For example, in cognitive psychology, incidental learning means not informing participants in an experiment that they will be assessed after their participation is over whereas intentional learning means instructing participants to focus on a specific formal feature (Hulstijn, 2003). In the field of SLA, Schmidt (1994) identified three different operational definitions of incidental learning. The first one refers to "learning without intent to learn" (see also Leow & Zamora, 2017). The second definition refers to "learning of one thing when the learner's objective is to do something else" (Schmidt, 1994, p. 16). The third definition also by Schmidt is more precise as it refers to the learning of a grammar form while the learner's main objective is to communicate in the L2. It is important to consider these different operational definitions when comparing results between studies.

Implicit and explicit learning has been studied using two main frameworks: one focusing on natural languages and the other on artificial languages. I will first present and describe a series of experiments related to implicit and explicit instruction using natural languages by explaining their significance and their impact in the field of instructed SLA. Then I will review the methodologies implemented in studies investigating the learning of artificial languages by showing their main findings and discussing their relevance to implicit and explicit instruction.

2.2 Research on Implicit and Explicit Instruction in SLA

Over the last thirty years, research in SLA has shown that certain language features of the L2 are very unlikely to be learned by mere exposure (Azaz, 2017; Comeaux & Mcdonald, 2017; Della Putta, 2016; Leow, Egi, Nuevo, & Tsai, 2003; Park, 2004). There are language forms that are very frequent in the input, yet after years of naturalistic exposure to the L2 learners may still not acquire them (see N. Ellis, 2006; 2015). An example is the difficulty with which Chinese L1 speakers learn the use of articles in English. One reason why some forms are difficult to acquire is their lack of perceptual salience, defined by Goldschneider and Dekeyser (2001) as the level of difficulty with which a form is perceived.

Perceptual salience has also been defined by Alanen (1995, pp. 261-262) as "the effect caused by quite concrete physical attributes of the target structure". Similarly, according to Loewen and Reinders (2011, p. 152), salience refers to "how noticeable or explicit a linguistic structure is in the input". Salience can commonly be confused with other related constructs such as frequency. For example, Kreuz and Caucci (2007) explain that there are stimuli in the environment that we see every day, and yet we may not be able to notice them thoroughly. A linguistic example of this distinction is the use of prepositions which L2 learners listen to frequently in the target language, but they might not be able to notice or remember their accurate usage. Namely, prepositions may be frequent in the input, but they are often not salient to learners. Salience can be caused by two types of processing: bottom-up and top-down processing (see N. Ellis, 2016). Bottom-up processing is triggered by issues related to the stimuli (Shiffrin & Schneider, 1977). For example, according to N. Ellis (2016), when we perceive data with contrasting stimuli, we are more likely to attend to it than when there is no contrast. When there is something in our surroundings that is different from everything else, such as in the case of a word that is stressed differently from the rest of the vocabulary, we are more likely to distinguish the word because of its contrasting sound. On the other hand, salience can also be driven by top-down processing caused by factors that are "emotional, cognitive and motivational" (N. Ellis, 2016, p. 343). That is, our current knowledge gained from previous experiences can make us perceive something from the environment that otherwise would not stand out from the rest of the stimuli. For example, when English language learners read a cognate in the L2, the word is likely to be salient because they can associate it with previous knowledge from their L1. Because some forms are not perceptually very salient, an explicit intervention might help learners to pick them up. Otherwise in the absence of explicit instruction, implicit training usually results in limited knowledge of target forms which does not translate into advanced communicative competence specifically in the case of adult learners (N. Ellis, 2011). Studies of instructed second language acquisition have focused on different pedagogical approaches with varying levels of explicitness. Long (1988) made the distinction between two approaches in SLA: focus on forms and focus on form. The former aims at teaching the language forms explicitly, with a focus on the target forms rather than on meaning. The latter aims at having learners complete pedagogical tasks where the focus is on meaning, and simultaneously, the teacher can draw learners' attention to specific formal aspects of language when necessary, but without distracting their attention from meaning (Doughty & Williams, 1998; R. Ellis, 2001).

Focus on forms and focus on form also vary in their level of pro-activeness and reactiveness. That is, whereas the former approach teaches target forms prior to practice, the latter teaches the target forms during practice. However, it has been debatable whether some pedagogical methods should be categorised either as focus on forms or as focus on form. As a result, Spada (1997a) used the umbrella term form-focused instruction (FFI) which comprises both approaches. Form-focused instruction refers to instructional practices in SLA that are based on the necessary role of noticing. The aim of form-focused instruction is to increase learners' attention to target forms reactively or proactively while they also pay attention to meaning. Over the last three decades, research in SLA has tested the effectiveness of different types of form-focused instruction such as input flood, textual enhancement, metalinguistic instruction, and processing instruction. These have varied in their level of explicitness with input flood being the most implicit and less obtrusive and processing instruction being the most explicit (see Doughty & Williams, 1998; R. Ellis, 2012). One of the main topics of inquiry in L2 learning research has been whether instruction plays a role or whether extensive exposure to the target language can be enough for learners to acquire the target forms. Consequently, there have been consistent comparisons between the effectiveness of explicit treatments over implicit treatments. Although each of the aforementioned training conditions can be studied in its own right as a single treatment, several studies have tested the effectiveness of combined treatments such as explicit instruction prior to textual enhancement exposure (Alanen, 1995; Indrarathne & Kormos, 2016; Park, Choi, & Lee, 2012).

In addition, an important issue that has been addressed is whether the type of instruction (implicit or explicit) can promote either implicit or explicit knowledge respectively or both. This strand of research was triggered as a reaction to Krashen's (1985) assertion that implicit and explicit knowledge are dissociated and that implicit instruction can only lead to implicit knowledge (acquisition), whereas explicit instruction can only promote explicit knowledge (learning). Research has revealed that while explicit knowledge and implicit knowledge are distinct as was stated by N. Ellis (1994; 1996) and Paradis (1994), there is interaction between both types of knowledge. For example, when a learner receives an explanation of a linguistic target, she may produce an explicit representation of it, but once the learner has consciously made the form-meaning connections, she may then unconsciously consolidate the knowledge through rehearsal (see N. Ellis, 1996; Pawley & Syder, 1983; Schmitt, 2004).

Until recently, testing the interface between implicit and explicit knowledge had not been possible due to the lack of appropriate assessment instruments which could provide relatively separate measures of implicit and explicit knowledge respectively. However, thanks to recent studies that have validated tests measuring implicit and explicit knowledge independently (see Bowles, 2011; Elder, 2009; R. Ellis, 2005; Erlam, 2009; Godfroid et al., 2015; Gutiérrez, 2013; Loewen, 2009), researchers in SLA are now implementing such designs that allow having a better understanding of the effects of implicit and explicit instruction. Nevertheless, these tests are not pure measures of implicit and explicit knowledge. They simply assess whether the knowledge that participants use in order to carry out particular tasks is primarily implicit or explicit. As Gutiérrez (2013) stated, it is unlikely that a test may assess pure implicit or explicit knowledge. For example, if a participant completes a TGJT successfully, this would be an indication that she used mostly implicit knowledge, but there is also the possibility that she used some explicit knowledge to a lesser degree if for instance she quickly used her metalinguistic knowledge to monitor her answers. That is, no measure of implicit knowledge can prevent learners from using some explicit knowledge. In the same vein, no measure of explicit knowledge can stop learners from using some implicit knowledge. For instance, if a participant completes a fill-in the blank test, there is a chance that she may rely not only on her explicit knowledge, but to a lesser degree she might also use her intuition about the L2 in order to answer the test. As R. Ellis (2005) has cautioned, a test may prompt learners to use a specific type of knowledge (implicit or explicit), but ultimately, there is no guarantee that they will. In addition, Gutiérrez (2013) has argued that although implicit and explicit knowledge are distinct, it is still not clear whether this difference should be seen as a dichotomy, or as two ends of a continuum. However, there appears to be agreement in that both implicit and explicit knowledge interact.

There is also no instructional method in L2 learning that can be considered purely implicit or explicit. For example, although input flood and input enhancement are primarily implicit as they do not comprise an overt explanation of the target forms, they cannot be considered completely implicit because their goal is to increase learners' awareness of a target form by increasing its salience. In the same vein, instructional treatments such as providing metalinguistic instruction or processing instruction are primarily explicit because the learners are given the rules of a target form. However, they are not completely explicit in that in many experiments, learners are additionally given extensive exposure to the target forms which can potentially function as implicit practice. Taking these limitations into account, the current study operationalized the type of instruction as two ends of a continuum with input flood being mostly implicit and metalinguistic instruction being mostly explicit.

Given that the current study looks at the effectiveness of implicit and explicit form-focused instruction, the following subsections will define and describe each of them (e.g. input flood, textual enhancement, metalinguistic instruction, processing instruction), and they will provide a historical overview of research investigating each of these pedagogical training conditions. First, a description of input flood studies in

SLA will be given. Then a definition of textual enhancement will be presented along with the most recent research. Third, an overview of studies testing the effectiveness of metalinguistic instruction in combination with implicit form-focused instruction will be provided. Then a description of research investigating the role of metalinguistic instruction within the framework of processing instruction will follow. The mixed findings revealed in these studies will also be discussed.

2.2.1 Input flood

Input flood is defined by Polio (2007) as the artificial increase of occurrences of a target form in a text. Every time that a target form appears in a text it is labelled a token. According to Berg (2014, p. 199), "token frequency reflects language use". That is, in a study focusing on regular verbs in past tense, each verb containing an –ed ending that appears in the text would be considered a token regardless of the number of times that this verb is repeated. Some input flood studies focus on token frequency while others focus on type frequency depending on the nature of their target form. According to Berg, type frequency is related to lexicon. That is, type frequency focuses on whether the same word is repeated many times. If a study aims at directing learners' attention by flooding lexical items such as adjective noun collocations (see Szudarski & Carter, 2016) or English articles (see Ziegler et al., 2017), then the focus would be type frequency.

Input flood has been studied in terms of its effectiveness in promoting attention to specific formal aspects of language, and it has been used by L2 instructors under the assumption that by giving learners extra exposure to specific target forms, these will become more salient, and as a result, learners will be more likely to notice them (Wong, 2005). Ultimately, the goal of input flood is to facilitate intake and to eventually promote the acquisition of the target forms. Its success has been tested by comparing it with treatments that include no input flood such as in the work by Loewen, Erlam and Ellis (2009). It has also been compared as a single variable against instruction that contains input enhancement such as the study conducted by Winke (2013) and against instruction that comprises a combination of input flood plus metalinguistic rule explanation (see Hernández, 2011). As the following literature will show, the effects of input flood seem to be very limited. Most evidence has revealed that input flood does not help learners to increase their noticing of the target forms, nor to increase intake or learning in the L2.

One of the few instances of input flood showing beneficial results was the work by Trahey and White (1993) revealing that it was effective enough for French-Canadian students to acquire the Subject-Adverb-Verb word order that is accepted in English, but it did not warn them not to use the Subject-Verb-Adverb-Object word order that is used in French. The authors concluded that flooding positive input could potentially be effective at indicating that a target form should be used, but it did not appear to be helpful at signalling that a target form should be absent in the L2. Another piece of evidence suggesting that input flood can at least in some cases be beneficial was presented recently by Loewen and Inceoglu (2016). Their findings revealed that input flood led to learners' increase of short-term knowledge of the target forms. The researchers concluded that input flood could be as effective as input enhancement at least with the imperfect tense and the simple past tense in Spanish.

On the other hand, some research has found no effects due to input flood. Loewen et al. (2009), Winke (2013) and Szudarski and Carter (2016) revealed that input flood did not promote implicit or explicit knowledge of the third person –s conjugation in English, passive forms and adjective noun collocations respectively. The authors concluded that input flood was not effective probably because the target form had very low salience, and because learners seem to have blocked the form-meaning function of the grammatical linguistic target as it was readily available within the subjects of sentences. As DeKeyser and Prieto-Botana (2015) explained, the way that learners process the input may prevent them from focusing on specific elements of target forms. These findings illustrate that input flood can be effective only in some cases and some of the reasons may be related to the target form, learners' prior knowledge of it and the number of instances that it occurs in a text. Although there is evidence that implicit knowledge can result from an implicit treatment or from a treatment that comprises explicit instruction combined with an implicit intervention, it is still not clear how much exposure is required. As proposed by Wong (2005), input flood research should aim at finding the ideal number of times needed for a form to occur in a text in order for learners to increase their noticing of it.

In light of this, research has been conducted specifically on implicit vocabulary learning (see Horst, Cobb, & Nicholae, 2005; Pigada & Schmitt, 2006; Waring & Takaki, 2003), and the findings have indicated that exposure of at least 8 to 10 instances of a word seem to be optimal for incidental learning to start occurring. However, a study conducted by Pellicer-Sánchez and Schmitt (2010) showed that with some words even one occurrence may be enough for incidental learning to take place although it was more likely to happen when words occurred between 5 to 8 times. Thus, although it is plausible in some cases for learners to acquire some lexical items after little exposure, generally in order for implicit instruction to be effective, extensive exposure to the target forms is required as Rodríguez-Silva and Roehr-Brackin (2016) have explained.

The outcomes of most studies indicate that input flood without any additional condition such as textual enhancement does not seem to be powerful enough to increase learners' depth of processing of the target forms to make form-meaning connections. As Szudarski and Carter (2016) concluded, if the objective is to increase learners' receptive knowledge of a linguistic target, input flood might be effective, but if the goal is to have learners increase their productive knowledge of a linguistic target (collocations) then it may be necessary to combine textual enhancement with input flood and with an additional treatment. In light of the limited effects of input flood and due to the need for additional types of instruction, the following subsection presents an overview of the major SLA studies focusing on textual enhancement without any additional explicit instruction treatment.

2.2.2 Textual enhancement

According to Sharwood Smith (1991), textual enhancement is any attempt to make a specific part of the input stand out to the learner. It has typically been operationalized as the typographical modification of a target form such as a syntactic or morphological structure or a lexical item. For example, several studies have used colourizing of the target forms (Della Putta, 2016; Loewen & Inceoglu, 2016; Winke, 2013), bold print (Fang, 2014; Indrarathne & Kormos, 2016; Jahan & Kormos, 2015; Park, Choi, & Lee, 2012), capitalization (LaBrozzi, 2016; Simard, 2009) and underlining (Ha, 2010). The aim is to make the enhanced forms more likely to be noticed by the learner. Because this kind of training does not require any type of explanation of the linguistic targets, it is considered a form of implicit instruction.

Over the last 25 years there has been extensive research attempting to find when and how textual enhancement can be more effective in increasing the likelihood that a target feature will be perceived by learners, that it will become intake, and that it will potentially be learned. A major inconclusive issue has been whether enhancing the input increases learners' noticing and learning of target forms. Some studies have shown that textual enhancement without the addition of any other treatment promoted learners' noticing, intake and in some studies even the learning of target forms (De Santis, 2008; Fang, 2014; Jahan & Kormos, 2015; LaBrozzi, 2016; Simard, 2009). On the other hand, research has also shown no positive effect (Della Putta, 2016; Kim, 2006; Leow, 1997; Leow, 2001; Leow et al., 2003; Overstreet, 1998; White, 1998).

There are several possible reasons for the lack of convergence between the findings in the aforementioned studies. For example, the target forms and the research designs have varied in most experiments as well as the assessment measures used. Some studies have relied on tests that measure primarily explicit knowledge such as untimed grammaticality judgement tests (Alanen, 1995; Izumi, 2002; Song, 2007), fill in the blank tests (Leow, 2001), metalinguistic knowledge tests (Jahan & Kormos, 2015) and multiple choice sentence completion tasks (Shook, 1994; White, 1998; LaBrozzi, 2016). Others have included measures that assess primarily implicit knowledge such as picture oral narration and elicitation tests (Doughty, 1991; White, 1998), and note taking activities (Tanaka, 2011).

Also, comparing the effectiveness of treatments across studies has been problematic due to the range of target languages that have been taught and the diversity of L1 learner populations. In addition, the length of treatments has also varied. Some researchers have implemented a one-session treatment (e,g, LaBrozzi, 2016), and others have extended up to six sessions (e.g. Ha, 2010; Izumi, 2002).

Some scholars have also sought to investigate what types of textual enhancement are more beneficial by implementing a design that consists of only one type of textual enhancement per condition. For example, rather than enhancing a text in the form of bold print in combination with underlining, researchers have only tested the use of bold print. The aim of this has been to avoid any possible confounding stimulus that might result from giving learners exposure to more than one type of enhancement simultaneously.

The effects of single types of textual enhancement

Three studies have tested the effectiveness of single types of textual enhancement (Choi, 2017; LaBrozzi, 2016; Simard, 2009). Overall, their findings revealed that capitalization was more effective in promoting intake than other treatments. The use of bold print was also found to be effective. According to Leow (1993, p. 334), intake refers to “the part of the input that has been attended by second language learners while processing the input”. Intake was measured in these studies either by implementing a multiple choice sentence completion task, by a multiple choice recognition task or by eye-tracking technology and a recall cloze test. These studies, however, did not assess whether intake lead to learning.

These three studies indicate that textual enhancement can sometimes be beneficial at promoting noticing and intake, but the type of enhancement is a factor that determines its success. Certain types of enhancement such as the use of capitalization or bold print seem to be more effective than other kinds such as underlining or the use of italics which have not promoted noticing or intake. In addition to the central question of whether input enhancement is beneficial for noticing, intake and learning, other additional topics of inquiry have emerged over the last two decades of research on textual enhancement. Three issues still in need of further research are whether this pedagogical approach can promote implicit knowledge, explicit knowledge or both, whether its effects apply equally to all formal aspects of an L2 and whether it has long term effects. The following subsections will focus on each of these three aims.

Textual enhancement and its effects on implicit and explicit knowledge

One question which is central to SLA is whether implicit instruction can promote implicit knowledge, explicit knowledge or both. In light of this, research on textual enhancement has recently started implementing designs which allow measuring both types of knowledge. Thus far, only Indrarathne and Kormos (2016) and Ziegler et al. (2017) have used measures of implicit and explicit knowledge to test the effectiveness of textual enhancement. These tests have differed in that implicit measures have been time restricted and they have aimed at eliciting learners' spontaneous responses whereas explicit measures have not imposed any time restrictions in order to allow for learners' declarative knowledge of target forms. Overall, the studies conducted by Indrarathne and Kormos and Ziegler et al. had both similar results although they diverge in the kind of construct, the type of enhancement that was investigated and in the types of assessment that were implemented.

Indrarathne and Kormos (2016) and Ziegler et al. (2017) found that textual enhancement did not promote much learning of target forms. In both experiments, the researchers concluded that perhaps the short length of their studies did not allow implicit or explicit knowledge to be acquired by an implicit type of instruction such as textual enhancement. Indrarathne and Kormos explain that instructing learners to pay attention to formal aspects of the L2 and providing an explanation of the target forms in addition to providing textual enhancement allowed participants to pay more attention to them, and this correlated strongly with gains of explicit knowledge but not with implicit knowledge. On the other hand, Ziegler et al. accounted for the lack of implicit knowledge in their study by relying on Polio's (2007) statement that textual enhancement operationalized narrowly as the modification of some formal aspect of L1 does not seem to make learners interact sufficiently with the texts as do other broader types of input enhancement. There are, however, additional reasons for the ineffectiveness of the training condition in promoting implicit knowledge in these two previous experiments. For example, it may be that other target forms are perhaps more likely to be noticed and learned due to implicit instruction. In other words, some forms may be more adequate for textual enhancement than others.

An important factor that may have been responsible for the lack of success in these two previous studies is the lack of salience of the target forms. Because the intended salience created by textual enhancement is initiated both by the language instructor and the learner (Sharwood Smith, 1993), there is no guarantee that the training condition will work. That is, language teachers can select a specific form to be enhanced with the hope that learners will notice it and rehearse it in their working memory, so that there is subsequent learning of it. Nevertheless, regardless of instructors' efforts, learners may not notice a target form in a text for reasons that are inherent to them, and also for reasons related to the nature of the target form. For example, if a language instructor enhances tag questions in a text, learners' noticing of the form may not increase simply because they may not be developmentally ready to process it (Gass, Spinner, & Behney, 2018; Lardiere, 2018; Pienemann, 1989).

On the other hand, even if learners are developmentally ready to learn a target form, an implicit treatment such as textual enhancement may not be effective with certain forms that have a redundant meaning or a low communicative value. According to Marsden (2006), communicative value refers to how much semantic value and redundancy a word has within a sentence. Marsden also explained that "features with higher communicative value have higher inherent semantic value and are less redundant, and features of lower communicative value have lower inherent semantic value and/or are more redundant" (2006, p. 510). In sum, the nature of the target form is one of the factors that can determine whether or not learners attend to the enhanced text. The following subsection will illustrate this.

Textual enhancement and its effects on different forms

In order to test the effects of textual enhancement on different target forms, experiments have been conducted where learners are provided with exposure to enhanced input of two target forms that are different in terms of salience. In those cases when there is a noticing effect or a learning effect of one of the target forms, researchers have found that it is usually the more salient form that is noticed or learnt, which seems to indicate that salience plays a role in determining whether textual enhancement effectively promotes noticing, intake or learning. Thus far, there have been two experiments in SLA investigating this issue (Jahan & Kormos, 2015; Leow et al., 2003), and their findings revealed that textual enhancement was beneficial with only one of the target forms in each study, but not with both. In the research by Leow et al. textual enhancement was effective in promoting the noticing of the Spanish present perfect but not as effective for the present subjunctive. This suggests that one important factor that determines the effectiveness of this implicit treatment is the nature of the target form. The findings reported by Jahan and Kormos go in hand with this stance since participants in their study were only able to learn one of the two target forms due to textual enhancement. In the same vein, Morgan-Short, Sanz, Steinhauer and Ullman (2010) have also expressed that the characteristics of a target form are a factor that can determine the success of a particular type of instruction.

In addition to investigating which characteristics of linguistic targets are more likely to be learned by textual enhancement without the addition of an explicit intervention, there is growing research focusing on the delayed effects of this implicit type of training.

Long term effects of textual enhancement

Overall, the findings of research investigating the long term effects of textual enhancement reveal that there is evidence of delayed knowledge of target forms due to the enhancement although not all experiments have shown that long term knowledge is plausible due to this implicit treatment. Three experiments have shown positive delayed results (see De Santis, 2008; Jahan & Kormos, 2015; Szudarski & Carter, 2016). These researchers found that input enhancement can increase noticing, learning and learners' ability in controlled tasks. The three studies revealed that the effects of input enhancement were sustained one week after the treatment and even up to two weeks in the study conducted by Jahan and Kormos.

There are, nevertheless, instances in which textual enhancement has not promoted long term effects. For example, Lyddon (2011) revealed no immediate learning of French prepositions a/au/en/aux before French toponyms nor any delayed learning 10 weeks after the end of the training. It is important to emphasize that there was no immediate effect, and thus it is not surprising that there was no delayed learning. Similarly, Tanaka (2011) did not find any immediate or delayed effects either after enhancing count and non-count nouns.

These studies implementing a delayed posttest design have contributed to the field of instructed second language acquisition by showing that in those cases when learners' noticing or learning of a linguistic target increases due to textual enhancement, it is plausible for this increase to be sustained one or two weeks after the treatment. However, these findings are not conclusive, and should be interpreted cautiously because learners may not be able to sustain their knowledge of some forms. Therefore, more research is needed that tests the long-term effects of this implicit treatment before any conclusions can be generalized to instructed second language acquisition.

2.2.3 The role of explicit instruction in textual enhancement studies

According to DeKeyser (1995), explicit instruction refers to two types of interventions: 1) inductive explicit instruction which involves indicating the learners to attend to a specific form in a text or 2) deductive explicit instruction which comprises the explanation of a metalinguistic rule of a specific target form. One basic element that distinguishes these two forms of explicit instruction is the use of bottom-up and top-down processing.

Bottom-up processing is data driven in the sense that it involves initially focusing on small units such as phonemes and morphemes and then subsequently processing larger units such as words, phrases and clauses. According to Moskovsky, Jiang, Libert and Fagan (2015), language perception seems to require primarily bottom-up processing although it also relies on some top-down processing (see also Jiang, Sawaki, & Sabatini, 2012). More specifically, as stated by Oliver and Young (2016), decoding and recognizing are characteristics of bottom-up processing (see also Breznitz & Share, 1992). For example, when figuring out the meaning of a word, a reader will start by using bottom-up processing in order to decode the word and all of its elements.

In contrast, top-down processing operates by initially focusing on the overall meaning of an utterance, and moving on to smaller units such as phrases and then to lexemes and morphemes (Matthews, 2007). As Abbott (2006) explained, learners rely on top-down processing when using their background knowledge, when identifying main ideas in a text and when making inferences. According to Moskovsky et al. (2015,

p. 257), speech production usually seems to require initial top-down processing by "starting with conceptual-semantic content and only then assigning grammatical structure to it". However, speech production also relies on bottom-up processing when learners monitor or analyse their own output production. Similarly, explicit instruction relies on both bottom-up and top-down processing. Specifically, inductive explicit instruction is based primarily on bottom-up processing whereas deductive explicit instruction is based mainly on top-down processing. The following are the theoretical principles that underlie the use of each of these two types of training conditions.

Inductive explicit instruction studies

Inductive explicit instruction has been defined by R. Ellis (1991, p. 239) as "a pedagogic activity where the learners are provided with L2 data in some form and required to perform some operation on or with it, the purpose of which is to arrive at an explicit understanding of some regularity in the data" (see also R. Ellis, 2010, p. 442). According to DeKeyser (2008), explicit instruction is inductive if learners are not explained the metalinguistic rule of a target form, but instead they are given activities that will induce them to discover the form-meaning mappings of target linguistic features. An example of inductive explicit instruction is when learners are told by the teacher to focus on a specific grammatical structure or lexical item while they read a text or while they complete an exercise.

Three studies conducted by Shook (1994), Park, Choi, and Lee (2012) and Indrarathne and Kormos (2016) have tested the effects of inductive explicit instruction. That is, before receiving exposure to enhanced texts, participants in these experiments have been instructed to pay attention to the target forms as they read. Their results revealed positive effects. In these three studies inductive explicit instruction prior to exposure to textual enhancement was superior to mere exposure to textual enhancement, and in one of them (Park et al., 2012), it was necessary in order for participants to learn the target forms (gerunds and infinitives in English).

Therefore, several questions are still in need for an answer such as: why is textual enhancement without any additional treatment sometimes sufficient for learners to improve on the use of a target form, and why is it sometimes necessary to include an additional explicit treatment in order for learning to occur? Also, why are some forms more likely than others to be acquired due to textual enhancement? As these questions continue to steer the direction of focus on form studies, more experiments will be required that focus on the role of inductive explicit instruction within the framework of textual enhancement research. I will now turn to research investigating the effects of another type of explicit instruction.

Deductive explicit instruction studies

Deductive explicit instruction in SLA classrooms usually means that the teaching focuses on one linguistic feature, delivering a metalinguistic explanation and providing examples about how the linguistic target is used (R. Ellis, 2010). According to DeKeyser (1995), in order for explicit instruction to be deductive, the rules need to be presented before the examples (see Hwu, Pan, & Sun, 2014). The examples can be given by the teacher or through a course book or a computer interface.

In order for deductive explicit instruction to be effective, the target form-meaning cues need to be explained to learners in simple and clear language (MacWhinney, 1997; MacWhinney, 2012). According to Cook (2016), language instructors that explain the use of target forms in the L2 assume that learners' conscious knowledge will lead to unconscious processes that can be used for comprehending and producing in the target language. In other words, the rationale behind providing deductive explicit instruction is that thanks to the explanation of target forms, learners will establish a pattern using declarative knowledge (see DeKeyser, 1997; DeKeyser, 2007; see also Shintani, 2013), and after receiving repeated and extensive exposure to the target cue, learners may eventually proceduralize its use. However, MacWhinney (2012) also explains that explicit instruction is not a prerequisite for proceduralization to occur, but it boosts and accelerates learning.

The idea of using declarative knowledge to explain a target form in the L2 accords with skill acquisition theory which originated in cognitive psychology (see Anderson, 1982). Skill acquisition consists of two phases: "a declarative stage in which facts about the skill domain are interpreted and a procedural stage in which the domain is embodied in procedures for performing the skill" (Anderson, 1982, p. 369; see also Anderson, 1987; Masson, 1990). As explained by DeKeyser (2008), in L2 learning explicit knowledge can become proceduralized through rehearsal. Skill acquisition theory can potentially serve as a principle for research investigating the effectiveness of deductive explicit instruction in combination with textual enhancement.

There has been a limited amount of research looking at the effects of metalinguistic explanation of the target forms in combination with textual enhancement (but see Alanen, 1995; Indrarathne & Kormos, 2016). These studies have revealed that providing participants with a metalinguistic rule explanation of the target forms is more effective than simply providing participants with exposure to enhanced input. Indrarathne and Kormos additionally found that deductive explicit instruction was more effective than inductive explicit instruction.

Nevertheless, deductive explicit instruction prior to exposure to textual enhancement has not always promoted noticing, intake or learning of the target forms.

For instance, Fernández (2008) found a significant effect on the learning of the subjunctive in Spanish, but no effect on the learning of word order and object pronouns. In addition, some forms can be learned implicitly through extensive exposure without any explicit pedagogical training. Identifying the characteristics required for target forms to be learned through mere exposure without providing any rule explanation has been one of the aims of instructed SLA, but further research is still needed in order to shed more light on this issue. One of the objectives of the current study is in line with this matter. The following subsection presents an overview of the work focusing on another type of explicit form-focused instruction: processing instruction.

2.2.4 Processing instruction

Processing instruction is a pedagogical treatment based on the principles of input processing (VanPatten & Cadierno, 1993). It operates under the premise that learners process particular forms in the L2 incorrectly, and therefore, it seeks to "push them away from non-optimal processing" (VanPatten, 2007, pp. 128-129). According to VanPatten and Oikkenon (1996, p. 496), "processing instruction is a type of focus on form that is input-and meaning-based (as opposed to output-based)", and "it consists of explanation plus structured input activities designed to encourage learners to make better form-meaning connections during comprehension of sentences" (1996, p. 498).

R. Ellis (2012, p. 294) defines a structured input activity as: "an activity that presents learners with input in a context that requires them to demonstrate that they have correctly processed the target structure for meaning." For example, VanPatten, Collopy, Price, Borst and Qualin (2013) used structured input activities that required learners of German as a foreign language to read sentences that had Object + Verb + Subject (OVS) and Subject + Verb + Object (SVO) word order. Participants were shown sets of pictures along with two sentences each. They then had to decide which sentence described the picture correctly. The following sentences taken from VanPatten et al. (2013, p. 515) illustrate this: *Den Hund hört die Katze* vs. *Die Katze hört den Hund.* If learners were shown a picture of a cat hearing a dog, they would generally misinterpret the first sentence as: *The dog heard the cat*. However, because the sentence begins with an article that is marked as accusative (*den*) rather than as nominative (*der*) the correct interpretation of the sentence is: *The cat heard the dog*.

According to VanPatten (2002), an advantage of processing instruction over other treatments is that it aims at helping learners to make form-meaning connections and modifying the way participants process a linguistic target (VanPatten, 2005). Whereas implicit treatments such as input flood and textual enhancement try to increase the salience of target forms, processing instruction aims at making the learner understand "the communicative function of a particular form" (Benati, 2001, p.99) and to subsequently use the form in real communication.

The rationale behind processing instruction is that part of the input that is transformed into intake and stored temporarily in working memory can subsequently be processed and incorporated to the learners' internal system. The product of such processing can be manifested as output which can potentially represent knowledge of the target language that has been acquired implicitly or explicitly (see Leow & Cerezo, 2016). However, not all the intake is further processed, and as a result, not all the intake becomes knowledge of the L2. In the same vein, not all the intake which becomes part of the learners' internal system is reflected as output production. According to Leow (2015), the way that input is initially processed may determine whether it simply becomes intake that later fades from working memory, or whether it is further processed in order for it to become internalized. There are three different ways that the learner can process the input: at the level of attention, at the level of detection and at the level of noticing. If the input is just peripherally attended, it is likely to result in attended intake which is not usually stored in working memory. Even in the unlikely event that this type of intake reaches working memory, if learners do not link it to previous knowledge, they may not process it further and therefore, the intake can vanish. On the other hand, if initially the input is selectively detected, or if it is noticed focally, it is likely to become detected or noticed intake respectively which tends to be stored in working memory and accessed eventually when the learner recognizes it in future input.

Empirical research on processing instruction has tested whether the combination of processing instruction with an implicit type of instruction such as textual enhancement is more effective than implicit instruction without any additional type of implicit training. The findings have shown no advantage in adding an implicit type of instruction as was evidenced by Russell (2012), who revealed that participants receiving processing instruction combined with textual enhancement performed with a similar level of accuracy on interpretation tests and on production tests as did learners who had received processing instruction only. The rule explanation and the processing strategies provided during the treatment were very helpful in order for learners to internalize complex grammar forms on a computer course.

Another aim has been to investigate if processing instruction is better than traditional instruction at helping learners improve their interpretation of sentences that comprise problematic target forms. Traditional instruction has been operationalized as providing learners with a metalinguistic rule of the target form but without including any strategy on how to process the linguistic target. A key issue that has driven processing instruction research is finding which of the two components (structured input activities or metalinguistic rule explanation) is responsible for the effectiveness of the treatment or whether the combination of both elements plus the teaching of processing strategies is ideal.

An important aspect that has predominated in processing instruction studies is researchers' focus on morphosyntactic target forms that have a direct "one-to-one mapping between meaning and form" (Cheng, 2002, p. 312). A one-to-one mapping between meaning and form refers to those cases in which a form conveys only one meaning which can depend on syntactic, morphological or lexical restrictions. For example, in English the suffix –ed can only be used to express the simple past tense of regular verbs, but not to express any other meaning. Therefore, if learners read a verb ending in –ed, it is unlikely that they will assign a different meaning to the suffix even if there are no adverbial cues (such as yesterday) signalling the past tense.

There has been little research investigating whether processing instruction is effective at promoting the acquisition of semantic meaning conveyed by lexical forms. There are two types of meaning: semantic meaning and lexical meaning. Semantic meaning according to Löbner (2002), derives from the composition of words within an utterance or sentence (see also Jaszczolt, 2002). On the other hand, Löbner (2002) defines lexical meaning as the meaning of words that we carry in our lexicon, and it is learned and stored in our memory. In order to understand an utterance or a sentence in an L2, we cannot only rely on lexical meaning because the sentence is not stored as a fixed item. Instead, we have to use our stored lexical knowledge in order to create semantic meaning of an utterance. Therefore, there is still a need for future research on processing instruction to focus not only on the lexical meaning conveyed by linguistic forms but also on their semantic meaning.

Moreover, processing instruction research has focused mostly on target forms of languages that have a flexible syntax such as Spanish, German and Russian. Because

English syntax is fixed, English L1 speakers learning these languages tend to have trouble identifying the subject and the object because they assume that the subject is placed at the beginning of sentences. Processing instruction has proven to be effective at modifying the way that learners process sentences in languages that have a flexible syntax. However, there has been scarce research investigating whether processing instruction can be effective at changing the way that learners process other types of target forms which are not syntactic and have no relationship to word order.

One possible reason for this lack of research investigating the effectiveness of processing instruction on non-syntactic forms may be due to Lightbown's (2004) claim that not all forms are appropriate for processing instruction. As she has stated, a language form is not suitable for processing instruction if a lack of mastery of the form does not cause a misinterpretation of overall sentence meaning.

One of the objectives of the current study is to test if it is true that the applicability of processing instruction should be restricted to only those forms in which meaning affects the overall meaning of the sentence. I hypothesise that processing instruction might also help learners to interpret the meaning of forms that do not have an impact on the overall meaning of a sentence but nevertheless carry semantic meaning. An example of such forms is the use of *ser* and *estar* (verb to be in Spanish).

The verb *ser* in Spanish implies a permanent or durable state such as in the example: *Soy mexicano* (I am Mexican). The verb *estar* implies a temporary state such as in the example: *Estoy ocupado* (I am busy). The distinction between these two verbs is of great semantic value even though the understanding or lack thereof of these forms does not affect the overall interpretation of a sentence.

Processing instruction vs. metalinguistic rule explanation

One main concern of processing instruction research has been whether the metalinguistic rule explanation component is necessary or whether it is the structured input activities that cause the change in learners' processing strategies. To investigate this, studies have recently been conducted by giving one of their experimental groups exposure to processing instruction (comprising both metalinguistic rule explanation and structured input activities), by giving another group only metalinguistic rule explanation, and by providing a third group only with exposure to structured input activities. The results have been mixed. For example, Leeser and DeMil (2013), Sanz and Morgan-Short (2004), and White and DeMil (2013) found that structured input activities were responsible for an improvement in performance, but metalinguistic rule explanation did not cause an effect (see also VanPatten et al., 2013). In contrast, Culman, Henry and VanPatten (2009), Henry, Culman, and VanPatten (2009) and VanPatten and Borst (2012) have shown that providing a metalinguistic rule explanation prior to the completion of structured input activities was the factor which helped participants to start processing German accusative case markings on articles with SVO and OVS word order.

As these results illustrate, the role of metalinguistic rule explanation within the processing instruction framework is still not clear partially because there have been participant differences between these studies. For instance, the aforementioned studies showing no effect due to a metalinguistic rule explanation comprised L1 English speakers who were accustomed to Spanish lessons following a communicative approach. As a result, they received little or no explicit instruction of clitic object pronouns in Spanish. In contrast, in those studies showing a positive role for metalinguistic rule explanation, participants were L1 English speakers that had already received some explicit instruction of German accusative case marking. Perhaps, learners in these German courses benefited more from explicit instruction than the learners in the Spanish courses because they were already used to focusing some of their attention to these formal aspects of language. Further research is needed which sheds light into the specific role of metalinguistic rule explanation within the processing instruction framework. The following subsection illustrates the types of linguistic targets that future research on processing instruction could aim at investigating.

Processing instruction forms in need of research

As mentioned previously, processing instruction has focused mostly on target forms that are syntactic rather than morphological. There have been few exceptions to this trend, but the findings have been similar to those in research investigating syntactic forms. That is, processing instruction has been beneficial in changing the way that learners process target forms. Three studies (Cheng, 2002; Benati, 2004; Benati & Angelovska, 2015) helped participants to modify the way they processed, interpreted and produced the target forms. One commonality shared by these studies is that they focused on morphological target forms which carry semantic meaning rather than focusing on syntactic forms.

However, an important difference is that while the experiments conducted by Benati (2004) and Benati and Angelovska (2015) aimed at target forms that have a redundant meaning (gender in Italian and simple past tense in English respectively), the target form used by Cheng does not. In contrast, in his study the difference between *ser* and *estar* is not signalled by any other word in the sentence. Thus, in order for the learner to identify the semantic meaning of *ser* or *estar*, the learner has to be able to perceive the speaker's intended meaning. In this sense, Cheng's study is unique in that to my knowledge it is the only experiment testing whether processing instruction can promote the learning of target forms that are not meaning redundant and do not carry a one-to-one meaning mapping.

Moreover, an interesting aspect about Cheng's findings is that processing instruction helped learners to modify the way they processed forms *ser* and *estar* even though the meaning conveyed by these two forms is not readily evident within the sentence. These findings seem to contradict Lightbown's (2004) theoretical description of target items that are not good candidates for processing instruction. Lightbown (2004, p. 75) stated that:

> There are probably many language features that are not good candidates for processing instruction. This would include those that learners acquire without apparent difficulty while they engage in interactive communicative language. At the other end of the continuum are those that learners continue to have difficulty with, because of their inability to distinguish between correct and incorrect language forms. These are features that do not ordinarily lead learners to misinterpret what they hear and read, and accuracy in producing these features leads to a more polished performance rather than to changes in the meaning.

It can be argued that learners' lack of understanding of the use of *ser* and *estar* in Spanish does not necessarily lead to meaning misinterpretation. That is, learners may understand the overall meaning of a sentence even without having metalinguistic awareness of the distinction between the two forms. Therefore, Cheng's results seem to challenge the idea that the effectiveness of processing instruction may be limited to those target forms that carry strong lexical meaning and which are needed in order for learners to understand the meaning of sentences. Thus, more studies are needed that use processing instruction to teach target items that do not carry a direct one-to-one meaning mapping. Polishing the use of such forms may allow high-intermediate learners to become more proficient in the L2.

Moreover, the aforementioned studies have shown that overall, processing instruction can be beneficial at enabling learners to modify the way they process target forms in the L2. However, it is still not clear which of the two components of processing instruction is the one responsible for such effect. In some experiments the metalinguistic instruction component has enabled learners to process the meaning conveyed by the target forms correctly, but in other studies structured input activities have caused the effect. Further research is needed in order to shed some light on the effectiveness of metalinguistic instruction and structured input activities.

All of the above studies have focused on the acquisition of natural languages. However, there is another strand of research in SLA focusing on the acquisition of artificial languages. Research using an artificial L2 is relevant to the present study as it has focused on related issues such as whether implicit instruction is plausible at all, whether the effects of implicit instruction differ depending on the form-meaning mappings conveyed by target forms, and whether some type of additional explicit instruction is sometimes necessary.

2.2.5 Studies using artificial languages

Part of the research investigating the role of implicit and explicit instruction has relied on the use of artificial languages. That is, rather providing participants with exposure to a natural language, learners are given exposure to an artificial form which is embedded in the lexicon of a natural language. For instance, Rebuschat and Williams (2009) and

Tagarelli, Ruiz, Moreno-Vega and Rebuschat (2016) have used an artificial language consisting of English lexis containing a grammar form that follows German syntax.

Some of the evidence has shown that implicit instruction leads to implicit knowledge. For example, Hamrick and Rebuschat (2012) found that the learners who were given exposure to an incidental treatment learned mostly implicit knowledge. On the other hand, the learners receiving an intentional learning treatment gained mostly explicit knowledge, but they also learned some implicit knowledge (see also Leung & Williams, 2012).

In order to find if these results could be transferred to the learning of natural languages, Godfroid (2016) conducted a replication of Leung and Williams's (2011; 2012; 2014) work using a natural language instead of an artificial language. More specifically, she investigated whether upper-intermediate German students exhibited grammatical sensitivity to inflection errors in German strong verbs that were presented to them in the form of input flood. She also tested whether input flood was effective in promoting implicit and explicit knowledge. Her findings revealed that participants who received input flood showed evidence of implicit learning of the trained strong verbs, and they were also able to transfer their knowledge to untrained strong verbs. The implicit treatment led to implicit knowledge, but there was no strong support to claim that implicit instruction promotes explicit knowledge. One possible reason as explained by Leung and Williams (2012) is that not all forms are equally suitable for implicit instruction. There are several linguistic factors that may determine whether learners can implicitly pick-up a form-meaning connection from the input. One of these factors is concept availability, which refers to how in their experiment learners were able to detect animacy more easily than the concept of relative size.

Moreover, there are instances when implicit instruction can lead to both implicit and explicit knowledge. According to Rebuschat, Hamrick, Riestenberg, Sachs and Ziegler (2015), one type of instruction (implicit or explicit) does not necessarily result in one single type of knowledge. In a study using concurrent verbal reports, retrospective verbal reports and subjective measures, Rebuschat et al. found that a treatment comprising incidental exposure can result in implicit knowledge in conjunction with explicit knowledge of target forms in an artificial language. The target forms were four artificial determiners that carried an implied meaning of distance and animacy: *gi*, *ro*, *ul*, and *ne*. Following Williams' (2005) study, Rebuschat et al. (2015) used the target forms with English lexis, and participants were explained that the target forms functioned as English determiners. Participants were told that they should use *ul* and *ne* for far objects and for near objects they should use *gi* and *ro*, but they were not told about the animacy function of these determiners. Most participants learned the animacy function not only of the items for which they had received training, but they were also able to generalize the learned knowledge to new items of which participants had not received any training. These findings served as evidence that learning the form-meaning function of target features of an L2 can occur without intention and without learners realizing what they learned. Their results also indicate that implicit learning does not necessarily only result in implicit knowledge as it can also lead to some explicit knowledge.

On the other hand, there is evidence that explicit instruction leads only to explicit knowledge according to Hama and Leow (2010), who found that participants were able to acquire explicit knowledge of a distance function of target determiners as shown by a multiple choice test and a production test. They were also able to generalize their knowledge of the distance function to new items. However, learners were not able to implicitly discover an animacy function of the target determiners. In sum, evidence was found only in support for the impact of explicit instruction on explicit knowledge, but there was no evidence indicating that implicit training conditions can result in implicit or explicit knowledge. Their findings contradict Hulstijn's (2015) suggestion that learners can make some implicit representations of a target form after receiving a declarative explanation and extensive exposure to it (see also Hulstijn, 2002).

Thus, more artificial language studies are needed which investigate the type of knowledge that can be promoted through implicit instruction, and also that shed light on the type of language forms that are more likely to be learned through mere exposure without any type of pedagogical treatment. Also, more research using natural languages should ideally replicate the work done with artificial languages such as was done by Godfroid (2016) in order to find further evidence on the impact or lack thereof of implicit L2 instruction.

2.2.6 Summary of findings of implicit and explicit FonF instruction

The studies presented above have shown that implicit instruction in some cases is plausible. However, not all forms seem likely to be learned through implicit treatments, and thus in certain cases it seems necessary to include additional explicit training in order for learners to notice and use the linguistic target. Research conducted during the last three decades has consistently found that explicit instruction has a larger effect size than implicit instruction (see Goo et al., 2015; Norris & Ortega, 2000; Spada, 2011; Spada & Tomita, 2010). The experiments mentioned in this chapter confirmed this, and they also provided evidence of the type of effects that can be expected from both implicit and explicit treatments. Implicit instruction operationalized as input flood can be beneficial as was shown by Loewen and Inceoglu (2016) and Trahey and White (1993), but it can also be ineffective as demonstrated by Loewen et al. (2009), Szudarski and Carter (2016) and Winke (2013). Textual enhancement, which is another type of implicit instruction, can also be helpful as demonstrated by Choi (2017), De Santis (2008), Jahan and Kormos (2015), LaBrozzi (2016), Simard (2009), but there is evidence that it can also be unsuccessful as shown by Indrarathne and Kormos (2016), Lyddon (2011), Tanaka (2011) and Ziegler et al. (2017). On the other hand, explicit instruction operationalized either as inductive/deductive explicit instruction or processing instruction was beneficial in all the experiments (Alanen, 1995; Culman et al., 2009; Henry et al., 2009; Indrarathne & Kormos, 2016; Leeser & DeMil, 2013; Shook, 1994; Park, Choi, & Lee, 2012; VanPatten & Borst, 2012; VanPatten & Cadierno, 1993; White & DeMil, 2013), but it was not always necessary. This echoes the statement made by Morgan-Short et al. (2012) that there is some evidence indicating that implicit and explicit instruction can be equally effective, but there is no study thus far revealing better results due to implicit instruction (see Sanz & Morgan-Short, 2005).

Research has also revealed that explicit and implicit treatments have differential effects on the type of knowledge that they promote (implicit or explicit). In recent work R. Ellis (2015) explained that explicit instruction is likely to promote explicit knowledge, but it can also facilitate the acquisition of implicit knowledge (see also Akakura, 2012; Andringa, de Glopper, & Hacquebord, 2011; Spada, 2011). However, Spada (2011) also encouraged further research to continue investigating the type of knowledge that results from both implicit and explicit types of form-focused instruction. Only after researchers systematically implement measures of implicit and explicit knowledge will it be possible to make stronger and more precise conclusions on this matter.

In the case of implicit instruction, R. Ellis (2005) points out that it is plausible for it to promote both implicit and explicit knowledge if participants “reflect on their use of specific linguistic forms” (p. 419). However, empirical research also shows that this is not always the case. Some studies (see Godfroid, 2016) have found that implicit instruction promoted mostly the acquisition of implicit knowledge. Thus, it is still inconclusive why some articles reported that implicit instruction resulted only in implicit knowledge while others such as Rebuschat et al. (2015) revealed that it resulted in both implicit and explicit knowledge. One possible reason for the differential results could be the diverse designs that have been employed. According to Andringa and Curcic (2015), studies that have implemented explicit knowledge tests measuring controlled use of the target language have revealed favourable results for explicit instruction. However, studies that have measured implicit knowledge through free-production tasks in written or spoken mode, have not been able to strongly support the hypothesis that explicit instruction is beneficial for learners to acquire advanced proficiency in the target language.

In those cases in which implicit instruction has been effective, the benefits were mostly reflected on tests that measured receptive knowledge. As the literature suggests, an implicit treatment such as textual enhancement can at its best be effective in increasing learners’ noticing of some target forms, it but seems to be insufficient to engage learners in deeper processing that is required to make form-meaning connections of the linguistic targets. Thus, learners may improve on a constricted response test due to textual enhancement, but they may still not have sufficient control of the language forms in order to produce them in free response tests.

Most studies on implicit and explicit instruction in L2 acquisition have relied solely on offline measures such as a pre and posttest. Few have used online measures (see Winke, 2013) such as eye-tracking. Online measures are becoming increasingly more common in form-focused studies because they can inform about how learners' attention varies according to the type of instruction that is given to them. Online measures can provide additional details about why learners' development changes from a pre to posttest.

2.2.7 Issues in need of further research

If it is plausible for learners to acquire some target forms through implicit treatments such as input flood or textual enhancement, then the question still remains as to what characteristics a linguistic form must have in order for it to be acquired through implicit instruction. Finding more about which forms are more likely to be learned without a metalinguistic explanation could perhaps also shed some light regarding the role of explicit instruction in L2 learning.

Concerning the issue of the type of knowledge promoted by implicit form-focused instruction, more studies are needed that use a battery of tests assessing both implicit and explicit knowledge. This would avoid the current bias that is present in studies using only measures of explicit knowledge. Also, as expressed by Bell (2017), comparing implicit instruction against explicit instruction is important to both theory and practice in SLA because it may enable to test which of the two types of treatment (implicit or explicit) results in more effective performance.

Regarding the receptive knowledge promoted by implicit treatments, thus far, textual enhancement in most studies has been delivered through reading tasks that do not require learners to produce output. This may explain why this implicit type of instruction has not resulted in learners' production of the target forms. More studies are needed that include tasks where learners are required to produce the target forms after receiving exposure to enhancement. In the same vein, future research focusing on implicit treatments could benefit by using tests that measure both receptive and productive skills. Rather than simply having learners respond to a constricted response test such as a multiple choice assessment, studies should include free response tests where participants have to focus on the meaning conveyed in the input and not only on the forms. An example of such free response tests could be a written decision making task. Providing such productive measures could perhaps avoid the current bias towards measures of receptive knowledge.

2.2.8 The current study

Due to the limited existing knowledge about what qualifies a target form to be successfully acquired through implicit instruction, the current study sought to investigate if three target forms that are governed by two distinct rules will be equally learned through implicit instruction. One of the rules does not exist in participants' L1, but the other rule does. The reason to include two types of rules was to find if either one of them could be learned by participants through an implicit treatment. Each of the target rules will be explained in detail in chapter 3.

To address the current need for studies testing both implicit and explicit knowledge, the current study aimed at investigating the effects of treatments that include and exclude explicit instruction. This type of design allowed examining if implicit instruction is sufficiently powerful to result in the acquisition of a target form, or if an additional treatment such as metalinguistic rule explanation can help learners acquire the form. As R. Ellis (2016) has recently expressed, there is a need for research that tests the impact of explicit and implicit instruction on implicit or explicit knowledge. The present study sought to accomplish this goal. Also, it attempted to shed light regarding the type of knowledge that is promoted by implicit instruction and by a type of training that encompasses both implicit and explicit instruction. In order to do so, it included measures of implicit and explicit knowledge.

Concerning the need for future implicit and explicit instruction experiments that assess both receptive and productive knowledge, the current study sought to test learners' progress of the target forms by including tasks that required participants to use the target forms in writing. By providing the tasks through a computer interface, it was possible to retrieve the output produced by participants and to analyse the development in their productive knowledge. The use of a computer interface is one of the attributes with which the current study attempted to contribute to the literature on studies investigating implicit and explicit instruction of an L2. The present study will aim at answering the following research questions:

R.Q. 1) What are the effects of implicit instruction and explicit instruction in the acquisition of English prepositions by adult native speakers of Spanish?

Hypothesis 1: Based on previous research, it is likely that explicit instruction operationalized as metalinguistic instruction or as processing instruction will lead to better acquisition of the target prepositions in comparison to implicit instruction. Of the two types of explicit instruction, processing instruction will be more effective than metalinguistic instruction because participants will be given processing strategies in addition to the explanation of the target rules. On the other hand, it is unlikely that implicit instruction in the form of textual enhancement will lead to improvements in the use of the target forms. In order to do so, it would be necessary for it to induce learners to make the form-meaning connections that are conveyed by the forms, and as previous research has revealed, textual enhancement can at its best increase learners' noticing of target forms.

R.Q. 2) Are there any delayed effects one week after the posttest?

Hypothesis 2: The groups that have a learning effect on the immediate posttest are likely to sustain their knowledge on the delayed posttest. Evidence from the studies by De Santis (2008) and Jahan and Kormos (2015) suggests that it is plausible for implicit instruction to lead to immediate knowledge of the target forms and that knowledge can be sustained on a delayed posttest. It is also probable that explicit instruction will result in delayed knowledge. However, if a group does not have a learning effect on an immediate posttest, there is no evidence that suggests that a learning effect will emerge on a delayed posttest.

R.Q. 3) Does the type of training condition affect:

SubQ1 the type of knowledge (implicit/explicit) that is acquired?

Hypothesis: Participants receiving an explicit intervention will gain explicit knowledge of the target forms, and they may also gain implicit knowledge based on empirical evidence from studies such as Akakura (2012) where explicit instruction promoted both explicit and implicit knowledge. On the other hand, learners receiving an implicit treatment will improve their implicit knowledge of the target features, but it is unlikely that they will gain explicit knowledge based on the findings in Godfroid's (2016) study where implicit instruction promoted mostly the acquisition of implicit knowledge.

Does the type of training condition affect:

SubQ2 the target forms *in, on* and *by* in different ways?

Hypothesis: Based on the findings by Leow et al. (2003) and Jahan and Kormos (2015), it is probable that the effect of implicit instruction in the form of textual enhancement will be different for each target form, but it is uncertain which target forms (*in*, *on* or *by*) are more likely to be learned. In the case of explicit instruction, it is less probable that the effect will be different for each target form because the perceptual salience of prepositions might play a lesser role than with implicit instruction. That is, providing learners with metalinguistic rules or with processing instruction is likely to direct learners' attention to the three target forms equally regardless of their level of salience.

Does the type of training condition affect:

SubQ3 the accuracy of output production during the training phase?

Hypothesis: Participants receiving explicit training are most likely to increase their output accuracy in comparison to the participants receiving implicit instruction. Also, an explicit treatment will make participants increase their production accuracy of the target forms sooner than implicit instruction as revealed by a meta-analysis conducted by Goo et al. (2015).

Chapter 3: The Pilot Study

Before conducting the main study, a pilot experiment was conducted with a small sample of participants. It was designed with the main purpose of exploring whether there would be a learning effect due to any of the treatments. Additionally, it enabled the testing of the interface and the detection of any technical problems that could arise during the main study. It allowed assessing whether or not there would be a practice effect for the control condition from pre-posttest. Also, conducting the pilot study revealed the reliability of each test, and the average time that participants took to complete each task and each test.

3.1 Research Questions for the Pilot Study

The pilot study aimed at answering the following research questions:

1) What are the effects of implicit instruction and explicit instruction on the acquisition of English prepositions by (adult) native speakers of Spanish?
2) Does the type of training condition affect the target forms *in* or *on* and *by* in different ways?
3) Does the type of training condition affect the accuracy of output production during the training phase?

3.2 Participants

Fifteen students from a state funded university in Mexico City participated in the pilot study. Their age ranged from 19 to 23 years (M = 20.93, SD = 1.87), and six participants were female. All the learners had taken the Michigan test within the last six months before the pilot study, and they had all scored at a B2 level according to the Common European Framework of References for Languages (CEFR). Data collection for this pilot study took place in students' homes after class. They logged into the interface in their own time and completed the treatment sessions. Participation was voluntary, and students were given extra credit by their English instructor for their effort and time.

3.3 Target Linguistic Forms

This pilot focused on the acquisition of three prepositions in English which are used in the context of forms of transportation: *in*, *on* and *by*. In order to understand the rationale for selecting these target forms, it is important to first comprehend the spatial and conceptual meaning relations that prepositions can convey in some languages. I will illustrate how the conceptual meaning carried by prepositions can be more specific in some languages than in others, and this can typically cause L2 learners to struggle with using prepositions accurately in the target language.

Prepositions have hardly a direct translation from one language to another. In some cases the meaning of a preposition in the L1 may appear to be transparent in the L2 when in fact it is not. An example of this is the use of prepositions *auf* and *an* in German. In German the preposition *auf* can be translated to English as the preposition *on* when it is used to conceptualize a horizontal surface. The following example illustrates this:

Das Buch liegt auf dem Tisch.
The book lies on the table.

In contrast, the German preposition *an* can also be translated to English as the preposition *on* when it is used to conceptualize a vertical surface as in the following example:

Das Bild hängt an der Wand.

The picture is hanging on the wall.

The above examples taken from Hawthorne (2006) show that the English preposition *on* does not have a direct translation to German. Whereas in English the preposition *on* does not specify the angle of the surface on which an object lies, German provides this additional tacit spatial meaning. This property of prepositions to imply that an object is resting on a horizontal or vertical surface is one of many examples of how prepositions can make a message more explicit.

Native speakers of English learning German tend to have difficulty using prepositions *auf* and *an* accurately because as Hawthorne (2006, p. 126) explains, "the English-speaking learner of German has to decipher and encode the lexical elements as well as the grammatical ones in a way s/he does not have to in the L1". According to Lam (2009), learning to use prepositions accurately can be difficult because the way that they are used contextually differs between languages. Lam explains that if L2 learners use their L1 knowledge of prepositions in the target language, they normally use them incorrectly (see also Lorincz & Gordon, 2012).

Just as native speakers of English struggle with German prepositions, native speakers of Spanish have difficulty using English prepositions appropriately. Therefore, the present study will focus on Spanish native speakers' acquisition and use of three English prepositions in the context of forms of transportation: *in*, *on* and *by*. These target prepositions in English are difficult for native speakers of Spanish to master for the same reason that English native speakers have difficulty becoming proficient users of *an* and *auf* in German. Namely, the use of *in*, *on* and *by* can be puzzling as there are cases when learners may not know whether to use *in*, *on* or whether to use *by* instead of *in* or *on*. Although traditional accounts claimed that the use of prepositions was arbitrary, cognitive linguistics has aimed at finding ways of accounting for their different uses. According to the cognitive linguistic framework, all prepositions in any language have more than one form-meaning function. These are called prototypical uses, and some are more frequent than others. According to Chavarría-Fonseca (2002, p. 64), the preposition *in* in English is generally used for "establishing a spatial relationship of one point to another which is three-dimensional… or when the area should be conceived of as an enclosed space." There are several prototypical uses of the preposition *in* that fit this explanation. For example, the prototypical use of the preposition *in* when used in the context of forms of transportation establishes that it can be used when it collocates with small, four-wheeled-motor vehicles. On the other hand, according to Chavarría-Fonseca (2002, pp. 61-62), the semantic space that the preposition *on* occupies in English is as follows:

> The preposition *on* has a line/surface configuration, establishing a spatial relationship of one point to another which can either be a one dimensional object, or represent a two dimensional area. The preposition *on* implies objects touching each other. This relationship can be given on a horizontal or non-horizontal surface.

One of the prototypical uses of the preposition *on* is when it is used for: "modes of transportation that are large and also for two-wheeled vhicles and animals used for transportation (Chavarría-Fonseca, 2002, p. 62). In Spanish, this semantic distinction between prepositions *in* and *on* in the context of forms of transportation is lexicalized by using the preposition *en* (Brala, 2001). The preposition *en* in Spanish can be used very broadly. As a result, it can substitute other prepositions (Chavarría-Fonseca, 2002).

In terms of its prototypical use regarding semantic space, it can be used with one-dimentional, two-dimentional and even three-dimentional objects. When referring to forms of transportation, the preposition *en* is used regardless of their size or their public or private nature as in the following example: *Voy al gimnasio* ***en*** *mi carro. I go to the gym* ***in*** *my car. Los estudiantes van a classes* ***en*** *el autobus de la escuela. The students go to classes* ***on*** *the school bus.*

In the case of the use of *by* the semantic distinction in Spanish is made as follows: the preposition *en* followed by an article or a possessive adjective implies that both the speaker and the listener know which specific form of transportation is being talk about. For example: *Voy a mi trabajo* ***en mi*** *carro todos los días. I go to work* ***in my*** *car every day.* However, to refer to a general form of transportation that neither the speaker nor the listener are thinking about, it is necessary to use the preposition *en* without an article or a possessive adjective as in this example: *Juan viaja todos los fines de semana a Estados Unidos* ***en*** *autobus. Juan travels* ***by*** *bus every weekend to The United States.*

With regard to the use of *in* or *on*, Lindstromberg (2010) explains that *in* is used when talking about a means of transportation that is not big and not public such as a car, a truck or a small boat. On the other hand, if we are talking about a means of transportation that is big and public such as a bus, a train, a ship or an airplane, we use *on*. Moreover, Lindstromberg also explains that *by* is used to refer to "generic means of transportation" (2010, p. 148). In other words, he explains that *by* can be used "when we aren't thinking of any particular machine. If we are thinking particularly – and therefore thinking of the scene in more detail – we may say, for instance, we came *in* her car or we came *on* the last train." (Lindstromberg, 2010, p. 148). In sum, the rule of usage for *in* vs. *on* has to do with two aspects of the form of transportation: 1) its size and 2) whether it is private or public. On the other hand, the rule for *by* vs. *in/on* is more abstract as it has to do with how the form of transportation is being conceptualized: namely whether or not there is disambiguation of the form of transportation.

One reason for selecting these target forms is that it is a known problem that the target population commonly has difficulty using them accurately in the context of forms of transportation. According to Evans and Tyler (2005), traditional accounts in the field of Linguistics had initially classified the use of English prepositions as idiosyncratic and mostly arbitrary (see Bloomfield, 1933; Chomsky, 1995). In addition, prepositions had been viewed as "an annoying little surface peculiarity" (Jackendoff, 1973, p. 345). As a result, L2 teachers had been instructed to teach these forms through memorization (as lexical items). The rationale for this approach was that the accurate usage of these forms could simply not be learned and used productively, but instead they had to be learned as prefabricated chunks. However, cognitive linguistics has studied how prepositions represent the spatial relationship between objects and how "spatial concepts are systematically extended to provide a wide array of non-spatial meanings" (Tyler & Evans, 2003). This has provided a different framework for teaching prepositions in an L2 learning setting. The goal within this cognitive linguistics approach is to help learners understand the different ways in which the L1 and the L2 view the relationships that are represented by prepositions and to aid them in matching these accurately (Chavarría-Fonseca, 2002, p. 72).

In order to ensure that the target items were in fact problematic for L1 Spanish speakers, I had previously conducted a small-scale exploratory study where I tested whether high intermediate English learners in a public university in Mexico had difficulty with producing prepositions *in*, *on* and *by* accurately. The findings revealed that indeed, learners used the target forms incorrectly most of the time thus providing further reason to study these target forms.

Also, it seemed realistic to expect participants to learn the two rules governing these forms in a short treatment considering that they are high in reliability and have a low scope according to Hulstijn and de Graff's (1994) taxonomy. In other words, the regularities of co-occurrence of the target forms do not have exceptions, and they are only used in certain specific contexts. Moreover, the two underlying rules are not typically taught by English teachers in Mexico. Unlike other forms such as the past tense endings, the rules governing the usage of the target forms in this pilot study are not normally part of the syllabus as is evident in English textbooks. Part of the reason for the exclusion of these target forms in a language course may be that, as expressed by Song and Sardegna (2014), in one lesson it might not be possible due to time restrictions to include the teaching of all prepositions and the exceptions in their use. Therefore, the lack of instruction of this form in classes of English as a foreign language makes it an adequate linguistic target for this study because it allows participants to begin the experiment with little or no knowledge of the target forms.

Finally, although the lack of accuracy of the target prepositions does not impede learners to use the language fluently or to understand the overall meaning of messages, it is very important for learners to become accurate users of the target language according to Jiménez (1996). The accurate usage of this linguistic target is also important because as has been explained by Baldwin, Korkodoni, and Villavicencio (2009), it is generally very difficult for language learners to become proficient in their use of prepositions. According to Lindstromberg (2001), not even 10% of advanced learners of English as a second language can become capable of fully understanding and using prepositions accurately in different contexts.

3.4 Materials

Participants in the pilot study completed a background questionnaire followed by a pretest and a posttest which comprised a timed grammaticality judgement test (TGJT), a fill in the blank test (FIB), and a metalinguistic knowledge test (MKT). Participants were also given an instructional treatment comprising three sessions where they completed pedagogical tasks. This section will first present a description of the questionnaire and each of the tests along with examples of some of the items in the tests that were given to participants during sessions 1 and 5. Then it will provide an explanation of the instructional treatment given during sessions 2, 3 and 4.

3.4.1 Background questionnaire

In order to ensure that participants in the pilot study were similar in terms of their English proficiency and English learning background, it was necessary to include a questionnaire during the experiment delivered via the online interface. The learners answered it as soon as they logged in the first time, and it took no more than ten minutes to complete (M = 4:47, SD = 0.12). It comprised three sections. First, participants were asked to specify their gender, nationality, country of origin and their age. Second, they were required to provide information about their second language background. Questions were included about their English learning age of onset, whether or not participants had spoken more than one language at home during their childhood, and they were also asked to report their level of English proficiency and to explain which other languages they spoke and how long they had spoken them. Third, participants were questioned about how long they had been learning English, about the circumstances in which they spoke the target language and about whether they had studied in a private or in a state funded school. A complete sample of the questionnaire is available in appendix B.

3.4.2 Timed grammaticality judgement test

The timed grammaticality judgement test had 40 items (20 fillers and 20 target items). Participants listened to each sentence, and then had six seconds to decide whether the sentence was grammatical or ungrammatical. They did not have to correct the ungrammatical sentences. The rationale for deciding the time limit was based on Indrarathne and Kormos (2016) and on a calibration that I did before the pilot study. That is, prior to the pilot, I gave the TGJT to three English learners from Mexico to measure the time they took to process each sentence. The TGJT was also piloted with five native English speakers from the United States, and all the participants were able to complete the test with their accuracy ranging from 90% to 100%. Piloting the TGJT test allowed finding the completion duration of the items without providing participants with exceeding time.

Whereas there were three parallel versions of the FIB test and three versions of the MKT, there was only one version of the TGJT. Thus, the same version of the TGJT was used for the pre and posttest. Reliability of the TGJT measured by Chronbach Alpha was .512, N =15. The low number of participants may have been one of the causes for the reliability to be moderate. However, the main study allowed assessing the reliability once more with a bigger population.

3.4.3 Fill in the blanks test

Following Macrory and Stone (2000), a FIB test was included as part of the battery to assess participants' explicit knowledge of the target forms. They were instructed to complete sentences by filling in the blanks and typing only one missing word. They could not add or delete any words. The FIB test had 20 distractors which tested the use of articles *a*/*an*, the use of *for* and *since*, the use of verb tenses, the use of auxiliaries for questions and subject-verb agreement. It also had 20 items assessing the target forms of which 10 tested the rule governing the use of *in* vs. *on* and 10 tested the rule corresponding to the use of *by* vs. *in*/*on*. Figure 1 shows an example of a distractor.

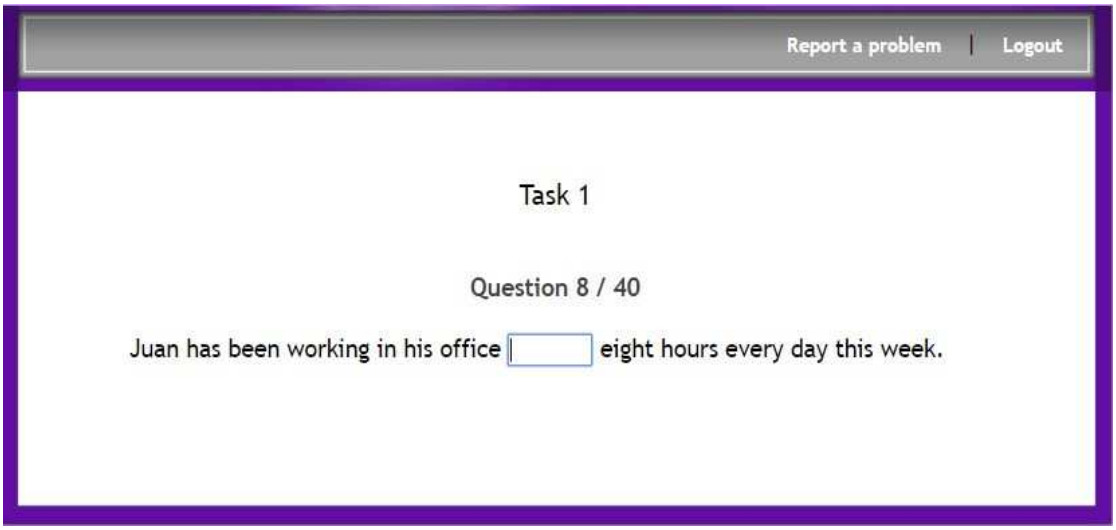

Figure 1. Example of a distractor included in the FIB pretest and posttest assessing the use of *for vs. since*.

Three parallel versions of the FIB test were designed: version A, B and C. In order to measure the internal reliability of the FIB test, I measured Cronbach Alpha on the pretest scores of all the participants from the three groups that completed the pilot sessions. Reliability of the FIB test measured by Cronbach's Alpha was .660, N = 16 for test A, .775, N = 17 for test B and .495, N = 15 for test C.

3.4.4 Metalinguistic knowledge test

The MKT test comprised 40 ungrammatical sentences. Participants had to find the mistake in each sentence and correct it. They were also asked to write the rule that was needed to correct each mistake. The MKT is a measure of explicit knowledge. As Elder (2009) explains, metalinguistic knowledge is analytical rather intuitive in nature because it involves explicit declarative facts (whether rules or fragments of information) that a person knows about language. Roehr (2008) also showed that metalinguistic knowledge is correlated with language analytic ability. Figure 2 shows an item from the MKT.

The reason for including a metalinguistic knowledge test is based on the need for assessing whether the type of training (implicit or explicit) would determine the type of acquired knowledge (implicit or explicit). That is, it was important to know if the implicit treatment would result in a learning effect only in the TGJT which is a test of implicit knowledge or whether it would also result in a learning effect in the FIB and the MKT which are measures of explicit knowledge. Also, in line with previous research (Faretta-Stutenberg & Morgan-Short, 2011; Godfroid, 2016; Rebuschat, 2013), the knowledge acquired by the participants in the pilot study was considered to be implicit if they demonstrated on the TGJT that they knew the target forms, but were not able to explain the rules on the MKT (see Rogers, 2017). In the same vein, it was important to know whether an explicit treatment would result in a learning effect only in the measures of explicit knowledge (FIB and the MKT) or whether there would also be a learning effect in the TGJT, which is a measure of implicit knowledge.

Three parallel versions of the MKT were designed. Figure 2 provides a sample of a target item on the MKT. To check the reliability of the MKT, I used the scores of all participants in the pilot study. Reliability of the MKT test measured by Cronbach's Alpha was 1.000, N = 5 for test A, .993, N = 5 for test B and 1.000, N = 5 for test C.

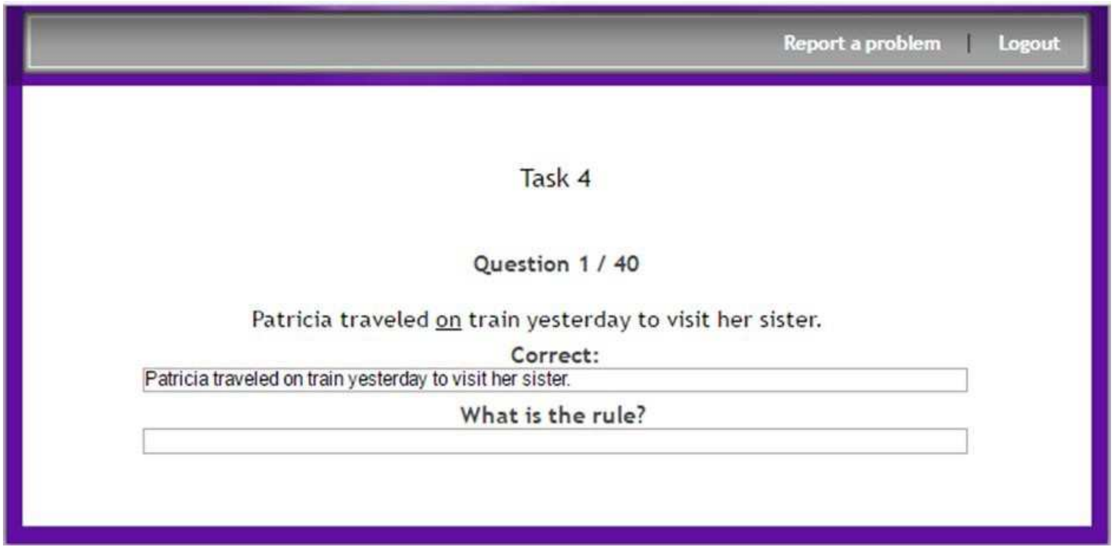

Figure 2. Sample Item from the Metalinguistic Knowledge Test.

3.4.5 Instructional treatment

During session two participants were given four pedagogical tasks. The first task was a short story containing 677 words. This word length could potentially allow participants to receive exposure to several occurrences of the target forms. In total, 86% of the words in the story are among the 1000 most frequent words in English and 7% are among the 2000 most frequent words according to Lexical Profiler. Following a similar rationale from Indrarathne and Kormos (2016), most of the vocabulary selected for the story was common for participants, so that understanding the meaning of the reading would not be so demanding that participants might not notice the target forms. The story had 12 occurrences of *in + forms of transportation*, three occurrences of *on + forms of transportation* and 11 occurrences of *by + forms of transportation.* Eight different forms of transportation were paired with the three target forms, and some forms occurred more than once as is illustrated in table 1.

Although there are a limited number of forms of transportation, in order for there to be a sufficient variety of lexical items, four of the target items included adjectives between the prepositions and the nouns. This was done so that participants could not just simply memorize the lexical items. Not all nouns appeared with the same frequency. Table 1 shows the frequency (also known as tokens) of co-occurrence of the target prepositions and forms of transportation.

Table 1

Frequency of Co-occurrence of the Target Prepositions and Forms of Transportation During the Treatment Session

Co-occurrence	Tokens	Co-occurrences	Tokens
in + (determiner) + truck	1	by car	2
in + (determiner) + car	7	by plane	2
in + (determiner) + boat	4	by boat	4
on + (determiner) + motorcycle	1	by tram	1
on + (determiner) + bus	1	by train	1
on + (determiner) + train	1		
Total	15	Total	10

The second task comprised six reading comprehension questions about the story that participants had just finished reading. Also, the questions were designed to encourage learners to produce the target forms. Once the six questions were completed, the interface would display task three which consisted of typing a summary of the story that they had just finished reading.

Task four was a decision making task in which learners had to solve a problem. They were given a situation that required them to make a plan related to forms of transportation. Unlike tasks 1, 2 and 3 which are linked, task four is not related to the previous tasks. The reason for including this type of task was to create a different type of cognitive demand from the participants such as making choices. Also, in contrast to the previous tasks, task four complies with the following four key criteria proposed by R. Ellis (2009): a) participants emphasized primarily on meaning, b) there was a gap in the task, c) participants had to depend on their own resources, and d) the task had a nonlinguistic outcome. A non-linguistic outcome refers to how “the language serves as the means for achieving the outcome, not as an end in its own right” (R. Ellis, 2009, p. 223). In other words, the learners were supposed to focus on accomplishing the task by using the target language, rather than to focus on the language. A complete sample of task 4 is included in appendix E.

3.5 Procedure and Conditions

After completing a background questionnaire and pretest, participants were randomly assigned to one of three training conditions varying in their level of explicitness as is illustrated in figure 3 and 4.

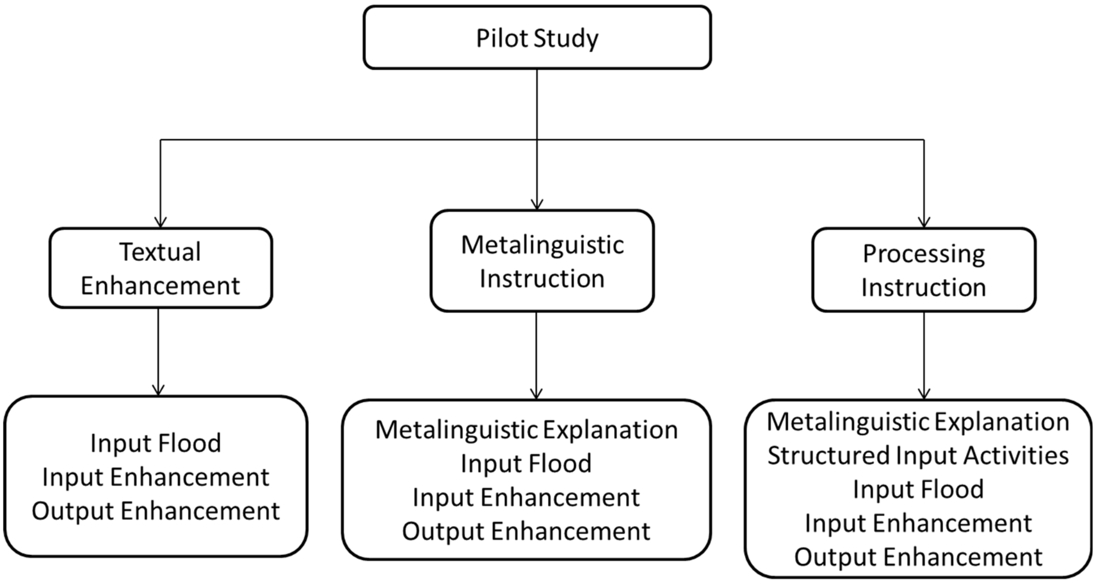

Figure 3. Conditions provided in the pilot study.

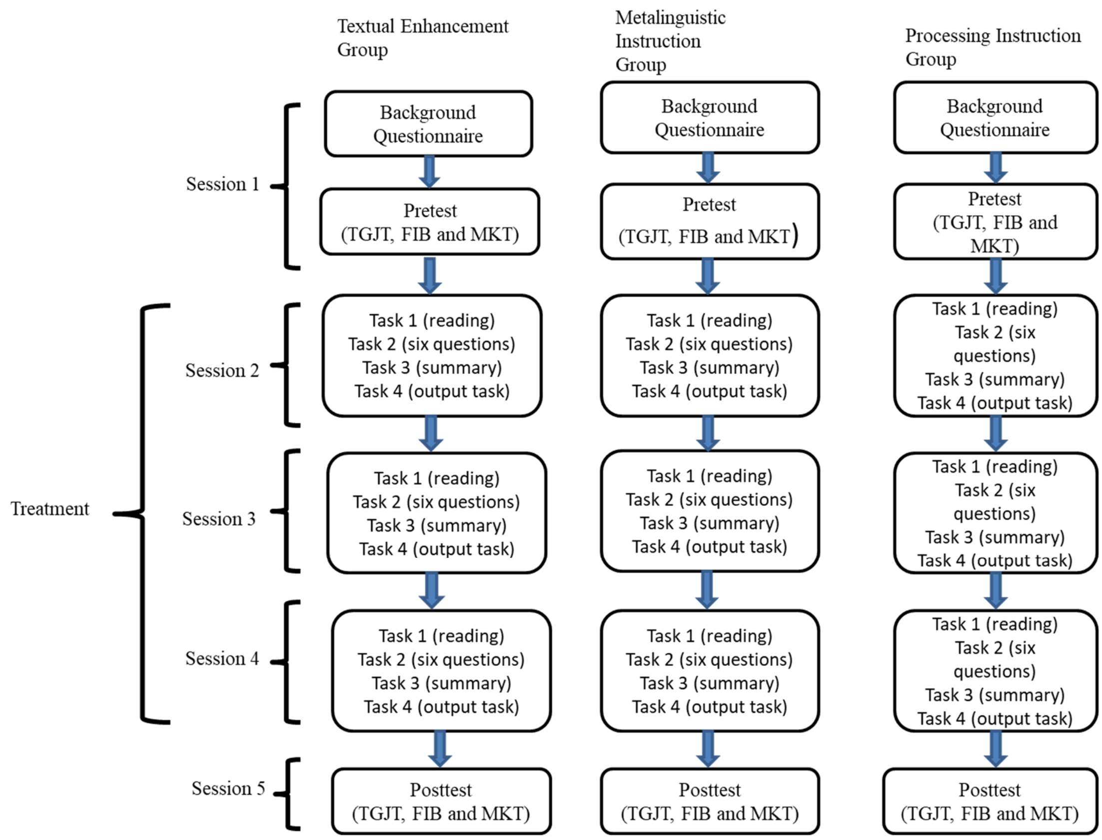

Figure 4. Experimental design.

3.5.1 Textual enhancement

This treatment comprised the combination of two types of enhancement. The first type consisted of colourizing prepositional phrases containing *in*, *on* and *by* that co-occurred with nouns representing forms of transportation: car, truck, bus, train, airplane, boat, and motorcycle. The prepositional phrases containing *in* and *on* were displayed in red, and the prepositional phrases containing *by* were displayed in blue. Hence, the prepositional phrases containing *in*, *on* or *by* will be mentioned throughout this paper as the target forms. The following excerpt contains examples of textual enhancement for each target form respectively.

> Juan told his family one day that they were going to take a trip around the country. Juan's wife, Laura, asked him: "but how are we going to travel?", and Juan responded: "We will travel **in our car**." Laura responded: "traveling around the country **by car** is dangerous". We should travel **by plane** instead". Juan said: "not at all. I have planned everything. Besides, would you prefer to fly across the country? It would be too expensive, and we would miss all the adventure."
>
> They all packed and started their journey on the first day of their summer vacation. Before the trip, Juan checked the tires and the engine. Everything seemed fine. They drove for several hours, but before they left the state, the engine started to overheat. They stopped at a rest area, and Juan had to ask a driver for a ride **in his truck** to the next town. He got to the next town **by truck** and found a mechanic. The mechanic told Juan that he could drive him back to the rest area. So they went back to where the family was. The mechanic fixed Juan's car quickly. It was only a water hose that needed to be replaced. So the family continued their trip. They saw a hotel by the beach and decided to stay there.

The second type of enhancement, called output enhancement, was done automatically by the interface. Output enhancement was operationalized as the automatic colorizing of the target prepositional phrases that were typed by the participants during the experimental tasks. Participants were given tasks designed with the goal of eliciting the use of the target prepositional phrases. Once the participants had finished typing the text of a specific task, the interface would display a button labelled SUBMIT. Participants had to click the SUBMIT button in order to continue. Then the interface would immediately and automatically colorize the target prepositional phrases as follows: those composed of *in* or *on* + *(noun representing a form of transportation)* would be colorized red, and those that comprised *by* + *(noun representing a form of transportation)* would be colorized blue.

The interface enhanced the target forms when they were typed accurately, but if participants typed the target forms incorrectly as in the sentence *I went to school in bus*, the form was not enhanced. As with input enhancement, the objective of having the interface enhance participants' output automatically during the training sessions was to increase the salience of the target forms and to test whether participants could increase their meta-awareness of the different uses of *in* and *on*, and also the differences between *in* and *on* in contrast to *by*. The following excerpts show an example of output enhancement in three steps.

Text typed by a participant before clicking SUBMIT

Example of output enhancement after the participant has clicked SUBMIT

3.5.2 Enhancement combined with metalinguistic instruction

This treatment consisted of giving participants an explanation of the target rules at the beginning of each training session before they received exposure to enhancement (in the texts and their output). It was similar to the previously explained treatment of input enhancement combined with output enhancement. The only difference was that this treatment included a rule explanation before giving participants exposure to the enhancement. At the beginning of each treatment session, participants saw a PowerPoint document with the target rules. To assess that participants had understood the target rules, the presentation required participants to write on a paper two sentences using each of the target rules.

3.5.3 Enhancement combined with processing instruction

This training condition was similar to enhancement combined with metalinguistic instruction as it provided participants with an explanation of the two target rules followed by input enhancement combined with output enhancement. However, after learners were given an explanation of the linguistic targets at the beginning of each session, they were additionally presented with structured input activities that helped them to process the target prepositional phrases differently than how they normally process them in their L1. The following excerpt shows an example of the metalinguistic explanation provided to both the metalinguistic instruction group and the processing instruction group at the beginning of each training session.

We use ***by***, ***in*** and ***on*** to refer to forms of transportation.

For example:

- I go to school **by** car every day.
- My parents went to the beach **in** their car.
- Last week I traveled to Mexico City **on** a bus.

But what is the difference between ***in***, ***on*** and ***by*** in the context of forms of transportation?

There are three rules that are used:

Rule 1: We use ***in*** when we are talking about an enclosed form of transportation that is not big and where we cannot stand up while the vehicle is moving.

- For example: I like to go to the supermarket **in** my truck.

Please produce 2 sentences where you use ***in*** for forms of transportation to show that you have understood the rule:

1 ____

2 ____

Every training session for the processing instruction group included a structured input activity. Three parallel versions of structured input activities were designed in order to avoid giving participants the same one during the three training sessions. Each version comprised 16 questions related to the use of the target forms. Twelve questions focused on the rule governing the use of *in* vs. *on*, and five questions focused on the use of the rule corresponding to the distinction *by* vs. *in*/*on*. The purpose of the structured input activities was to modify the way that participants process the use of the target forms in their L1 and to emphasize the use of each target rule. That is, the activities were intended to help learners know when each of the two rules applies. The following excerpt shows a section of a structured input activity included as part of processing instruction.

Structured Input Activities

Please read each sentence and the question that follows the sentence. Respond to each question based on the preposition in each highlighted phrase.

by vs. **in/on**

1 We will travel **in our car**.

Does the sentence refer to a specific car or to any car in general?

____.

2 Traveling around the country **by car** is dangerous.

Does the sentence refer to a specific car or any car in general?

_______________________________________.

3 Would you prefer to travel across the country **by plane**?

Does this sentence refer to a specific plane or any plane in general?

_______________________________________.

For the purpose of simplification, the three aforementioned training conditions will be named throughout the pilot and main study as illustrated in table 2.

Table 2

Labels and descriptions of each treatment condition

Label	Description of Treatment
Textual enhancement	input enhancement and output enhancement
Metalinguistic instruction	metalinguistic explanation plus input enhancement and output enhancement
Processing instruction	metalinguistic explanation plus structured input activities plus input enhancement and output enhancement

3.6 Data Analysis

3.6.1 Scoring and coding of the training sessions

To measure participants' progress throughout the sessions, I counted the number of obligatory occurrences of the target forms in the summaries in every session. Then I gave a point for every accurate occurrence and calculated the total accuracy by dividing the number of obligatory occurrences by the number of accurate occurrences.

I followed the same procedure with participants' output in tasks 2, 3 and 4 in every session.

Task 2: Reading comprehension

The second task required participants to respond to six questions related to the reading. The purpose of this task was to have participants use the target forms while focusing on the story that they had read. This way, participants could produce output that included the use of the target prepositions. Also, another objective was to analyse whether or not participants were actually attending to meaning while they read the short story or whether they were only focusing on the forms. If participants were capable of responding to the six questions correctly, this would indicate that they had focused at least partially on meaning. Figure 5 shows an example of task 2.

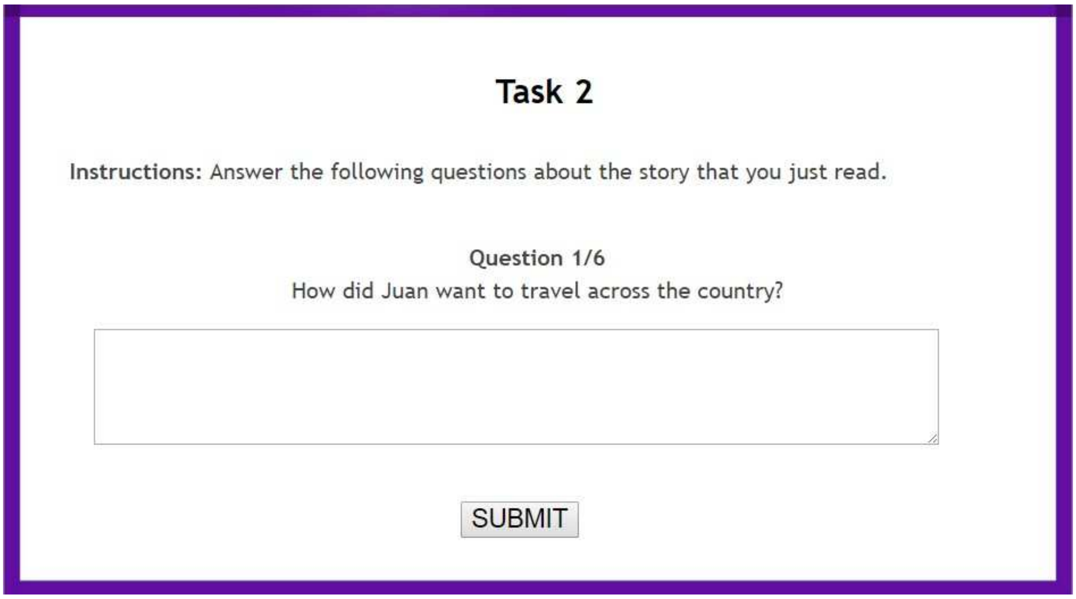

Figure 5. Example of a reading comprehension question on task 2.

Task 3: Summary writing

Task three required participants to type in a box the most important points of the story in their own words. Participants were instructed that their summary should have a length of at least 200 words. The objective of this task, as in task two, was to elicit the production of the target forms. Also, it required participants to focus on meaning and attend the target forms while they were creating their summary. Figure 6 shows an example of task three.

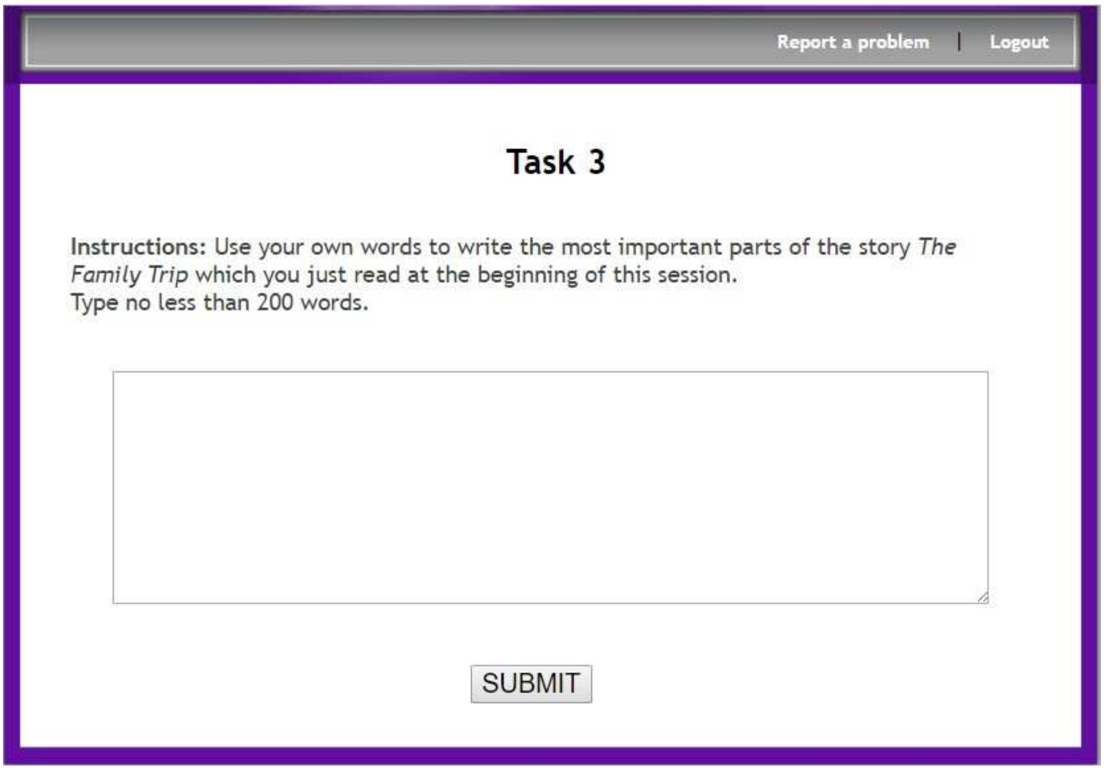

Figure 6. Instructions to type a summary of the short story that participants read as part of task 1.

Task 4: Completing a decision making task

Task four in each of the training sessions consisted of a task in which participants had to type an email to an imaginary friend explaining about a trip that they were going to make. In each session they were given a map of a place that they would visit. This triggered participants to use the target forms in the context of forms of transportation. Once participants in the three training conditions (textual enhancement, metalinguistic instruction and processing instruction) completed the email, the interface instructed them to click the button labelled "submit", and it automatically colourized the target forms containing *in*, *on* and *by*. This task had no time limit, but participants were encouraged not to take more than fifteen minutes completing it. Figure 7 shows the instructions that participants were given in order to complete task 4 in training session 1.

Task 4

Instructions:

Imagine that you will travel to the United Kingdom, and you will stay there for ten days. You will travel to the following five cities (in the following order): *London, Manchester, Liverpool, Belfast* and *Edinburgh*. Then you will travel back to London where you will take a plane back home. You cannot spend more than **£150** on transportation on all these trips.

Write an email to your travel agent where you explain the forms of transportation that you will use for each of the trips.

The following table shows the prices of different forms of transportation that you can use.

Figure 7. Instructions to complete task 4.

3.6.2 Scoring of pre-posttest scores and within group comparisons

As mentioned previously, during the first session participants completed a pretest, and on the last session (the fifth session) they completed a posttest. Both comprised a TGJT, a FIB and an MKT. The following is a brief description of how each test was scored and coded. The scoring and coding of all tests focused only on the 20 target items while the 20 distractor items were ignored.

In the TGJT a point was given for every target item that participants judged accurately. That is, one point was awarded if a sentence was grammatical, and participants judged it as grammatical or if a sentence was ungrammatical and participants judged it as ungrammatical. However, if a target item was ungrammatical and learners judged it as grammatical, no points were granted. Conversely, if a sentence was grammatical and learners judged it as ungrammatical, no points were given.

In the FIB test, a point was awarded for every blank space that was filled correctly. On the other hand, for every space that was left unanswered, no points were given. Similarly, no points were granted for every sentence that was completed with an incorrect preposition.

A similar procedure was followed for scoring and coding the MKT. A point was granted if participants corrected an ungrammatical sentence and typed an explanation of the target rule that had been broken. However, if they corrected an ungrammatical sentence without providing an explanation of the target rule that needed to be followed, no points were given. In the same vein, no points were awarded if learners did not correct an ungrammatical sentence even if they typed an explanation of the target rule. To find if there were any significant differences from pre to posttests on the TGJT test, I conducted a Mixed Factor ANOVA with time and group as the independent variables. I then followed the same procedure with the data of the FIB test and the MKT. The objective of the analysis was to find which treatment was more effective in promoting accuracy of the target forms.

3.7 Results

The pilot study delivered results from two different sources: the treatment sessions and the pretest and the posttest. The findings from the treatment sessions comprised the output produced by participants during each of the training sessions. The interface allowed retrieving each group's performance in order to analyse if learners had made progress from the first to the last treatment session. The scores from the pretest and posttest were also retrieved and analysed. The following subsections will first explain the findings that were gathered from participants' output during the treatment sessions and then they will illustrate the learning patterns that emerged from the pretest to the posttest.

3.7.1 Accuracy during treatment sessions

Participants' accuracy in each task was compared across sessions. For example, the accuracy of learners' output was compared from the first to the second treatment session and from the second to the third treatment session on task 3 which involved typing a summary of a story that learners had read. The same procedure was followed to compare participants' output on task 4 throughout the sessions.

The columns containing the accuracy scores of participants' output in session 1, 2 and 3 on table 3 illustrate that in task 3 textual enhancement did not result in an increase of accuracy in participants' output during the tasks because participants' score was too high from the beginning of the training in session 1. However, adding metalinguistic instruction to the treatment gradually increased learners' accuracy. Moreover, adding processing instruction to the combined treatment was even more effective than adding metalinguistic instruction. Participants who received processing instruction made significant progress from the start of the treatment.

Table 3

Participants' General Accuracy Scores on Task 3 during the Three Treatment Sessions

	Session 1		Session 2		Session 3	
	Task 3		Task 3		Task 3	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*n*	M (*SD*)
Textual Enhancement	5	10 (0)	5	8.9 (2.18)	5	10 (0)
Metalinguistic Instruction	5	7.9 (2.94)	5	8.3 (1.77)	5	8.6 (1.41)
Processing Instruction	5	6.9 (2.52)	5	8.3 (1.76)	5	7.9 (2.29)

In task 4 the textual enhancement group also scored higher than the other two groups on session 1. This may have been due to the small sample size used for this pilot study. With five participants per group, it is not uncommon to have variability between the groups from the beginning of an experiment. Thus, a larger sample size is recommended and therefore, the main study had a much larger population in each group. The columns showing the scores from session 1, 2 and 3 on table 4 indicate that the textual enhancement group and the processing instruction group improved across sessions, but the metalinguistic instruction group did not improve much. The following subsection will present the results from the pretest and the posttest.

Table 4

Participants' General Accuracy Scores on Task 4 during the Three Treatment Sessions

	Session 1		Session 2		Session 3	
	Task 4		Task 4		Task 4	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*n*	M (*SD*)
Textual Enhancement	5	8.5 (2.60)	5	9.7 (0.56)	5	9.3 (0.94)
Metalinguistic Instruction	5	5.4 (2.97)	5	5.7 (3.14)	5	6 (2.54)
Processing Instruction	5	5.6 (2.95)	5	7.2 (1.77)	5	8.1 (2.56)

3.7.2 Pretest and posttest

A paired-samples T test was conducted with the pre and posttest scores of the TGJT. The column comprising the p values on table 5 shows that there was a significant increase in mean score of the *in* vs. *on* rule from pre to posttest for both the metalinguistic instruction group, and for the processing instruction group. However, there was no significant increase for the group receiving textual enhancement. The column displaying the p values on table 6 also indicates that none of the three groups had a significant increase in mean score of the *by* vs. *in/on* rule from pre to posttest on the TGJT.

Table 5

Results from the TGJT Pre to Posttest of the rule (in vs. on) for each of the Conditions

	Pretest		Posttest			95% CI	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*p*	*LL*	*UL*
Textual Enhancement	5	5.00 (1.58)	5	5.20 (2.48)	0.861	-3.164	2.764
Metalinguistic Instruction	5	3.60 (2.07)	5	7.60 (2.40)	0.009	-6.322	-1.677
Processing Instruction	5	3.80 (1.78)	5	7.00 (2.34)	0.045	-6.291	-0.108

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

Table 6

Results from the TGJT Pre to Posttest of the rule (by vs. in/on) for each Condition

	Pretest		Posttest			95% CI	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*p*	*LL*	*UL*
Textual Enhancement	5	6.00 (1.87)	5	8.00 (1.22)	0.154	-5.165	1.165
Metalinguistic Instruction	5	6.80 (2.04)	5	5.6 (0.89)	0.109	-0.418	2.818
Processing Instruction	5	7.00 (2.64)	5	7.60 (2.07)	0.683	-4.386	3.186

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

A paired samples T-test was also conducted with the pre and posttest scores of the FIB test. The column displaying the p value on table 7 indicates that the textual enhancement group and the metalinguistic instruction group did not learn the rule *in* vs.

on from pre to posttest. Only the processing instruction group learned this rule. However, this group also had the lowest score in the pretest which partially explains why this group had a significant learning effect from pre to posttest in contrast to the other two groups which scored higher on the pretest and did not have a learning effect. The column containing the p value on table 8 shows that none of the groups learned the rule *by* vs. *in/on* from pre to posttest.

Table 7

Results from the FIB test Pre to Posttest of the rule (in vs. on) for Each Condition

	Pretest		Posttest			95% CI	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*p*	*LL*	*UL*
Textual Enhancement	5	5.2 (2.28)	5	4.6 (1.81)	0.5	-1.655	2.855
Metalinguistic Instruction	5	5.0 (2.82)	5	6.8 (4.43)	0.52	-9.061	5.461
Processing Instruction	5	4.0 (1.58)	5	9.0 (1.41	< .001	-5.877	-4.122

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

Table 8

Results from the FIB test Pre to Posttest of the rule (by vs. in/on) for Each Condition

	Pretest		Posttest			95% CI	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*p*	*LL*	*UL*
Textual Enhancement	5	8.2 (2.68)	5	8.8 (1.64)	0.68	-4.386	3.186
Metalinguistic Instruction	5	5.40 (3.20)	5	8.00 (2.34)	0.19	-4.483	-0.716
Processing Instruction	5	9.0 (1.00)	5	92. (1.09)	0.704	-1.56	1.1601

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

A paired-samples T test was also conducted with the pre and posttest scores of the MKT. As shown on the column displaying the p value on table 9, there was an increase in mean scores of the *in* vs. *on* rule in the MKT test from pre to posttest for the processing instruction group, but no increase for the metalinguistic instruction group or for the textual enhancement group which scored zero points in both the pretest and the posttest. The three groups' showed evidence of no metalinguistic knowledge of the rule *in* vs. *on* from the beginning of the experiment. This floor effect on the pretest simply shows that learners were not able to verbalize the target rules in spite of having some knowledge on the TGJT and FIB pretest. The two groups that learned this rule due to the treatment sessions scored above chance on the immediate posttest suggesting that the increase in metalinguistic knowledge was not due to a low score at the beginning of the experiment, but because of the explicit treatments.

The column with the p values on table 10 also indicates that the same pattern emerged with the mean scores of the *by* vs. *in*/*on* rule where there was an increase from pre to posttest for the processing instruction group, but no increase for the metalinguistic instruction group nor for the textual enhancement group, which again scored zero points in the pretest and the posttest. This floor effect on the pretest shows that although participants had scored above chance on the TGT and FIB pretest, they were not able to explain this target rule prior to the treatment sessions.

Table 9

Results from the MKT Pre to Posttest of the rule (in vs. on) for Each Condition

	Pretest		Posttest			95% CI	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*p*	*LL*	*UL*
Textual Enhancement	5	0	5	0			
Metalinguistic Instruction	5	0	5	5.80 (5.31)	0.071	-12.39	0.793
Processing Instruction	5	.60 (0.89)	5	10.0 (0)	< .001	-10.51	-8.289

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

Table 10

Results from the MKT Pre to Posttest of the rule (by vs. in/on) for Each Condition

	Pretest		Posttest			95% CI	
Condition	*n*	M (*SD*)	*n*	M (*SD*)	*p*	*LL*	*UL*
Textual Enhancement	5	0	5	0			
Metalinguistic Instruction	5	0	5	5.80 (5.31)	0.071	-12.39	0.793
Processing Instruction	5	.80 (1.78)	5	10 (0)	< .001	-11.42	6.978

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

To analyse if there was a significant increase in mean scores between groups over time for the TGJT, a Mixed Factor ANOVA was conducted with the pre and posttest scores of *in* vs. *on* items as a within subject factor and with the group treatment as a between subject factor. No significant interaction between treatment conditions and improvement over time was found, Wilk's λ = .606, $F(2, 12)$ 3.909, p = .050, η_p^2 = .394, 1-β = .588. The same procedure was followed with the items of *by* vs. *in*/*on*, and there was no interaction between treatment conditions and improvement over time, Wilk's $\lambda = .731$, $F(2, 12)$ 2.206, $p = .153$, $\eta_p^2 = .269$, $1\text{-}\beta = .363$.

In order to test whether there had been a significant increase in mean scores between groups over time for the FIB results, I conducted a Mixed Factor ANOVA with the FIB pre and posttest scores of *in* vs. *on* items as a within subject factor and with group treatment as a between subjects factor. No significant interaction was found for any of the groups' pre to posttest scores over time, Wilk's $\lambda = .658$, $F(2, 12) = 3.116$, $p = .081$, $\eta_p^2 = .342$, $1\text{-}\beta = .490$. For the items *by* vs. *in/on*, the same procedure was followed, and there was also no interaction for any of the groups' pre to posttest score over time, Wilk's $\lambda = .756$, $F(2, 12)$ 1.937, $p = .187$, $\eta_p^2 = .244$, $1\text{-}\beta = .323$.

A Mixed Factor ANOVA was also conducted with the MKT pre and posttest scores of *in* vs. *on* items as a within group factor and with group treatment as a between group factor. A significant interaction between treatment conditions and improvement over time, Wilk's $\lambda = .340$, $F(2, 12)$ 11.634, $p = .002$, $\eta_p^2 = .660$, $1\text{-}\beta = .973$, was found. A Bonferroni Post Hoc test indicated a significant gain for the metalinguistic instruction group ($p = .036$) and for the processing instruction group ($p < .001$).

For the MKT pre and posttest scores of *by* vs. *in/on* a Mixed Factor ANOVA revealed that there was a significant interaction between treatment conditions and improvement over time, Wilk's $\lambda = .367$, $F(2, 12)$ 10.338, $p = .002$, $\eta_p^2 = .633$, $1\text{-}\beta = .955$. A Bonferroni Post Hoc test indicated that there was a significant increase from pre to immediate posttest for the metalinguistic instruction group ($p = .045$) and also a significant increase from pre to immediate posttest for the processing instruction group ($p = .001$).

3.8 Discussion

3.8.1 Effectiveness of conditions

R.Q. 1 What are the effects of implicit instruction and explicit instruction on the acquisition of English prepositions by (adult) native speakers of Spanish?

The findings in this pilot study have to be interpreted with caution because of the small sample size that was used. Because there were only five participants per group, it is plausible that this small sample size caused variability among the groups' pretest scores. Thus, it is not possible to conclude about the effectiveness of implicit instruction in the form of textual enhancement in promoting the acquisition of the target forms. Due to the initial high scores in the TGJT and in the FIB by the textual enhancement group, they were perhaps less likely to increase their scores on the posttest compared to the other two groups. Based on the data, it is also not possible to conclude that an explicit pedagogical treatment such as metalinguistic instruction or processing instruction was needed in order for learning to occur.

In terms of metalinguistic knowledge, the initial floor effect by the three groups suggests that the target rules are challenging for participants at this stage. There was no evidence that learners could discover the target rules on their own without receiving any form of explanation prior to completing the tasks. Also, the learners receiving explicit instruction operationalized as either metalinguistic instruction or processing instruction had better metalinguistic knowledge on the posttest compared to the group receiving only textual enhancement. This seems to underscore the important role of explicit training in terms of gaining metalinguistic knowledge.

These results of the metalinguistic knowledge test go in hand with the findings of two meta-analyses (Norris & Ortega, 2000; Spada & Tomita, 2010) where explicit treatments had a larger effect size than implicit training conditions. However, one important factor to consider is that the sample size of the entire pilot experiment was very small (15 participants), and perhaps conducting it with a larger population would reveal different results.

These findings will be later compared with those from the main study.

3.8.2 Effects of training conditions on target forms

R.Q. 2: Does the type of training condition affect the target forms *in*, *on* and *by* in different ways?

It was not possible to find if there would be more learning of the rule *in* vs. *on* or the rule *by* vs. *in*/*on* due to the training condition because the pretest scores on the items targeting the rule *by* vs. *in*/*on* were higher than those of the rule *in* vs. *on*. The limited number of participants in each group may be one of the reasons for this. The main study is more likely to shed some light into this matter as it will comprise a much larger population.

3.8.3 Output accuracy during training sessions

R.Q. 3: Does the type of training condition affect the accuracy of output production during the training phase?

The results of the training sessions do not allow making a clear conclusion about whether the type of training condition affects the accuracy of output during the training phase as is shown on tables 3 and 4. It is not possible to make claims about the progress or lack thereof of the textual enhancement group in task 3 because of the initial high scores shown in the training. In the case of task 4 the results suggest that the more explicit the training condition is, the more likely it is that participants' output accuracy will increase during the training sessions since only the processing instruction group resulted in a learning effect during the treatment sessions.

3.8.4 Implications of pilot results on the main study

This pilot appears to confirm what previous research had found; namely, that explicit instruction has a more powerful effect than implicit instruction in terms of gains of metalinguistic knowledge. It seems unlikely that implicit instruction in the form of textual enhancement can ultimately lead to declarative knowledge of the target forms although this will have to be confirmed in the main study.

Based on the implications of the pilot, two modifications were made to the main study regarding the stories in the treatment sessions and the sample size. In the pilot experiment the three stories did not have an equal number of target forms as is shown in tables 11 and 13. In order to avoid any unwanted task effect in the main study, the number of target forms in each story was modified. As a result, the three stories in the main study had an equal number of target forms as is shown in tables 12 and 14.

Table 11

Number of co-occurrences with in vs. on in the pilot experiment

	Story One	Story Two	Story Three	
	Number of Occurrences	Number of Occurrences	Number of Occurrences	Total
in__car	7	1	2	10
in__truck	1	1	3	5
in__rowboat	4			4
on__motorcycle	1		1	2
on__bus	1		1	2
on__train	1	3	3	7
in__boat		3		3
on__plane		3	1	4
on__bicycle		3		3
on__tractor			2	2
in__taxi			2	2
	15	14	15	44

Table 12

Number of co-occurrences with in vs. on in the main study

	Story One	Story Two	Story Three	
	Number of Occurrences	Number of Occurrences	Number of Occurrences	Total
in__car	1	1	1	3
in__truck	1	1	1	3
in__rowboat				
on__motorcycle	1	1	1	3
on__bus	1	1	1	3
on__train	1	1	1	3
in__boat	1	1	1	3
on__plane	1	1	1	3
on__bicycle				
on__tractor				
in__taxi				
	7	7	7	21

Table 13

Number of co-occurrences with by vs. in/on in the pilot experiment

	Story One	Story Two	Story Three	
	Number of Occurrences	Number of Occurrences	Number of Occurrences	Total
by car	2		1	3
by plane	2	2	3	7
by boat	4	3		7
by tram	1			1
by train	1	1	1	3
by motorcycle		1		1
by bus		1	2	3
by bicycle		2		2
by truck			1	1
by subway			1	1
by taxi			1	1
	10	10	10	30

Table 14

Number of co-occurrences with by vs. in/on in the main study

	Story One	Story Two	Story Three	
	Number of Occurrences	Number of Occurrences	Number of Occurrences	Total
by car	1	1	1	3
by plane	1	1	1	3
by boat	1	1	1	3
by tram				
by train	1	1	1	3
by motorcycle	1	1	1	3
by bus	1	1	1	3
by bicycle				
by truck	1	1	1	3
by subway				
by taxi				
	7	7	7	21

Also, the sample size in the main study was larger than in the pilot study. It had a minimum of 30 participants per group, and it included the same research questions as the pilot study. However, it included an additional research question that probed whether the learning of any of the treatments can be sustained two weeks after the treatment has ended.

3.9 Summary

This pilot study chapter provided an explanation about the design and methods used to deliver implicit instruction and explicit instruction of two target rules and to test the two different types of knowledge. An important objective was assessing if each type of pedagogical treatment was effective. The results from this pilot are not robust enough to conclude whether implicit and explicit treatments promoted learning differently. Another aim was to test if participants would have enough time to complete each of the tasks during the training sessions and each test. This pilot indicates that learners had sufficient time to complete all the tasks and tests. The following chapter will present information about the main study. Because it used the same methodology as the one presented in this chapter, it will not include an extensive explanation of the methods. However, it will present an explanation of how the participants in the main study differed from those of the pilot study.

Section II

Chapter 4: The Main Study

4.1 Introduction

The main study followed the same design as the pilot study. There were three treatment groups receiving a three-session treatment, but additionally, there was a control group that only completed the sessions with exposure to neither enhancement nor any form of explicit instruction. Another addition to the main study was a delayed posttest delivered one week after participants had taken an immediate posttest and two weeks after the treatment had ended.

The aim of including delayed measures of learning in the current study was to offer a broader picture of any sustained learning that may occur due to the treatments. Although there are no established criteria about the ideal length between the immediate posttest and the delayed posttest, Schmitt (2010) suggested that a one week delay or more is needed in order for any sustained gain to be considered long-term learning. An example of a recent study using a one-week delayed test was conducted by Choi (2017) who assessed the learning of collocations. Delayed measures of learning have not been traditionally used in textual enhancement studies. Only seven studies conducted prior to Choi's experiment have incorporated delayed posttests (see De Santis, 2008; Jahan & Kormos, 2015; Leow, 2001; Lyddon, 2011; Szudarski & Carter, 2016; Tanaka, 2011; White, 1998). The length of the delay has varied considerably from one week to up to ten weeks. Table 15 shows how long the delay has been in these studies.

Table 15

Length Between the End of Training and the Delayed Posttest in Input Enhancement Studies

Input Enhancement Studies using Delayed Posttests: Length of delay between the end of the treatment and the posttest	
Study	Length of Delay
White (1998)	one month
Leow (2001)	three weeks
DeSanti (2008)	one week
Tanaka (2011)	two weeks
Lyddon (2011)	ten weeks
Jahan and Kormos (2015)	two weeks
Szudarski and Carter (2016)	twoweeks
Choi (2017)	one week

As table 15 above illustrates, there still has not been consensus on the length that is needed in order to measure whether there is sustained long-term learning. This lack of agreement on the required delay of long-term measures may be partly responsible for the contradicting findings in delayed posttests. For instance, only one textual enhancement study (see De Santis, 2008) has shown attrition from the immediate posttest to the delayed posttest. The other studies using delayed posttests have shown either sustained learning from the immediate posttest to the delayed posttest (see Jahan & Kormos, 2015), learning on a delayed posttest without using an immediate posttest (see Szudarski & Carter, 2016) or no learning on the immediate posttest nor on the delayed posttest (see Leow, 2001; Lyddon, 2011; Tanaka, 2011; White, 1998). Thus, it is one of the aims of the current study to investigate whether or not there will be any attrition between the immediate posttest and the delayed posttest. The following research questions address this and other issues.

4.2 Research Questions for the Main Study

The main study aimed at answering the following questions:

R.Q. 1) What are the effects of implicit instruction and explicit instruction on the acquisition of English prepositions by (adult) native speakers of Spanish?

R.Q. 2) Are there any delayed effects one week after the posttest?

R.Q. 3) Does the type of training condition affect:

SubQ1 The type of knowledge (implicit/explicit) that is acquired?

SubQ2 The target forms *in* or *on* and *by* in different ways?

SubQ3 The accuracy of output production during the training phase?

4.3 Participants

A pool of 124 students in a state funded university in the northwest of Mexico participated in the study. As a university requirement, all participants had taken the Michigan English Test within a six-month period before the study, and they all scored at a B1 level according to the Common European Framework of References for Languages (CEFR). The learners' age ranged from 18 to 25 years (M = 20.86, SD = 2.64), and sixty-four (52%) of them were female. They all had been studying English for more than three years, and none of them reported being a bilingual or having learnt English or any other language additional to Spanish during their childhood. Also, none of them had lived in the United States or in any other English speaking country.

Moreover, students had limited exposure to the target language outside of class, and English as a foreign language was taught five days a week in 50-minute sessions. The reason to conduct the main study in this university was that it has an abundant number of English L2 learners at an intermediate level, which was the target proficiency desired because beginners would not have been able to complete the pedagogical tasks satisfactorily, and advanced learners would have likely scored high on the pretest. Another important criterion for selecting the university was that it has a computer lab that English learners can use during or after the class. It was also important to control that no participant came from an English L1 background. In the same vein, a state university in the northwest of Mexico seemed an appropriate choice since there were no students in this context who spoke English as their native language.

Additionally, Mexican students were an ideal population for the purposes of this study because prepositions are used differently in their L1 than in English. Thus, the target structure of this study is typically problematic for Hispanic learners of English as a foreign language. Also, as mentioned earlier, an initial small-scale pilot study revealed that the target forms (prepositions *in*, *o*n and *by* in the context of forms of transportation) were problematic for Hispanic students learning English as a foreign language. The target prepositions may be also troublesome for learners with an L1 background other than Spanish, but because the pilot study had been conducted with Mexican students, it was important to be consistent with the type of population, and so I chose to collect the data for the main study in Mexico.

Data collection for this study took place in a computer laboratory during class time. Learners were given extra credit by their English instructors for participating. During the first session at the beginning of the study, participants read an information sheet about the experiment. They were then asked to sign a consent form if they agreed to participate. The consent form is available in the appendix section. The students who did not agree to participate were given the option of completing pedagogical exercises related to their English lessons during the sessions. Those who agreed to participate were given a pretest. Once they completed the pretest, they were assigned a username and a password which randomly determined the condition to which they were placed. The specific details about their random distribution will be provided in the procedures.

4.4 Materials

4.4.1 Pretests, posttests and delayed posttests

To measure the reliability of each pretest, I calculated the Chronbach Alpha of the TGJT and of versions A, B and C of the FIB test and MKT with the scores of all participants. Chronbach Alpha was only calculated for the item scores of each test, and the distractor items were not included in the reliability analysis. I then followed the same procedure with the posttest scores of all tests and with the delayed posttest scores respectively. Table 16 first presents the reliability of the TGJT, FIB, and MKT pretests. It also displays the reliability of the posttests and delayed posttests. As shown by the reliability coefficients, with the exception of the TGJT pretest version A, all the other tests had Chronbach Alphas higher than 0.7 indicating that overall, the reliability of the pretests, posttest and delayed posttest was adequate.

Table 16

Reliability of Tests

		TGJT		FIB		MKT	
	Test Type	Chronbach Alpha	N	Chronbach Alpha	N	Chronbach Alpha	N
Pretest	A	0.642	124	0.755	42	0.896	42
	B			0.715	41	0.95	41
	C			0.777	41	0.901	41
Posttest	A	0.776	124	0.79	42	0.983	42
	B			0.801	41	0.965	41
	C			0.777	41	0.973	41
Delayed Posttest	A	0.703	124	0.906	42	0.983	42
	B			0.878	41	0.965	41
	C			0.895	41	0.973	41

4.4.2 Instructional treatment

As the pilot study, the main study required participants to complete three treatment sessions. Each session comprised four tasks. The first task in each session was to read a story. The same stories used in the pilot were also used in the main study, but they were slightly modified in order to ensure that the readings in each session had an equal number of occurrences of each target form. That is, there were 4 instances of *in*, 5 instances of *on* and 7 instances of *by* in each reading as illustrated in tables 17 and 18. The number of target forms in each session was controlled to avoid any unwanted task effect. This allowed comparing the progress made by participants in their use of the target forms. It was also possible to detect if they increased their use of the target forms throughout the training sessions.

Table 17

Number of Co-occurrences with in vs. on in the Main Study

	Story One	Story Two	Story Three	
	Number of Occurrences	Number of Occurrences	Number of Occurrences	Total
in __ car	1	1	1	3
in __ truck	1	1	1	3
in __ rowboat				
on__motorcycle	1	1	1	3
on __ bus	1	1	1	3
on __ train	1	1	1	3
in __ boat	1	1	1	3
on __ plane	1	1	1	3
on __ bicycle				
on __ tractor				
in __ taxi				
	7	7	7	21

Table 18

Number of Co-occurrences with by vs. in/on in the Main Study

	Story One	Story Two	Story Three	
	Number of Occurrences	Number of Occurrences	Number of Occurrences	Total
by car	1	1	1	3
by plane	1	1	1	3
by boat	1	1	1	3
by tram by train	1	1	1	3
by motorcycle	1	1	1	3
by bus	1	1	1	3
by bicycle by truck by subway by taxi	1	1	1	3
	7	7	7	21

The stories had 663 words in the first treatment session, 654 words in the second treatment session and 602 words in the third treatment session. As in the pilot study, each story in the main study comprised mostly words which are among the most commonly used in English (K-1000 and K-2000). Table 19 shows the vocabulary frequency in each story. The labels K-1000 and K-2000 in the table refer to the one thousand most common words and the two thousand most common words used in English respectively.

Table 19

Word Frequency in Each Story

	K-1000 words	K-2000 words	Academic Words	Off list words
Story 1	85%	8%	1%	6%
Story 2	85%	6%	1%	8%
Story 3	89%	4%	1%	6%

Following the same treatment design as in the pilot, the main study included the same reading comprehension questions after each story at the beginning of each training session. It also included the same instructions as in the pilot study asking participants to type a 200-word summary of the story that they had read. As a final task in each session, the main study also included the same decision-making tasks used in the pilot study.

4.5 Experimental Design

During the first session participants completed a background questionnaire related to their English learning development. It also focused on the age at which students started to learn English and on the amount of time that they spent practicing the target language. It took participants no more than ten minutes to complete it (M = 5.20, SD = 0.10), and once they had answered it, the interface displayed the pretest. Once participants had completed the TGJT, FIB and the MKT pretest, they were instructed to log out of the interface as this was the end of the pretesting session.

As in the pilot study, the main study included implicit and explicit treatments. However, it comprised an additional control group that received exposure to input flood but no exposure to textual enhancement. The control group had 32 participants, the textual enhancement group had 30 participants, the metalinguistic instruction group had 31 participants and the processing instruction group had 31 participants too. Figure 8 shows the two types of implicit training and the two types of explicit treatments included in the main study.

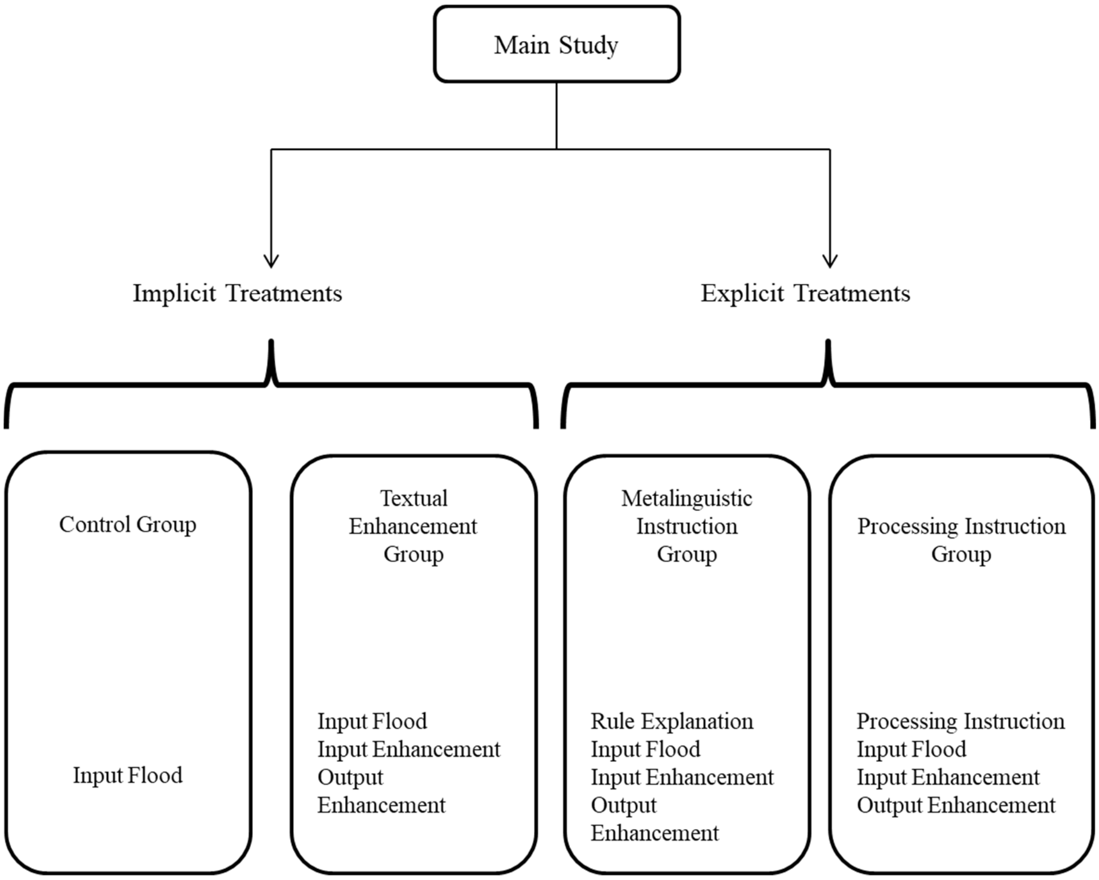

Figure 8. Main study treatments.

4.6 Procedure and Conditions

The main study followed the same data collection procedure from the pilot study. All groups including the control produced output as part of the treatment. Therefore, the four conditions followed a presentation, practice and production (PPP) design. The rationale behind this design was that learners of English as a foreign language in Mexico are accustomed to this layout, and according to Fotos (1998) and Littlewood (2007), a PPP approach may be necessary in a context where the L2 is taught as a foreign language. Also, part of the experiment involved measuring the effectiveness of output enhancement. Therefore, it was necessary to provide output tasks.

4.7 Data Scoring and Analysis

4.7.1 Performance during treatment sessions

The interface allowed analysing participants' output during the three training sessions. The analysis done for the main study focused on two aspects of participants' output: the number of occurrences of the target forms and the accuracy with which these forms were used. In order to determine the number of times that participants used the target forms, I counted the total number of noun phrases containing the target prepositions along with forms of transportation.

To determine participants' accuracy during the sessions, I counted the number of instances where each of the target forms (*in*, *on* and *by*) was correctly used. Then I deducted the number of accurate instances from the number of total occurrences of the target noun phrases.

These results of participants' accuracy during the treatment sessions will be shown in the following chapter. Assessing participants' accuracy during their training was an important part of the main study because it provided an online measure of learning. Therefore, the analysis of participants' training sessions will illustrate whether participants' accuracy increased during the sessions, and it will inform if any increase in accuracy occurred immediately after the first session or whether it incremented gradually from session one to session three.

4.7.2 Scoring and coding the pre, post and delayed posttests

The interface automatically saved the FIB and MKT scores of all participants. In the FIB test, a point was given if the participant had typed the correct missing preposition in a sentence. For example, figure 9 illustrates a sentence where the participant correctly typed the missing preposition *by*. This participant received one point.

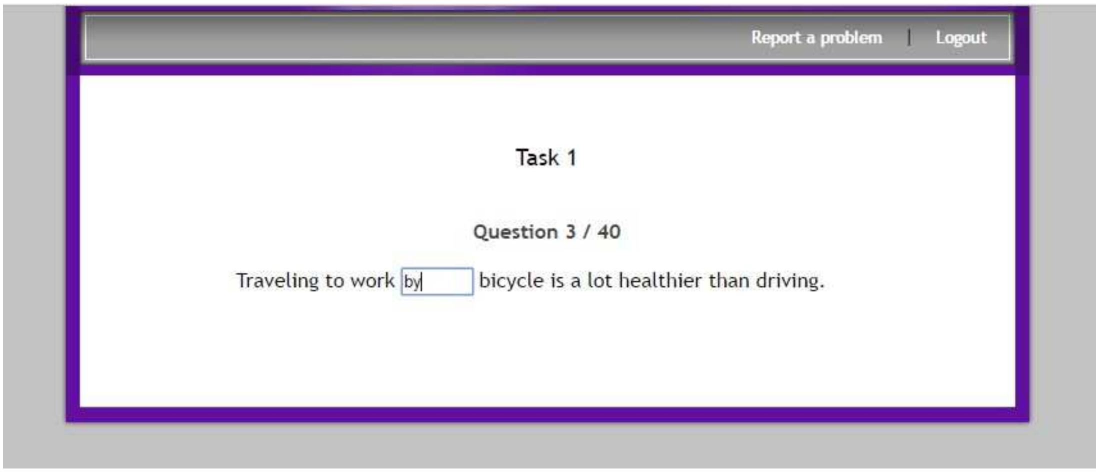

Figure 9. Example of an item of the FIB test completed correctly.

If the participant had typed a preposition that was not appropriate, zero points were scored. Figure 10 is an example of an incorrect response which was not given any points. The participant typed *on*, but the correct response was *in*. No half points were given for partially correct answers. If participants typed more than one word, the sentence was not given a point.

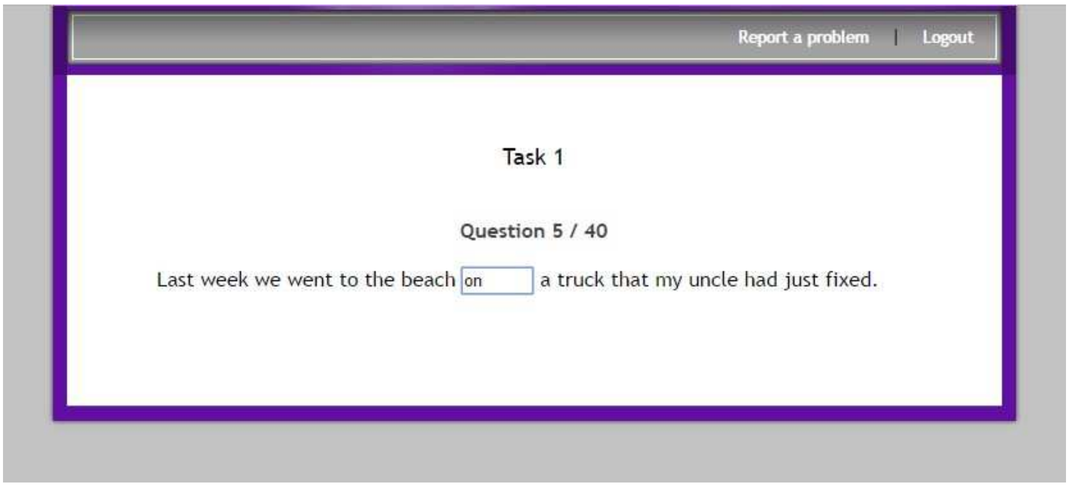

Figure 10. Example of an item of the FIB test completed incorrectly.

In the MKT a point was scored when a participant had been able to correct a sentence and to type the reason explaining why it was ungrammatical. Figure 11 shows an item where the preposition *on* is incorrect.

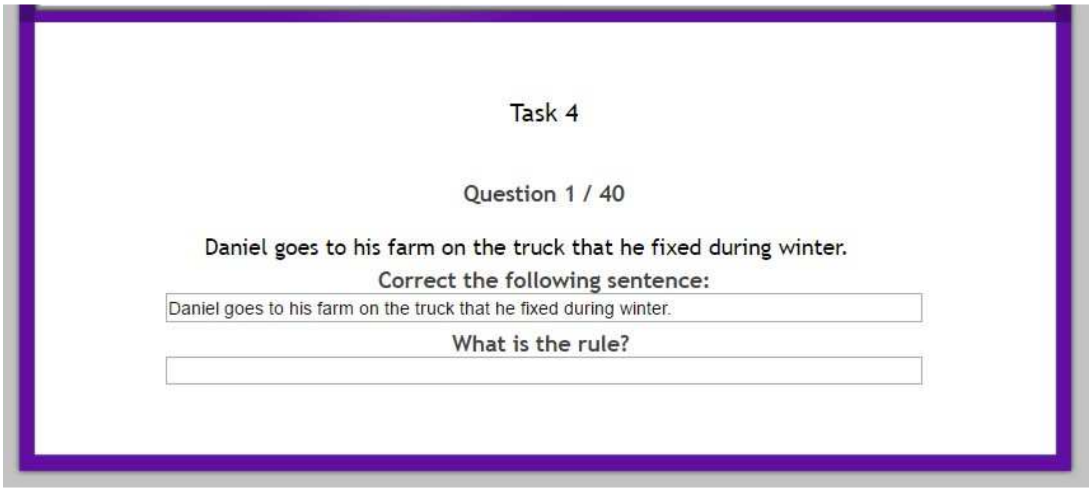

Figure 11. Example of an MKT item that had an incorrect preposition.

Figure 12 shows the same item after a participant corrected the preposition that was ungrammatical. At this stage the participant was halfway through the completion of the item. There was still a blank space below the question "What is the rule?" where the participant needed to explain why the sentence was ungrammatical. If the participant corrected the ungrammatical preposition but provided no metalinguistic explanation of the target rule, the item was scored zero points. Following previous research using metalinguistic knowledge tests (see Akakura, 2012; Roehr, 2008), no half points were given if an item had been corrected but lacked a metalinguistic explanation. Also, no half points were given if the metalinguistic explanation was incorrect. The rationale for this criteria was that as explained by Roehr (2008, p. 173), metalinguistic knowledge has typically been assessed by learners' capability or lack thereof "to correct, describe and explain L2 errors". Thus, according to this operationalization, identifying an error demands metalinguistic knowledge only partially, as it is also an essential part of this construct to be able to explain what is wrong in a sentence, and how it should be modified in order for it to be grammatical.

Figure 13 illustrates how the participant deleted the preposition *on* and replaced it with the preposition *in*. Then the participant typed the explanation of the rule that she applied in order to correct the sentence. In this case, the item was given one point because the participant corrected the ungrammatical sentence and provided a metalinguistic explanation that was correct.

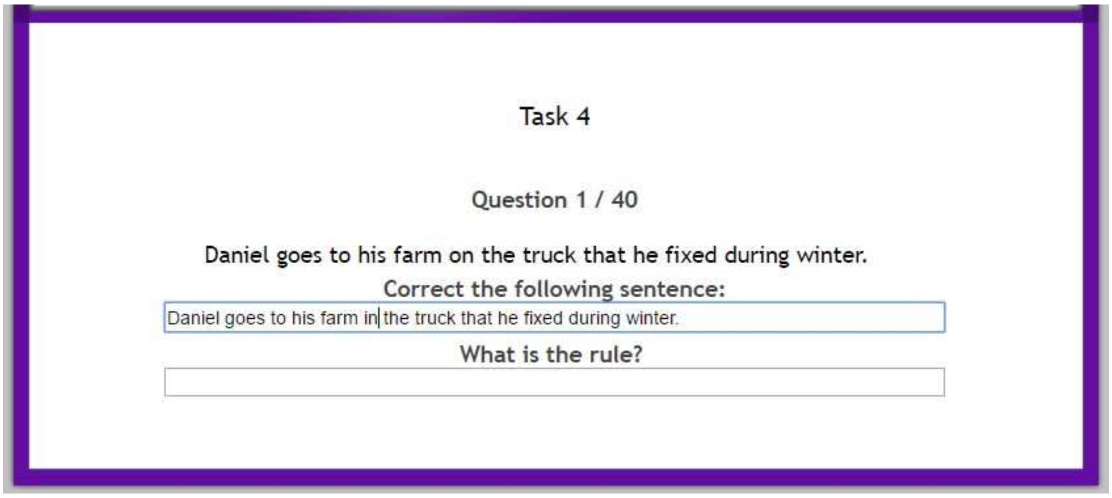

Figure 12. Example of an ungrammatical item of the MKT that was corrected, but no metalinguistic explanation was provided.

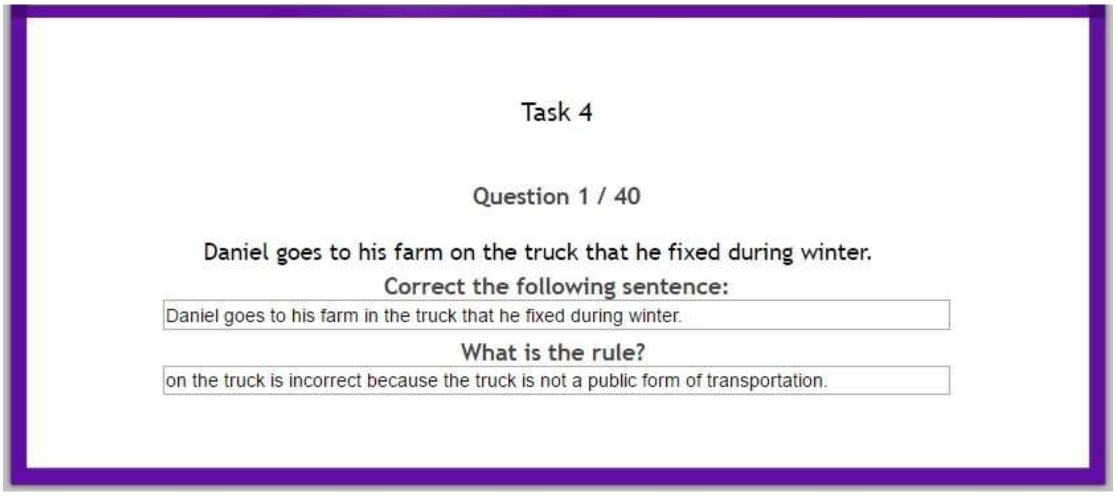

Figure 13. Example of an MKT item after the sentence was corrected and after the participant provided an explanation of the target rule.

A metalinguistic explanation was accepted as correct as long as the participant showed knowledge of the rule even using basic language. Participants were told that they did not have to use sophisticated language in order to explain the target rule that had been broken in each item. Also, to avoid any confound between the level of English proficiency and metalinguistic knowledge, participants were told that if they knew the rule but were not able to express it in English, they could type it in Spanish.

4.8 Results

4.8.1 Performance during Training Tasks

The mean number of occurrences of *in*, *on* and *by* was calculated for each group. Also, the accuracy percentage of each target form for each group was calculated by dividing the number of instances that *in*, *on* and *by* occurred accurately by the number of total occurrences. In order to find if the output scores produced during the training tasks met the assumption of normality, Shapiro-Wilk tests were conducted first with the scores representing the number of occurrences that participants in each group produced the prepositions *in*, *on* and *by*. Then the same procedure was followed to find if the accuracy scores of the output produced by each group were normally distributed. The columns containing the Shapiro-Wilk results in the tables in appendix F illustrate the descriptive statistics of learners' output data.

Because not all the scores met the assumption of normality even after transforming the data, I conducted Wilcoxon Signed Ranks tests to measure participants' progress through the sessions. As shown in table 20, only the control group had a significant difference in the number of occurrences of *in* from session one to session two. That is, the control group produced fewer instances of *in* in the second training session in comparison to their first training session. None of the other three groups increased the number of times they produced *in* from session one to session two. From session two to session three none of the groups increased the number of times they produced the preposition *in*. Similarly, none of the groups increased their production of *in* from session 1 to session 3.

The column showing the Wilcoxon Signed Rank test results from session 1 to session 2 on table 21 indicates that there was an increase in the number of occurrences of the preposition *on* only for the processing instruction group. There was no increase for any of the groups from session 2 to session 3, but the processing instruction group decreased its production of *by*. None of the groups increased the number of occurrences from the first training session to the last training session.

The number of occurrences of *by* during the three tasks completed in each training session is shown on table 22. The column labelled Wilcoxon Signed Rank Session 1-Session 2 illustrates that only the processing instruction group decreased its production of the preposition *by* while the production of *by* of the other groups did not change. From session 2 to session 3 all groups except for the textual enhancement group decreased their number of instances of *by*. Similarly, all groups decreased their production of *by* from session 1 to session 3 with the exception of the textual enhancement group.

Table 20

Number of Occurrences of the Preposition in During Sessions 1,2 and 3

	Session 1		Session 2		Session 3		Wilcoxon Signed Rank Session 1-Session 2		Wilcoxon Signed Rank Session 2-Session 3	
Condition	*n*	M(*SD*)	*n*	M(*SD*)	*n*	M(*SD*)	*p*	*z* Score	*p*	*z* Score
Control	32	1.4 (1.5)	32	0.9 (1.3)	32	0.93 (1.1)	0.012	-2.508	0.529	-0.629
Textual Enhancement	30	0.9 (1.6)	30	0.7 (1)	30	0.8 (1)	0.937	-0.079	0.961	-0.049
Metalinguistic Instruction	31	1.06 (1.33)	31	0.09 (1.2)	31	0.8 (0.8)	0.372	-0.892	0.63	-0.482
Processing Instruction	31	.65 (0.79)	31	0.80 (0.95)	31	0.92 (0.84)	0.339	-0.956	0.207	-1.261

Table 21

Number of Occurrences of the Preposition on During Sessions 1,2 and 3

	Session 1		Session 2		Session 3		Wilcoxon Signed Rank Session 1-Session 2		Wilcoxon Signed Rank Session 2-Session 3	
Condition	*n*	M(*SD*)	*n*	M(*SD*)	*n*	M(*SD*)	*p*	*z* Score	*p*	*z* Score
Control	32	0.9 (1.3)	32	0.62 (1.12)	32	0.58 (0.93)	0.061	-1.872	0.922	-0.098
Textual Enhancement	30	0.4 (0.7)	30	0.7 (1.1)	30	0.55 (0.78)	0.88	-1.708	0.431	-0.787
Metalinguistic Instruction	31	1.11 (1.45)	31	1.1 (1.2)	31	0.87 (0.99)	0.864	-0.171	0.07	-1.812
Processing Instruction	31	0.62 (1.15)	31	1.34 (1.24)	31	0.94 (1.08)	< .001	-3.634	0.018	-2.374

Table 22

Number of Occurrences of the Preposition by During Sessions 1, 2 and 3

	Session 1		Session 2		Session 3		Wilcoxon Signed Rank Session 1-Session 2		Wilcoxon Signed Rank Session 2-Session 3	
Condition	*n*	M(*SD*)	*n*	M(*SD*)	*n*	M(*SD*)	*p*	*z* Score	*p*	*z* Score
Control	32	0.7 (1.3)	32	0.7 (1.3)	32	0.4 (0.8)	0.769	-0.293	0.009	-2.621
Textual Enhancement	30	1.2 (1.6)	30	1 (1.5)	30	1.18 (1.01)	0.357	-0.922	0.128	-1.52
Metalinguistic Instruction	31	1.39 (1.44)	31	1.4 (1.7)	31	1.02 (1.21)	0.898	-0.128	0.013	-2.476
Processing Instruction	31	2.10 (1.72)	31	1.47 (1.51)	31	0.68 (1.10)	0.005	-2.838	< .001	-4.845

Table 23

Accuracy Percentage of the Preposition in During Sessions 1, 2 and 3

	Session 1		Session 2		Session 3		Wilcoxon Signed Rank Session 1-Session 2		Wilcoxon Signed Rank Session 2-Session 3	
Condition	*n*	M(*SD*)	*n*	M(*SD*)	*n*	M(*SD*)	*p*	*z* Score	*p*	*z* Score
Control	32	40.4 (0.39)	32	39.8 (0.37)	32	38.9 (0.39)	0.42	-0.792	0.53	-0.625
Textual Enhancement	30	61.76 (0.40)	30	73.4 (0.47)	30	64 (0.5)	0.06	-1.842	0.35	-0.928
Metalinguistic Instruction	31	65.6 (0.46)	31	70.2 (0.48)	31	83.6 (51)	0.64	-0.456	0.01	-2.564
Processing Instruction	31	72.8 (0.47)	31	87.09 (0.49)	31	90.74 (0.46)	0.12	-1.544	0.01	-2.368

To know the percentage of occurrences where *in*, *on* and *by* were correct, the accuracy percentage was calculated for each group by dividing the number of accurate occurrences of each target form for each participant by the number of times that each participant produced the corresponding preposition in the tasks. As illustrated in table 23 in the column labelled session 1, the textual enhancement group, the metalinguistic instruction group and the processing instruction group produced the preposition *in* more accurately than the control group. The columns corresponding to session 2 and 3 show that this trend continued as the textual enhancement group, the metalinguistic instruction group and the processing instruction group produced the preposition *in* more accurately than the control group. The columns labelled Wilcoxon Signed Rank show that from session 1 to session 2 none of the groups became more accurate at producing the preposition *in*, but from session 2 to session 3 the metalinguistic instruction group's accuracy improved.

Participants' pattern in their production accuracy of preposition *on* was similar to that of the preposition *in*. The textual enhancement group, the metalinguistic instruction group and the processing instruction group produced the preposition *on* more accurately than the control group as illustrated in table 24 in the three columns labelled session 1, session 2 and session 3. The Wilcoxon Signed Rank column from session 1 to session 2 shows that only the metalinguistic instruction group and the processing instruction group became more accurate at producing the preposition *on*. From session 2 to session 3, none of the groups improved their accuracy of *on* as was revealed by the Wilcoxon Signed Rank test.

Table 24

Accuracy Percentage of the Preposition on During Sessions 1, 2 and 3

	Session 1		Session 2		Session 3		Wilcoxon Signed Rank Session 1-Session 2		Wilcoxon Signed Rank Session 2-Session 3	
Condition	*n*	M(*SD*)	*n*	M(*SD*)	*n*	M(*SD*)	*p*	*z* Score	*p*	*z* Score
Control	32	32.4 (0.34)	32	33 (0.29)	32	31.8 (0.29)	0.394	-0.853	0.987	-0.017
Textual Enhancement	30	67.9 (0.41)	30	75 (0.45)	30	76.5 (0.46)	0.215	-1.24	0.847	-0.192
Metalinguistic Instruction	31	71.1 (0.45)	31	85.7 (0.52)	31	91.5 (0.5)	< .001	-3.665	0.566	-0.573
Processing Instruction	31	77.56 (0.40)	31	81.59 (0.47)	31	87.74 (0.48)	< .001	-4.513	0.178	-1.346

Table 25

Accuracy Percentage of the Preposition by During Sessions 1, 2 and 3

	Session 1		Session 2		Session 3		Wilcoxon Signed Rank Session 1-Session 2		Wilcoxon Signed Rank Session 2-Session 3	
Condition	*n*	M(*SD*)	*n*	M(*SD*)	*n*	M(*SD*)	*p*	*z* Score	*p*	*z* Score
Control	32	40.1 (0.33)	32	41.9 (0.33)	32	41.3 (0.27)	0.857	-0.18	0.165	-1.389
Textual Enhancement	30	51 (0.4)	30	53.6 (0.39)	30	62.6 (0.45)	0.809	-0.241	0.001	-3.201
Metalinguistic Instruction	31	91.9 (0.48)	31	93.9 (0.54)	31	96.9 (0.49)	0.635	-0.474	0.083	-0.215
Processing Instruction	31	82.9 (0.46)	31	81.48 (0.49)	31	95.83 (0.48)	0.379	-0.88	0.003	-2.948

Participants in the textual enhancement group, in the metalinguistic instruction group and in the processing instruction group produced the preposition *by* more accurately than the control group as is illustrated in the columns labelled session 1, session 2 and session 3 in Table 25. The columns corresponding to the Wilcoxon Signed Rank show that none of the groups became more accurate in producing the preposition *by* from session 1 to session 2, but the textual enhancement group and the processing instruction groups' accuracy increased from session 2 to session 3. A summary of the findings of the accuracy on the use of *in*, *on* and *by* through the sessions is shown in tables 26, 27 and 28. As is illustrated, there was no increase of accuracy for the control group. However, textual enhancement, metalinguistic instruction and the processing instruction resulted in a significant increase either from session one to session two or from session two to session three.

Table 26

Output Accuracy Improvement of the Preposition in

Measure	Control	Textual Enhancement	Metalinguistic Instruction	Processing Instruction
Session 1 to session 2	⇔	⬆	⇔	⇔
Session 2 to Sssion 3	⇔	⇔	⬆	↑

Note. ↑ = increase; ↓ = decrease; ⬆ = large increase; ⬇ = large decrease; ⇔ = no effect;

Table 27

Output Accuracy Improvement of the Preposition on

Measure	Control	Textual Enhancement	Metalinguistic Instruction	Processing Instruction
Session 1 to session 2	⇔	⇔	⇧	⇧
Session 2 to Sssion 3	⇔	⇔	⇔	⇔

Note. ↑ = increase; ↓ = decrease; ⇧ = large increase; ⇩ = large decrease; ⇔ = no effect;

Table 28

Output Accuracy Improvement of the Preposition by

Measure	Control	Textual Enhancement	Metalinguistic Instruction	Processing Instruction
Session 1 to session 2	⇔	⇔	⇔	⇔
Session 2 to Sssion 3	⇔	⇔	⇔	⇧

Note. ↑ = increase; ↓ = decrease; ⇧ = large increase; ⇩ = large decrease; ⇔ = no effect;

4.8.2 Performance during Pre-Posttests

This subsection will present participants' progress over time taking as evidence the results on pretests, posttests and delayed posttests. Two separate analyses were conducted with the data. The first focused on the combination of mean scores of items *in* vs. *on* and of items *by* vs. *in*/*on*. Henceforward, this combination of mean scores will be labelled general scores. The general scores consisted of the sum of 20 target items in each of the tests. The second analysis focused on the scores by rule. Namely, rather than analysing all the target items in each test, the second analysis focused first on the ten items in each test that assessed the rule governing the use of prepositions *in* or *on* and then it focused independently on the ten items in each test assessing the rule governing the use of the preposition *by*.

4.8.3 Timed grammaticality judgement test

Within-group effects

In order to find if the data score distribution of the TGJT pre, post and delayed posttest met the assumption of normality, Shapiro Wilk tests were conducted with the data sets of each group. The tables in appendix G illustrate that not all the scores met this assumption. More specifically, on the immediate posttest the general scores of the textual enhancement group and the general scores of the processing instruction group violated the assumption of normality as shown by the Shapiro-Wilk's value lower than .05. Similarly, on the delayed posttest the control group and the metalinguistic instruction group did not meet the assumption of a normal distribution.

Because not all the data scores were normally distributed, I conducted non-parametric tests with the TGJT data sets. Wilcoxon signed ranks tests were conducted with the TGJT general scores of each group. Table 29 shows the pre, post and delayed posttest scores of all groups in the TGJT. Figures 14, 15, 16 and 17 illustrate the learning pattern of each group on the TGJT across time.

Table 29

Within Group Differences of the TGJT General Scores from Pre to Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank				Wilcoxon Signed Rank			
							Pre to Posttest		95% CI		Post to Delayed		95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*LL*	*UL*	*p*	z Score	*LL*	*UL*
Control	32	3.96 (1.03)	32	4.07 (0.92)	32	3.96 (1.03)	0.53	-0.624	3.63	4.49	0.6	-0.527	3.7	4.4
Textual Enhancement	30	3.88 (0.78)	30	5.03 (0.98)	30	4.21 (1.56)	< .001	-4.279	3.52	5.46	0	-2.024	4.6	4.66
Metalinguistic Instruction	31	3.88 (1.01)	31	5.77 (1.56)	31	5.46 (1.06)	< .001	-1.248	3.54	6.19	0.2	-1.248	5.4	5.9
Processing Instruction	31	3.85 (0.99)	31	6.38 (1.13)	31	6.24 (1.23)	< .001	-0.549	3.51	6.8	5.8	-0.549	6	6.68

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

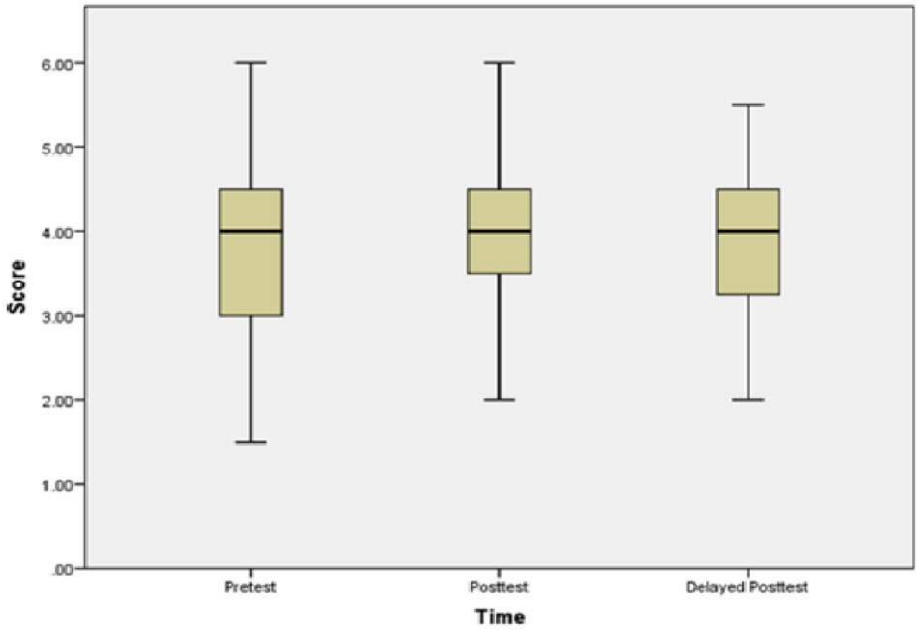

Figure 14. Control group general scores across time in the TGJT.

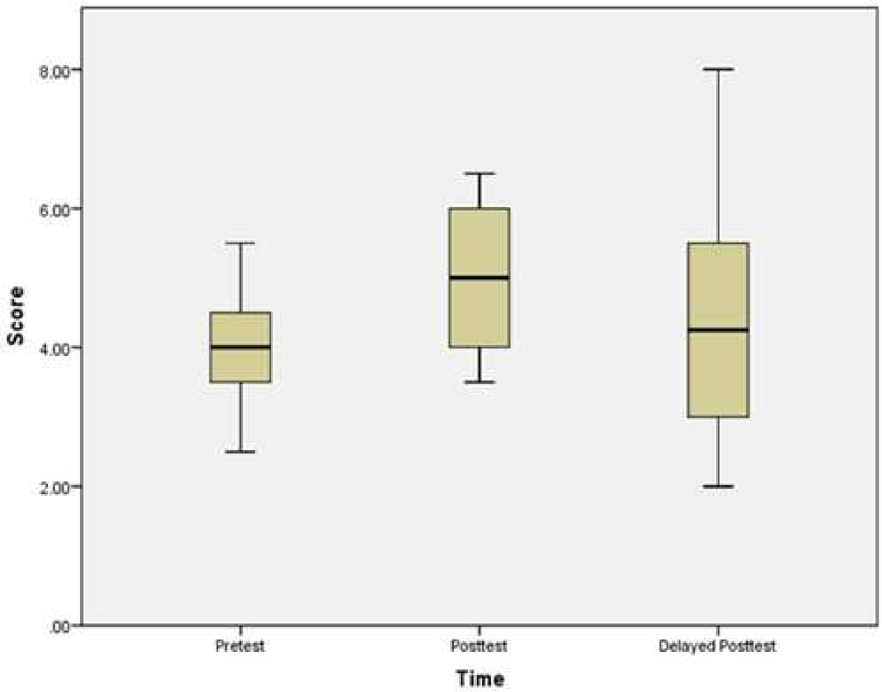

Figure 15. Textual enhancement group general scores across time in the TGJT.

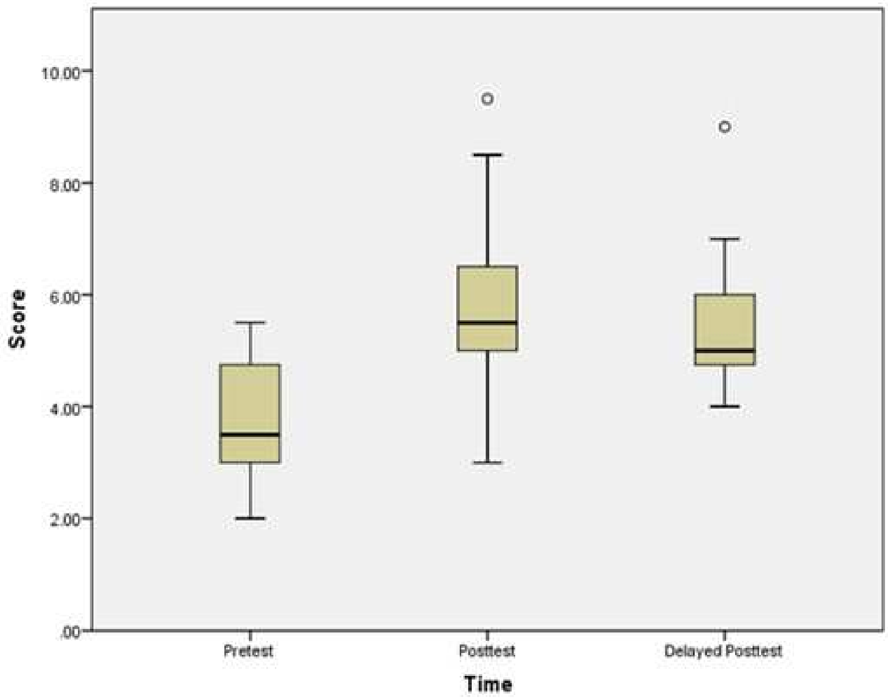

Figure 16. Metalinguistic instruction group general scores across time in the TGJT.

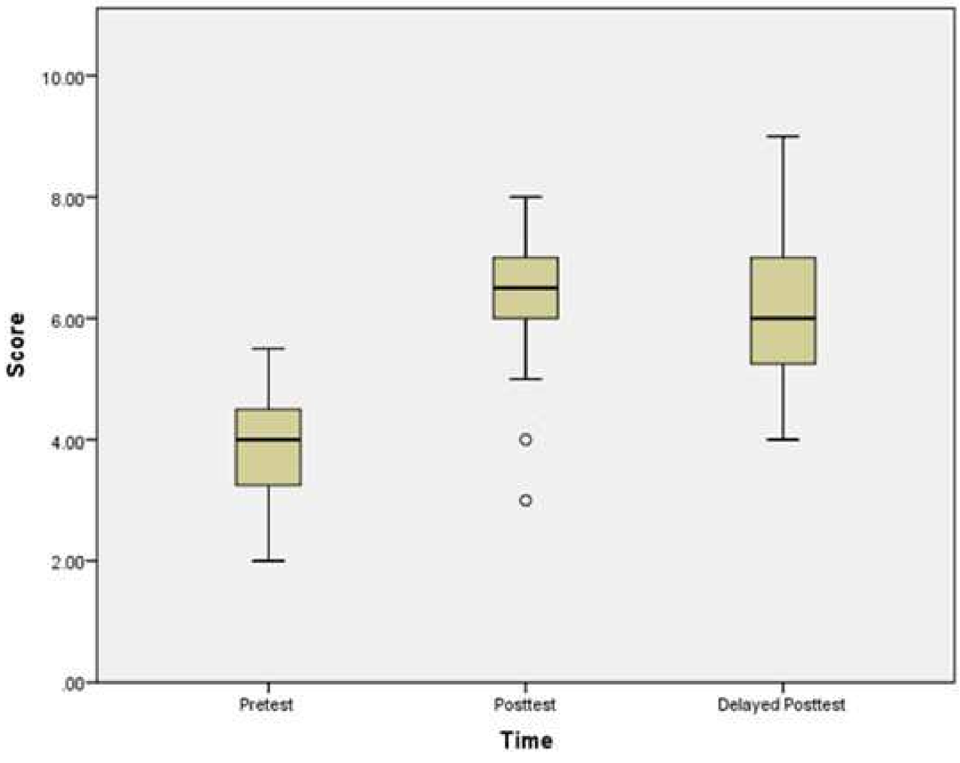

Figure 17. Processing instruction group general scores across time in the TGJT.

The following subsection will explain the findings of the analysis conducted with the TGJT scores by rule. First, I will elaborate on how learners in each group improved their use of prepositions *in* or *on* in the TGJT. Then I will explain the improvement of each group on the use of the preposition *by* in the TGJT as well.

Within-group effects by rule

In order to find if the data score distribution of the TGJT items targeting prepositions *in* or *on* in the pre, post and delayed posttest met the assumption of normality, Shapiro Wilk tests were conducted with the data sets of each group. The Shapiro-Wilk column on the tables in appendix G illustrate that all the TGJT scores on the pretest, posttest and delayed posttest had a p-value higher than .05 indicating that they met the assumption of normality.

Although most of the data scores were normally distributed, some were still very close to non-normal distribution, and the delayed posttest scores of the processing instruction group did not meet the assumption of a normal distribution. Thus, I conducted nonparametric tests with the TGJT data sets. For each group a Wilcoxon signed ranks test was conducted with the scores of items targeting the preposition *in* or *on*. Figures 18, 19, 20 and 21 show the performance of each group across time on the TGJT.

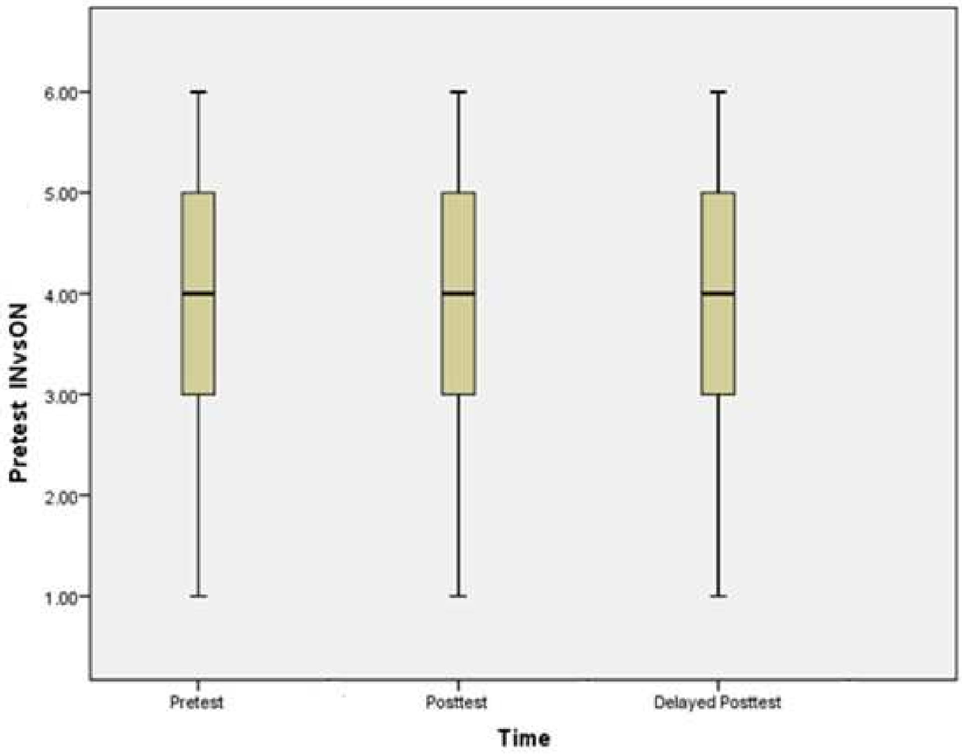

Figure 18. Control group mean scores of *in vs. on* items across time in the TGJT test.

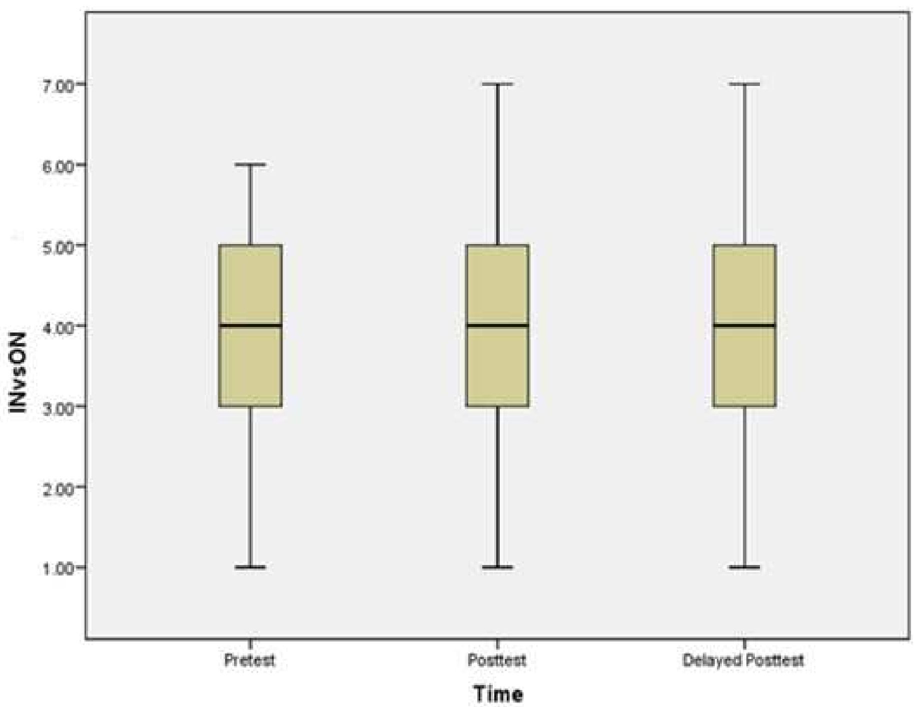

Figure 19. Textual enhancement group accuracy scores across time of the rule *in vs. on* in the TGJT.

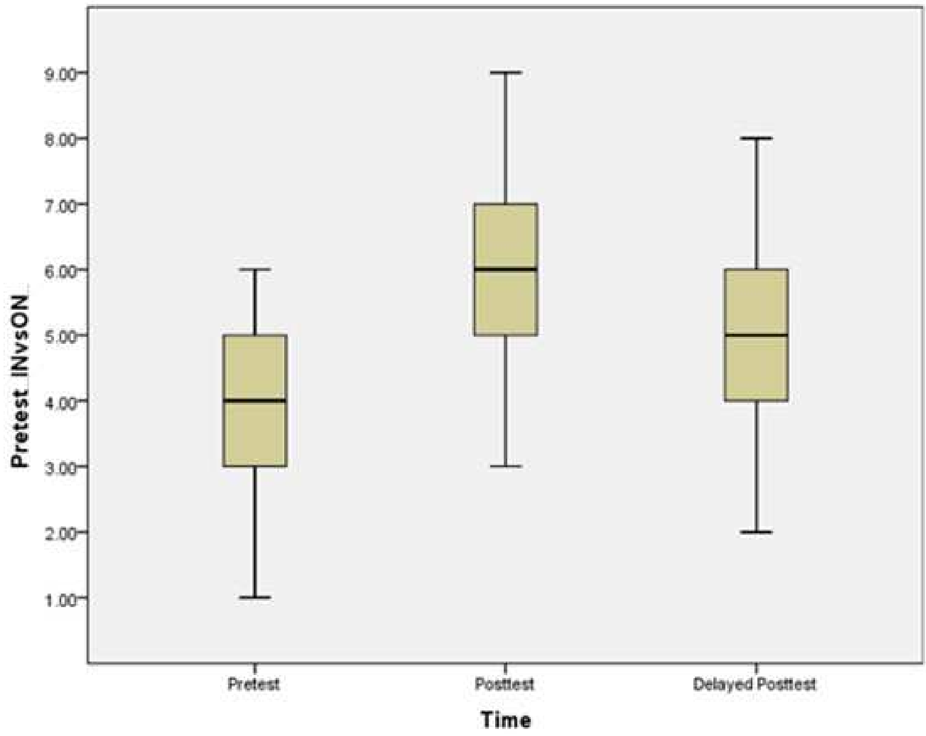

Figure 20. Metalinguistic Instruction group accuracy scores across time of the rule *in* vs. *on* items in the TGJT.

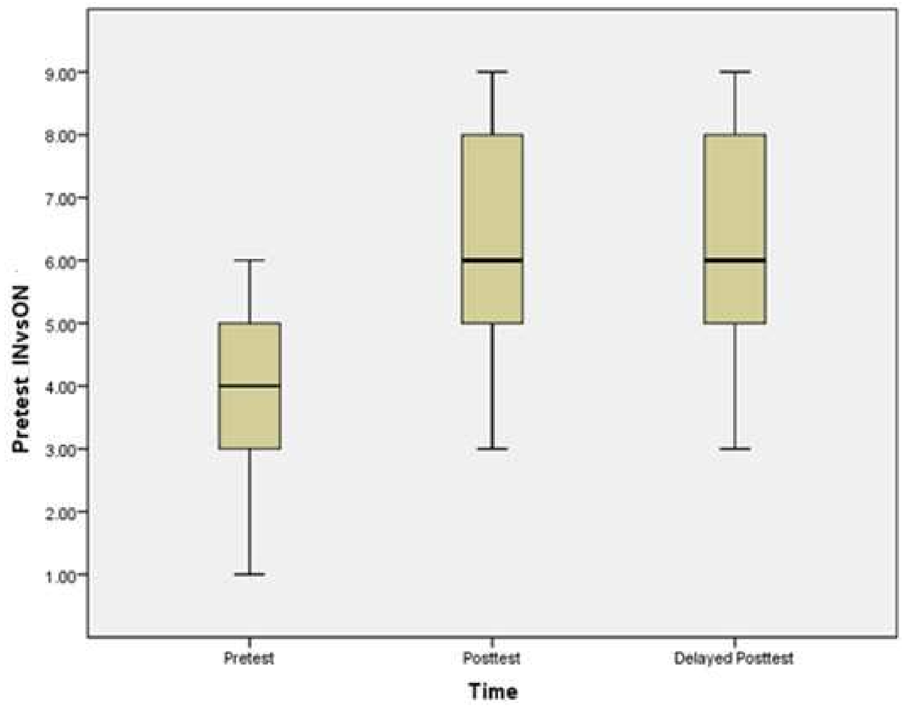

Figure 21. Processing instruction group accuracy scores across time of the rule *in* vs. *on* in the TGJT.

The above findings from the Wilcoxon signed ranks tests revealed that the control group did not improve its scores of prepositions *in* or *on* from pre to posttest on the TGJT nor from the immediate posttest to the delayed posttest. However, the textual enhancement group, the metalinguistic instruction group and the processing instruction group improved their scores of prepositions *in* or *on* from pre to posttest. The textual enhancement group and the processing instruction group sustained their knowledge of the target forms *in* or *on* in the delayed posttest, but the metalinguistic instruction group had a significant decrease of scores of the target items on the delayed posttest. Table 30 illustrates the descriptive statistics of each group on the TGJT pre, post and delayed posttest.

Table 30

Within Group Differences of the TGJT in vs. on Scores from Pre-Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank						Wilcoxon Signed Rank					
							Pre to Posttest				95% CI		Post to Delayed				95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*R*	r^2	*LL*	*UL*	*p*	z Score	*R*	r^2	*LL*	*UL*
Control	32	40 (1.30)	32	3.9 (1.34)	32	4.0 (1.33)	0.741	0.33	0.041	0.001	-0.31	0.43	0.87	-0.16	-0.02	< .001	3.45	4.448
Enhancement	30	3.8 (1.37)	30	4.30 (1.52)	30	4.2 (1.55)	0.348	-2.49	-0.321	0.103	3.3	4.91	0.85	-0.18	-0.02	< .001	3.75	4.78
Metalingusitic	31	3.9 (1.39)	31	6.0 (1.72)	31	5.0 (1.45)	< .001	-4.36	-0.554	0.306	3.45	6.6	0	-3.06	-0.38	0.151	5.46	5.51
Processing	31	3.9 (1.39)	31	6.3 (1.77)	31	6.4 (1.75)	< .001	-4.74	-0.602	0.362	3.45	6.82	0.65	-0.449	-0.05	0.003	5.69	6.92

	Wilcoxon Signed Rank					
	Pre to Delayed				95% CI	
	p	z Score	*R*	r^2	*LL*	*UL*
Control	0.81	-0.239	-0.03	< .001	-0.38	0.446
Enhancement	0.14	-1.494	-0.193	0.037	-0.44	0.64
Metalingusitic	0	-3.194	-0.406	0.164	0.444	1.685
Processing	< .001	-4.478	-0.569	0.323	-0.87	0.609

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

The following paragraphs will show the procedures that I followed in order to compare within group differences over time on the TGJT scores targeting the preposition *by*. I first tested whether each group scores met the assumption of normality by conducting a Shapiro-Wilk test. The tables in appendix G illustrate whether or not the TGJT pretest, posttest and delayed posttest scores of the preposition *by* were normally distributed.

As the Shapiro-Wilk column in the tables in appendix I illustrates, all the group scores of items targeting the preposition *by* were higher than .05 although they were still very close to the threshold. Nevertheless, in order to allow the comparison of these findings against those of the FIB and the MKT items targeting the prepositions *in* or *on* where non-parametric tests were used, I conducted non-parametric tests.

Wilcoxon signed ranks tests were conducted with each group's scores targeting the preposition *by*. Figures 22, 23, 24 and 25 show the performance of each group on the TGJT specifically on items targeting the preposition *by*. Table 31 presents the descriptive statistics of each group's improvement on the TGJT of the preposition *by* across time.

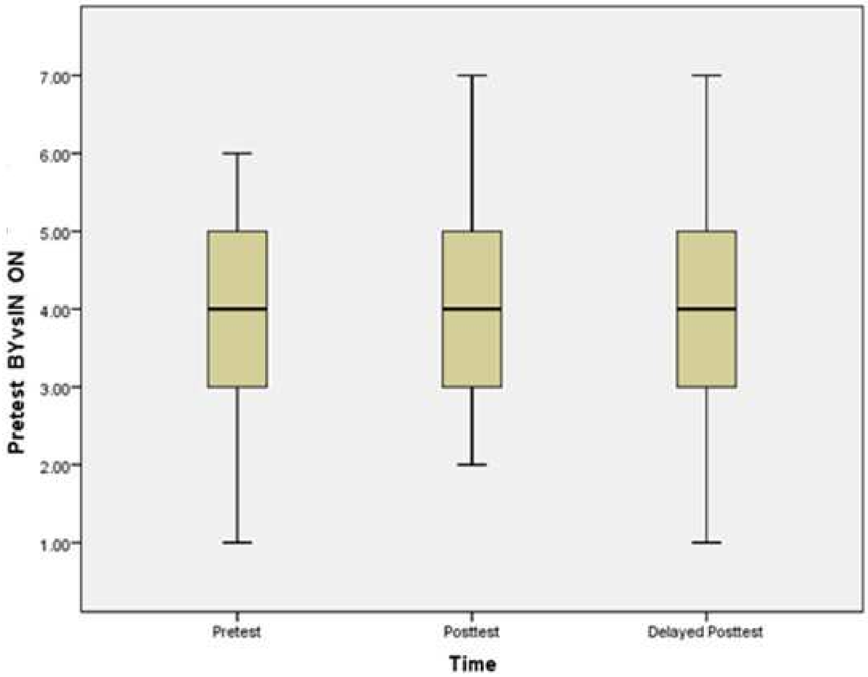

Figure 22. Control group accuracy scores across time of *by* vs. *in/on* items in the TGJT.

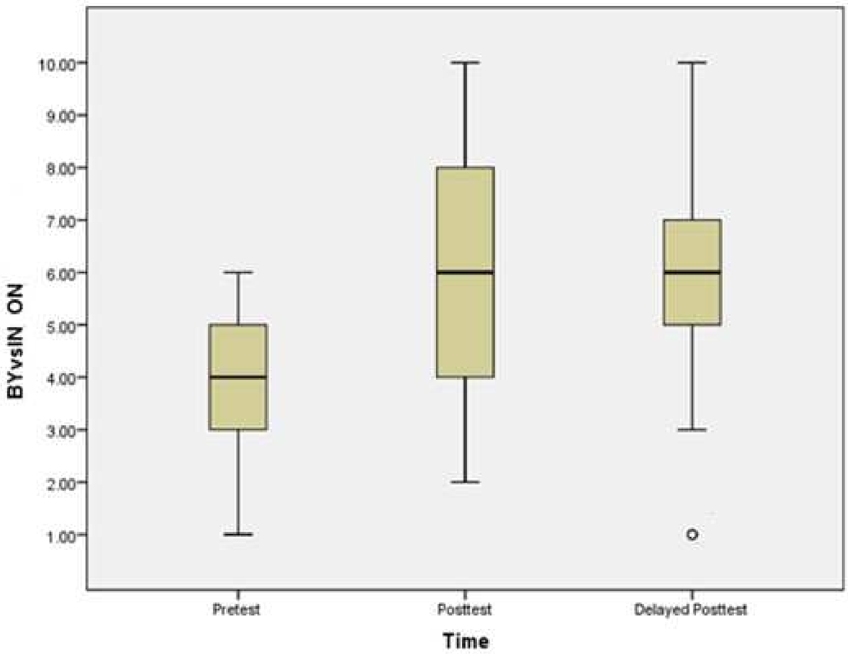

Figure 23. Textual enhancement group accuracy scores across time of the rule *by* vs. *in/on* in the TGJT.

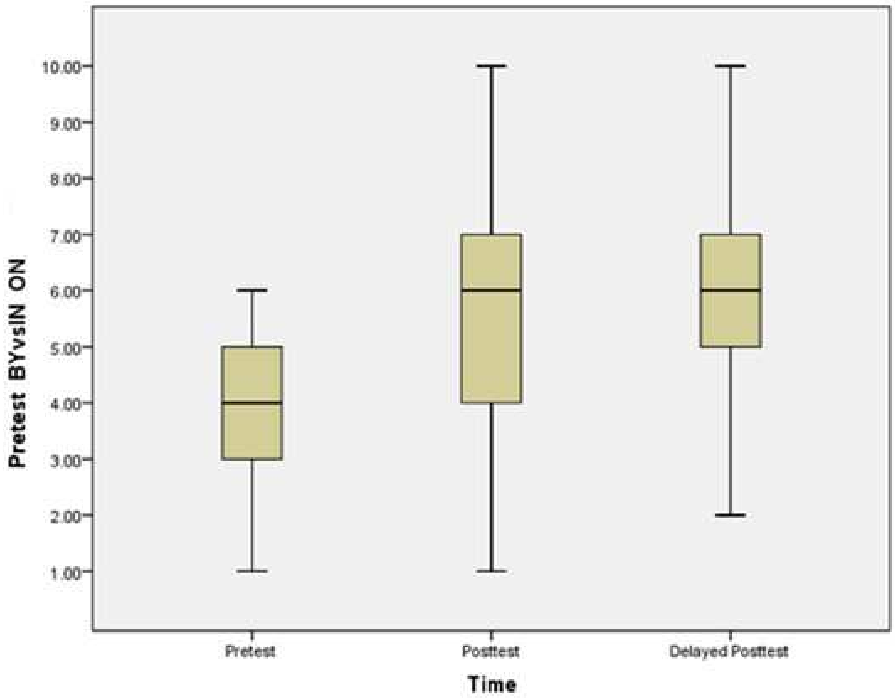

Figure 24. Metalinguistic instruction group accuracy scores across time of the rule *by* vs. *in/on* in the TGJT.

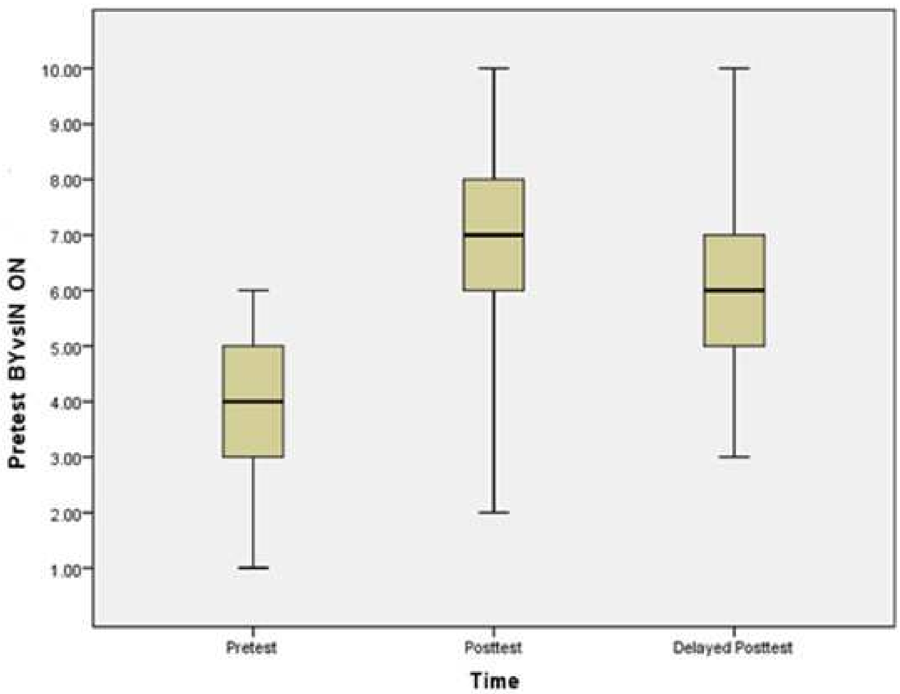

Figure 25. Processing instruction group accuracy scores across time of the rule *by* vs. *in/on* in the TGJT.

Table 31

Within Group Differences of the TGJT by vs. in/on Scores from Pre-Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank						Wilcoxon Signed Rank					
							Pre to Posttest				95% CI		Post to Delayed				95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*R*	r^2	*LL*	*UL*	*p*	z Score	*R*	r^2	*LL*	*UL*
Control	32	3.93 (1.36)	32	4.21 (1.28)	32	3.96 (1.63)	0.203	-1.27	-0.158	0.025	3.44	4.92	0.254	-1.14	-0.143	0.020	3.51	4.63
Enhancement	30	3.96 (1.37)	30	5.73 (2.25)	30	5.8 (2.155)	< .001	-4.02	-0.519	0.269	3.46	6.46	0.421	-0.8	-0.103	0.010	5	6.49
Metalingusitic	31	3.83 (1.46)	31	5.51 (2.32)	31	5.96 (1.87)	< .001	-4.02	-0.511	0.260	3.34	6.23	1.05	-1.62	-0.206	0.042	4.79	6.64
Processing	31	3.77 (1.38)	31	6.51 (2.06)	31	6.09 (1.97)	< .001	-4.39	-0.558	0.310	3.27	7.23	0.078	1.76	0.224	0.049	5.79	6.77

	Wilcoxon Signed Rank					
	Pre to Delayed				95% CI	
	p	z Score	*R*	r^2	*LL*	*UL*
Control	0.886	-0.143	-0.018	< .001	-0.553	0.4906
Enhancement	0.001	-3.263	-0.421	0.177	-0.991	0.858
Metalingusitic	< .001	-4.631	-0.588	0.345	-0.986	0.0827
Processing	< .001	-3.863	-0.491	0.240	-1.228	0.9615

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

The next subsection shows the differences in increase of general scores between groups across time. That is, it will illustrate whether some groups improved significantly more than others from pre to posttest and from the immediate posttest to the delayed posttest. In a later subsection I will present the between-group effects by rule.

Between-group effects

First, a Kruskal-Wallis test was conducted to compare the TGJT pretest mean general scores between groups. A Kruskal-Wallis test was also used to compare the posttest mean general scores between groups and the delayed posttest mean general scores respectively. No significant difference was found between the groups on the TGJT pretest ($\chi^2(3, 124) = .225$, $p = .973$). Significant differences were found between groups on the posttest ($\chi^2(3, 124) = 46.786$, $p < .001$) and on the delayed posttest ($\chi^2(3, 124) = 48.076$, $p < .001$). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. After conducting a Bonferroni adjustment for pairwise comparisons, the alpha was set at .08. Significant differences were found on the immediate posttest between the control group and the textual enhancement group ($U = 241.00$, $z = -3.403$, $p < .001$, $R = -0.3055$, $r^2 = 0.0933$), between the control group and the metalinguistic instruction group ($U = 173.50$, $z = -4.463$, $p < .001$, $R = -0.4007$, $r^2 = 0.1606$) and between the control group and the processing instruction group ($U = 64.00$, $z = -5.970$, $p < .001$, $R = -0.5361$, $r^2 = 0.2874$). In addition, a significant difference was also found between the textual enhancement group and the processing instruction group ($U = 171.00$, $z = -4.289$, $p < .001$, $R = -0.3851$, $r^2 = 0.1483$).

In order to find where the differences lay on the delayed posttest, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. No significant difference was found on the immediate posttest between the control group and the textual enhancement group (U = 435.50, z = -.633, p < .527, R = -0.0568, r^2 = 0.0032). However, significant differences were found between the control group and the metalinguistic instruction group (U = 73.50, z = -5.840, p < .001, R = -0.5244, r^2 = 0.2750) and between the control group and the processing instruction group (U = 153.50, z = -4.753, p < .001, R = -0.4268, r^2 = 0.1821). In addition, significant differences were also found between the textual enhancement group and the metalinguistic instruction group (U = 241.50, z = -3.248, p = .001, R = -0.2916, r^2 = 0.0850), between the textual enhancement group and the processing instruction group (U = 142.50, z = 4.676, p < .001, R = 0.4199, r^2 = 0.1763) and between the metalinguistic instruction group and the processing instruction group (U = 295.50, z = -2.632, p = .008, R = -0.2363, r^2 = 0.0558).

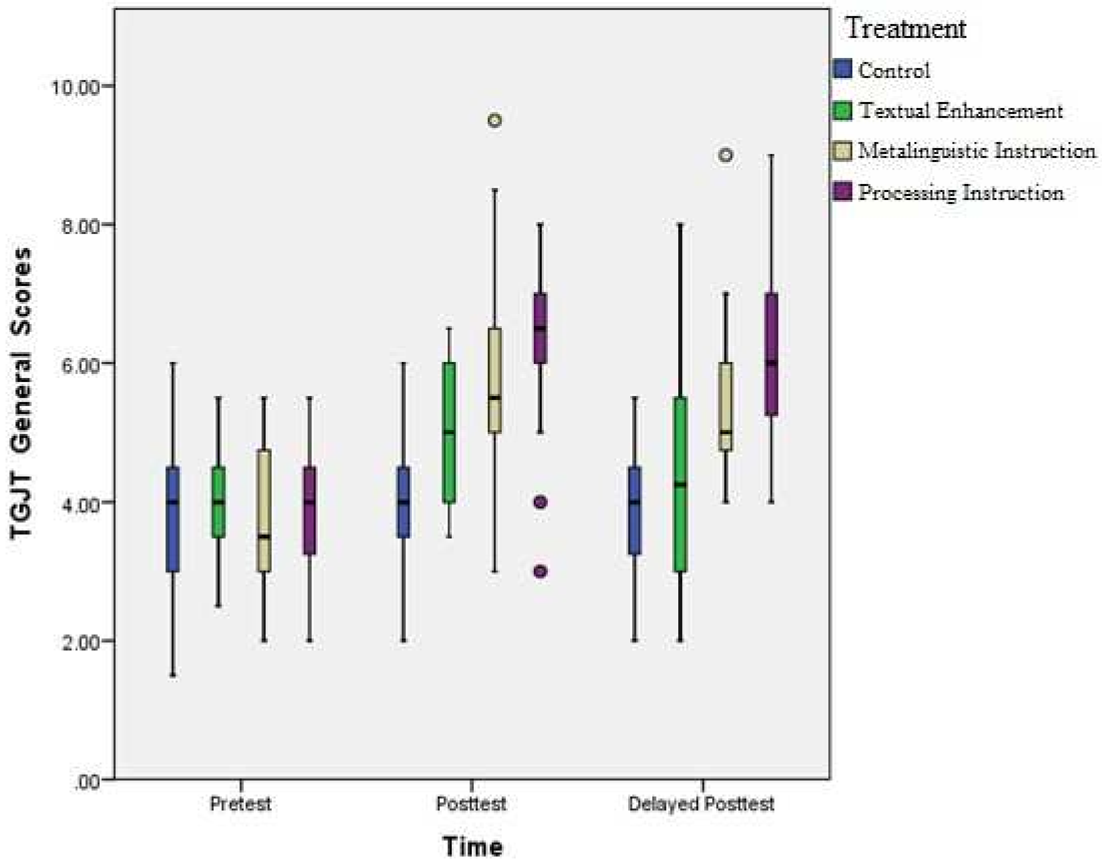

Figure 26. Between-group differences across time in the TGJT general scores.

The improvement from pre to posttest made by the textual enhancement group was not significantly greater than that made by the control group. In contrast, the improvement made by the metalinguistic instruction group from pre to posttest was significantly greater than that made by the control group, and the improvement was sustained on the delayed posttest. Similarly, the processing instruction group improved from pre to posttest significantly more than the control group, and this group showed the least attrition on the delayed posttest. The following subsection will show how each group increased its scores of items targeting the prepositions *in* or *on* differently. Then it will present the differences in increase of scores of items targeting the preposition *by*.

Between-group effects by rule

The following analysis focuses only on the scores of the TGJT test items targeting the prepositions *in* and *on*. First, a Kruskal-Wallis test was used to make between group comparisons of the posttest mean scores and the delayed posttest mean scores respectively. No significant difference was found between the groups on the TGJT pretest ($\chi^2(3, 124) = .284$, $p = .963$). Significant differences were found between groups on the posttest ($\chi^2(3, 124) = 35.580$, $p < .001$) and on the delayed posttest ($\chi^2(3, 124) = 30.838$, $p < .001$). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. A Bonferroni adjustment for pairwise comparisons revealed no significant differences on the immediate posttest between the control group and the textual enhancement group ($U = 406.50$, $z = -1.057$, $p = .290$, $R = -0.0949$, $r^2 = 0.009$), but there was a difference between the control group and the metalinguistic instruction group ($U = 179.00$, $z = -4.416$, $p < .001$, $R = -0.3965$, $r^2 = 0.1572$). Significant differences were also found between the control group and the processing instruction group ($U = 157.00$, $z = -4.721$, $p < .001$, $R = -0.4239$, $r^2 = 0.1797$), between the textual enhancement group and the metalinguistic instruction group ($U = 224.50$, $z = -3.518$, $p < .001$, $R = -0.3159$, $r^2 = 0.0998$) and between the textual enhancement group and the processing instruction group ($U = 200.50$, $z = -3.866$, $p < .001$, $R = -0.3471$, $r^2 = 0.1205$).

Mann Whitney U tests were also conducted with the delayed posttest scores of items targeting prepositions *in* or *on* revealing no significant differences between the control group and the textual enhancement group ($U = 436.00$, $z = -.633$, $p = .527$, $R = -0.0568$, $r^2 = 0.0032$). Significant differences were found between the control group and the metalinguistic instruction group ($U = 316.50$, $z = -2.520$, $p = .012$, $R = -0.2263$, $r^2 = 0.0512$) and between the control group and the processing instruction group ($U =$

144.00, z = -4.902, p < .001, R = -0.4402, r^2 = 0.1937). There was no significant difference between the textual enhancement group and the metalinguistic instruction group (U = 346.00, z = -1.748, p = .080, R = -0.1569, r^2 = 0.0246), but there was between the textual enhancement group and the processing instruction group (U = 175.50, z = -4.225, p < .001, R = -0.3794, r^2 = 0.1439). Figure 27 shows the differences in increase of scores by each group across time.

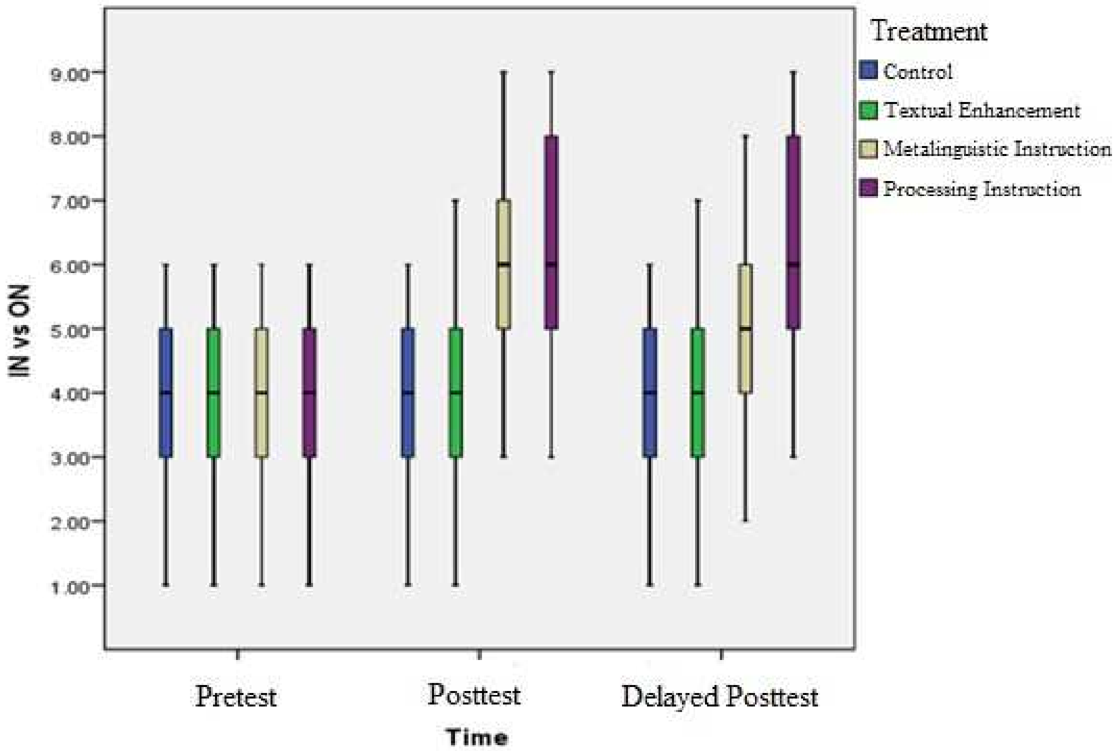

Figure 27. Between group differences of accuracy scores in the TGJT of the rule *in* vs. *on*.

To make between group comparisons across time of the item scores targeting the preposition *by*, a Kruskal-Wallis test was also used. No significant difference was found between the groups on the TGJT pretest (χ^2(3, 124) = .420, p = .936). Significant differences were found between groups on the posttest (χ^2(3, 124) = 18.928, p < .001) and on the delayed posttest (χ^2(3, 124) = 22.019, p < .001). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. After conducting a Bonferroni adjustment for pairwise comparisons, significant differences were found on the immediate posttest between the control group and the textual enhancement group (U = 300.50, z = -2.567, p = .010, R = -0.2305, r^2 = 0.0531), between the control group and the metalinguistic instruction group (U = 320.00, z = -2.454, p = .014, R = -0.2203, r^2 = 0.0485), and between the control group and the processing instruction group (U = 179.50, z = -4.400, $p < .001$, R = -0.3951, r^2 = 0.1561). Comparisons on the delayed posttest were also done by conducting a series of Mann Whitney U tests. A significant difference was found between the control group and the textual enhancement group (U = 235.50, z = -3.489, $p < .001$, R = -0.3133, r^2 = 0.0981), between the control group and the metalinguistic instruction group (U = 214.50, z = -3.918, $p < .001$, R = -0.351, r^2 = 0.1237) and between the control group and the processing instruction group (U = 213.00, z = -3.941, $p < .001$, R = -0.3539, r^2 = 0.1252). Figure 28 shows each group's differential increase across time of item scores targeting the preposition *by*.

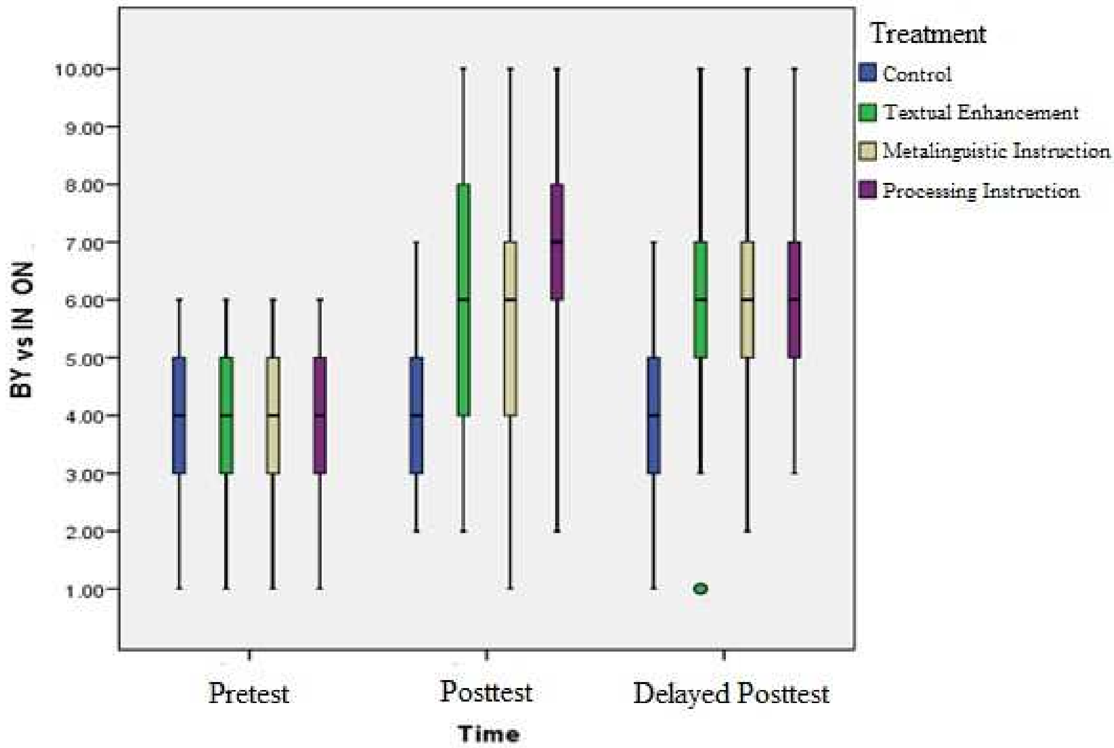

Figure 28. Between group differences of accuracy scores in the TGJT of the rule *by* vs. *in/on*.

The following subsection will reveal the results of the fill in the blank test. As in the previous analysis performed on the TGJT test, the FIB test analysis will first comprise the within-group general scores followed by the within-group effects by rule. Then the between group effects for the general scores will be presented followed by the between group effects by rule.

4.8.4 Fill in the blank test

As mentioned in the main study chapter, the fill in the blank test (FIB) had a total of 40 items. Half of the items were distractors, and the other half were target items. The results presented here will only refer to the target items. The distractors were not checked, and they were not included in this analysis. I will now explain the steps followed in order to analyse if there was any learning within each of the groups across time.

Within-group effects

Before conducting any statistical test, I conducted a Shapiro Wilks' test with the general scores of each group in order to find if the data score distribution of the FIB pre, post and delayed posttest met the assumption of normality. All the scores met the assumption of normality except for the processing instruction group FIB pretest scores and the control group FIB delayed posttest scores as illustrated on the Shapiro-Wilk column in the tables in Appendix H.

Because not all the data scores were normally distributed, I conducted non-parametric tests with the FIB data sets. More specifically, Wilcoxon signed ranks tests were conducted with the general scores of each group.

Table 32

FIB General Scores from Pre-Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank				Wilcoxon Signed Rank			
							Pretest to Posttest		95% CI		Pretest to Posttest		95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*LL*	*UL*	*p*	z Score	*LL*	*UL*
Control	32	2.21 (1.03)	32	2.64 (1.21)	32	2.73 (1.30)	0.003	-2.99	1.79	3.16	0.766	-0.3	2.11	3.36
Enhancement	30	2.45 (1.34)	30	3.95 (1.39)	30	4.35 (1.48)	< .001	-4.226	2	4.49	0.125	-1.38	3.4	5
Metalinguistic	31	2.37 (1.39)	31	6.09 (1.86)	31	5.29 (2.18)	< .001	-4.79	1.93	6.63	0.043	-2.05	5.56	5.93
Processing	31	2.19 (1.09)	31	6.53 (1.46)	31	6.14 (2.08)	< .001	-4.87	1.75	7.06	0.097	-1.56	5.99	6.78

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

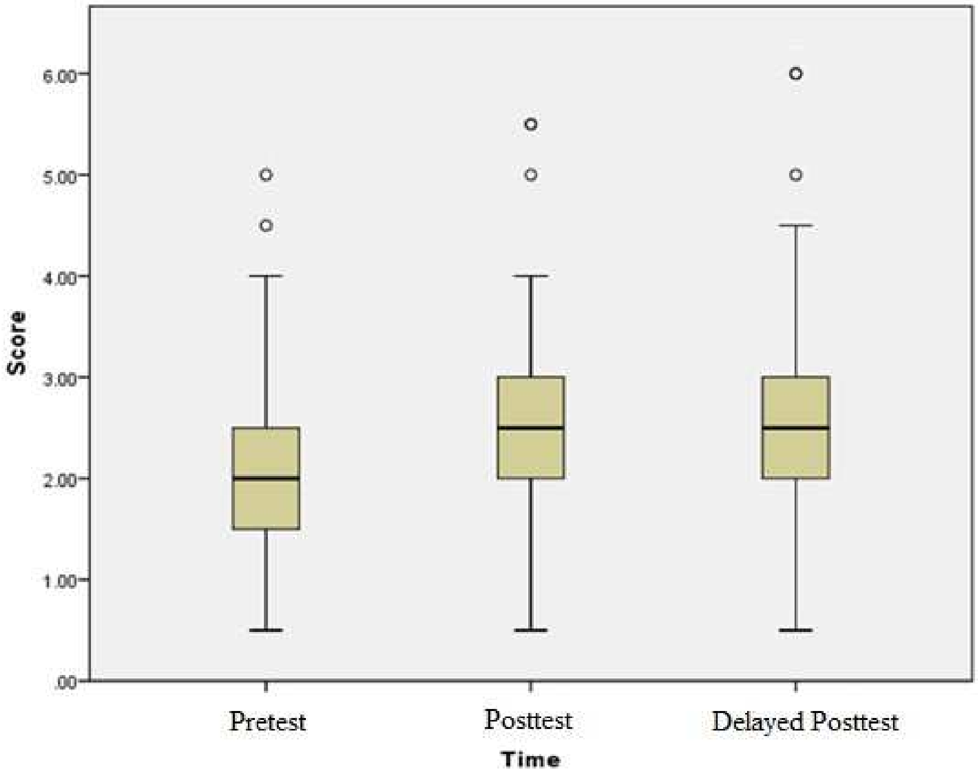

Figure 29. Control group general scores in the FIB test.

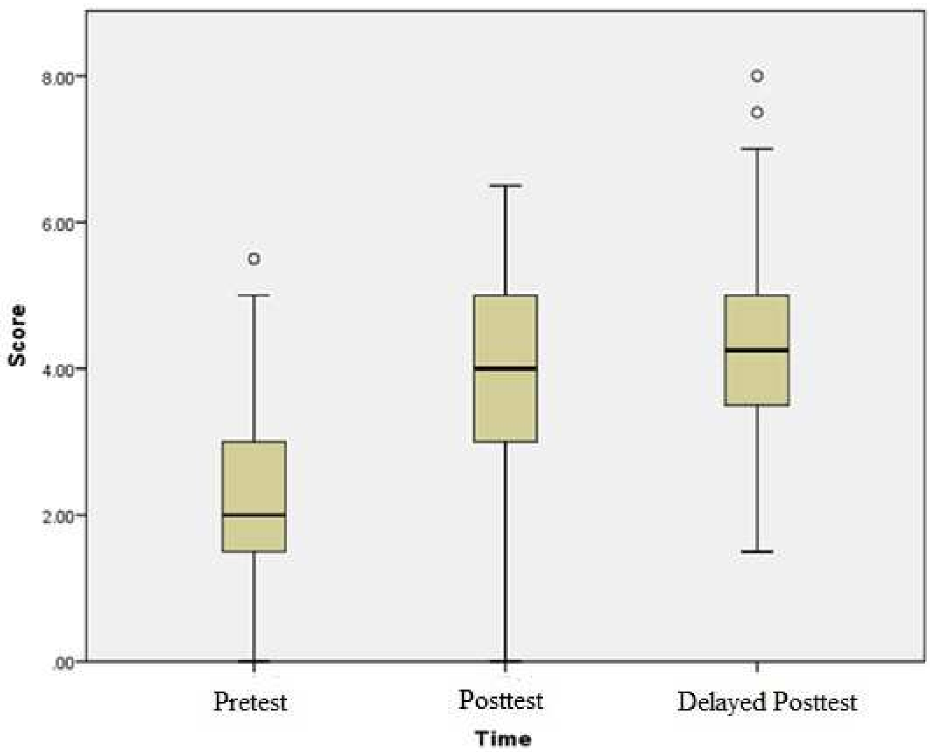

Figure 30. Textual enhancement group general scores in the FIB test.

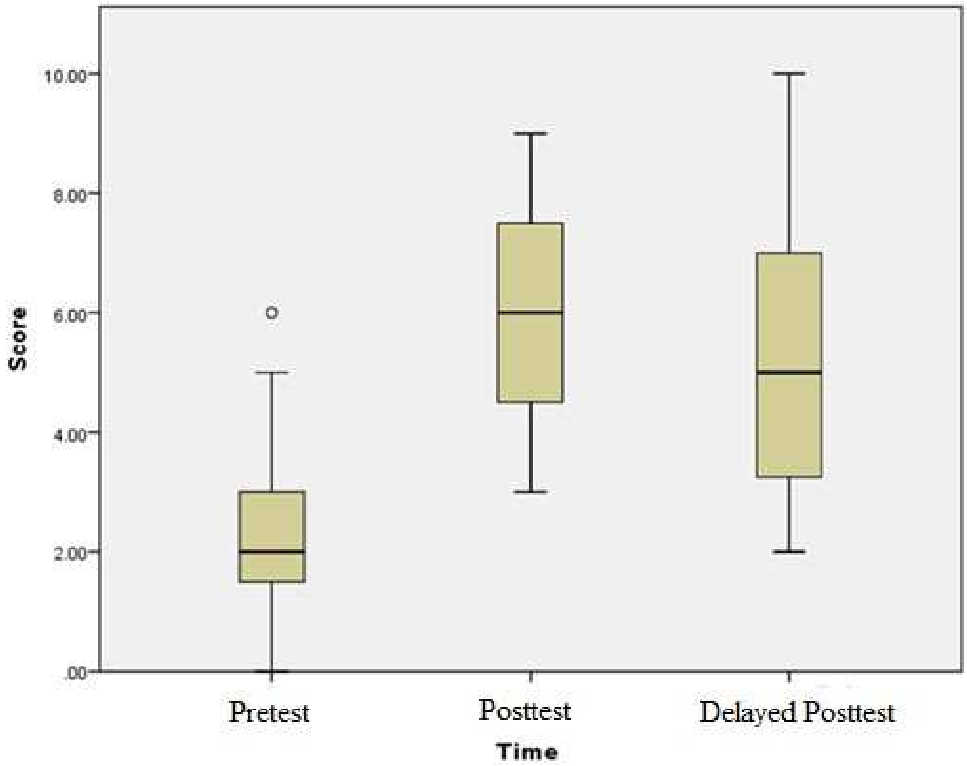

Figure 31. Metalinguistic instruction group general scores in the FIB test.

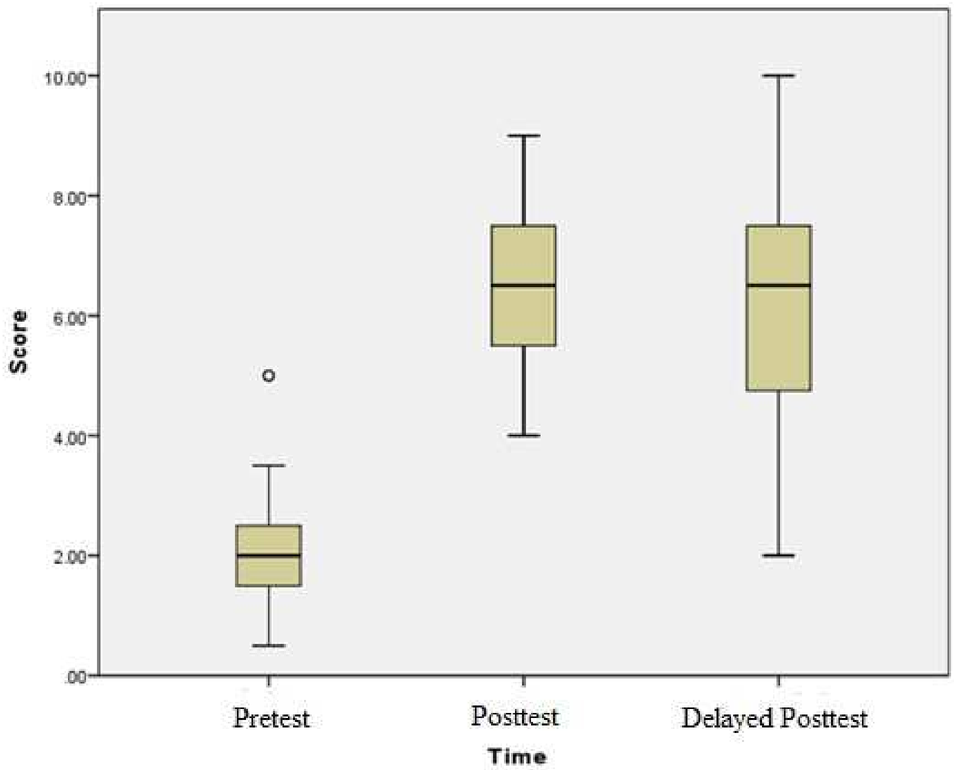

Figure 32. Processing instruction group general scores in the FIB test.

All groups performed better on the FIB immediate posttest than on the pretest. However, as illustrated in figure 29, the improvement made by the control group was marginal. Figure 30 shows that the textual enhancement group improved its performance on the immediate posttest as well, but figures 31 and 32 indicate that the metalinguistic instruction group and the processing instruction group improved significantly more.

Within-group effects by rule

The Shapiro-Wilk p-values of the FIB pretest, posttest and delayed posttest scores of items *in* or *on* were higher than .05 except for the FIB processing instruction group pretest scores as illustrated in the tables in appendix H. However, some of the values above the significance threshold were still very close to .05. Thus, non-parametric tests were used. The rationale for this decision was also that the test scores of the items targeting *by* were not all normally distributed. Thus, in order to compare the findings of items targeting prepositions *in* and *on* with the findings of items targeting preposition *by*, it was necessary to use the same type of tests. For each group a Wilcoxon signed ranks test was conducted with the pretest, posttest and delayed posttest FIB scores of items targeting prepositions *in* and *on*. As the tables in appendix H illustrate, several of the group scores of items targeting the preposition *by* did not meet the assumption of normality. Thus, I conducted non-parametric tests. Figures 33, 34, 35 and 36 show the increase of scores by the metalinguistic instruction group and the processing instruction group in the use of prepositions *in* and *on* across time. As shown in figures 37, 38, 39 and 40, the three treatment groups increased their scores of the prepositions *by* across time.

Table 33

Within Group Differences of the FIB in vs. on Scores from Pre-Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank: Pre to Posttest				95% CI		Wilcoxon Signed Rank: Post to Delayed				95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*R*	r^2	*LL*	*UL*	*p*	z Score	*R*	r^2	*LL*	*UL*
Control	32	3.68 (1.42)	32	4.18 (1.73)	32	4.43 (1.74)	0.062	-1.86	-0.23	0.054	3.16	4.82	0.486	-0.69	-0.08	0.007	4	5.09
Enhancement	30	3.86 (1.50)	30	3.86 (1.73)	30	4.0 (1.41)	0.913	-0.10	-0.01	<.001	3.32	4.52	0.705	-0.37	-0.04	0.002	3	4.68
Metalingusitic	31	3.51 (1.69)	31	6.80 (2.16)	31	6.35 (2.02)	< .001	-4.59	-0.58	0.339	2.98	7.45	0.319	-0.99	-0.12	0.015	6	7.02
Processing	31	3.70 (1.32)	31	7.54 (1.65)	31	6.74 (2.25)	< .001	-4.72	-0.59	0.359	3.18	8.2	0.003	-2.97	-0.37	0.142	3	8.2

	Wilcoxon Signed Rank: Pre to Delayed				95% CI	
	p	z Score	*R*	r^2	*LL*	*UL*
Control	0.043	-2.02	-0.25	0.064	-0.891	0.391
Enhancement	0.648	-0.45	-0.05	0.003	-0.803	0.537
Metalingusitic	< .001	-4.30	-0.54	0.299	-3.732	-1.94
Processing	< .001	-4.29	-0.54	0.297	-3.986	-2.07

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

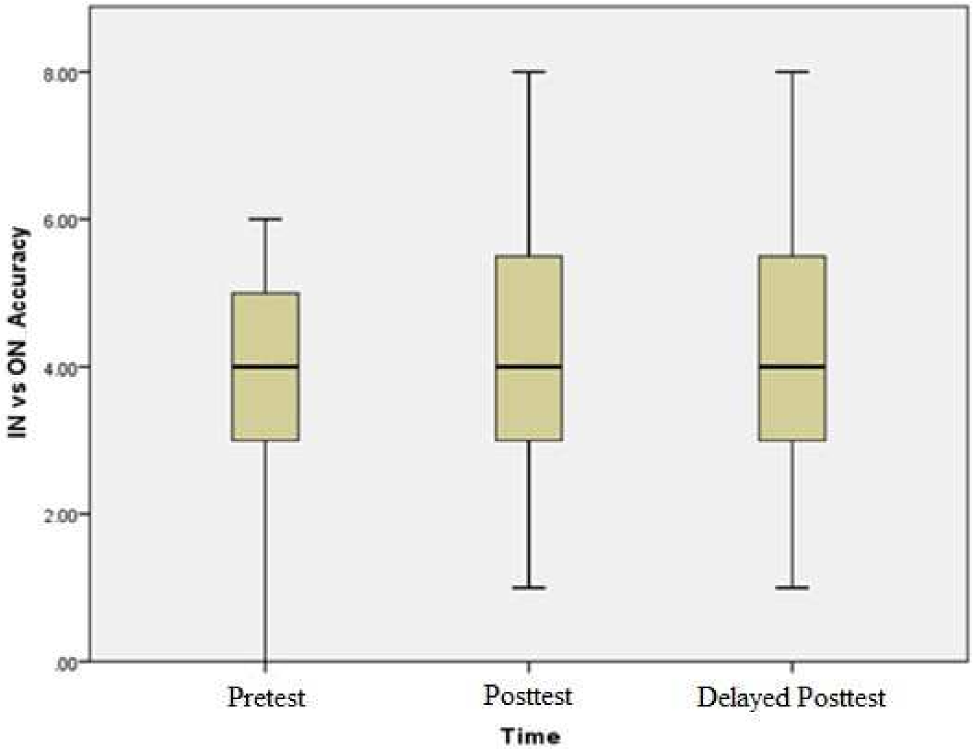

Figure 33. Control group accuracy scores of rule *in* vs. *on* in the FIB test.

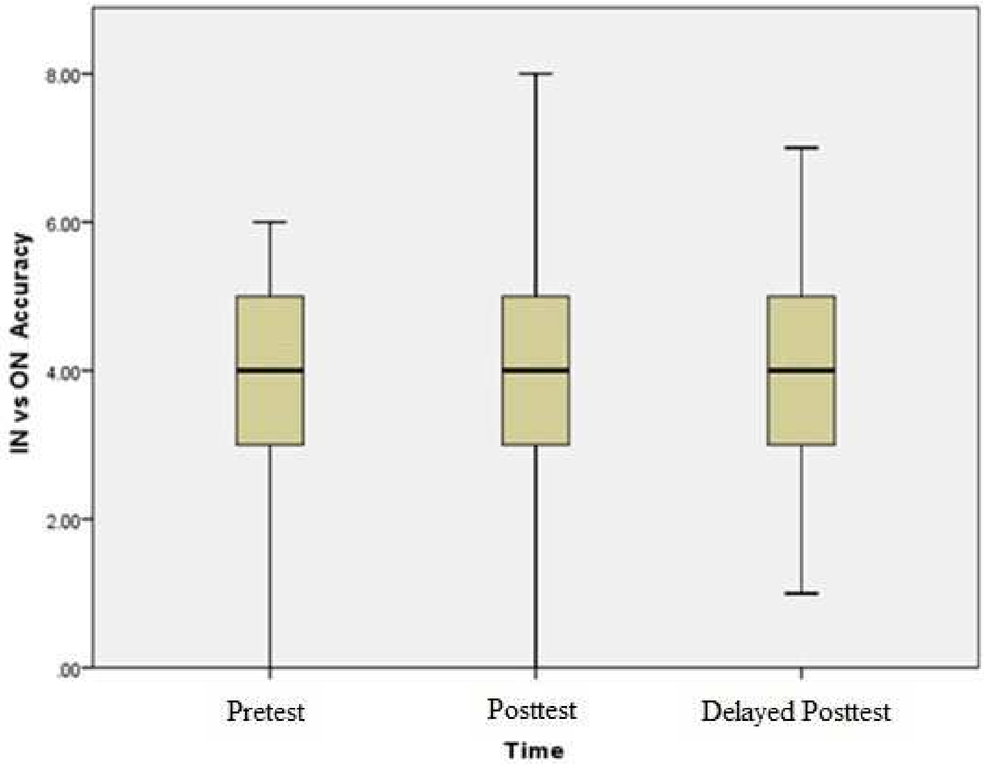

Figure 34. Textual enhancement group accuracy scores of the rule *in* vs. *on* in the FIB test.

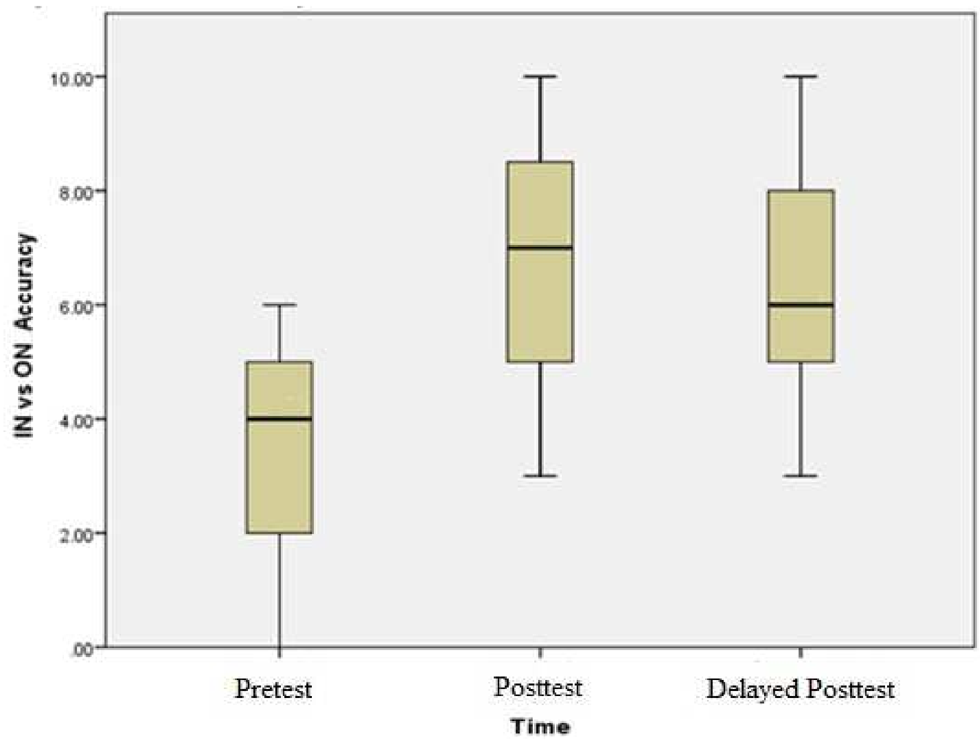

Figure 35. Metalinguistic instruction group accuracy scores of rule *in* vs. *on* in the FIB test.

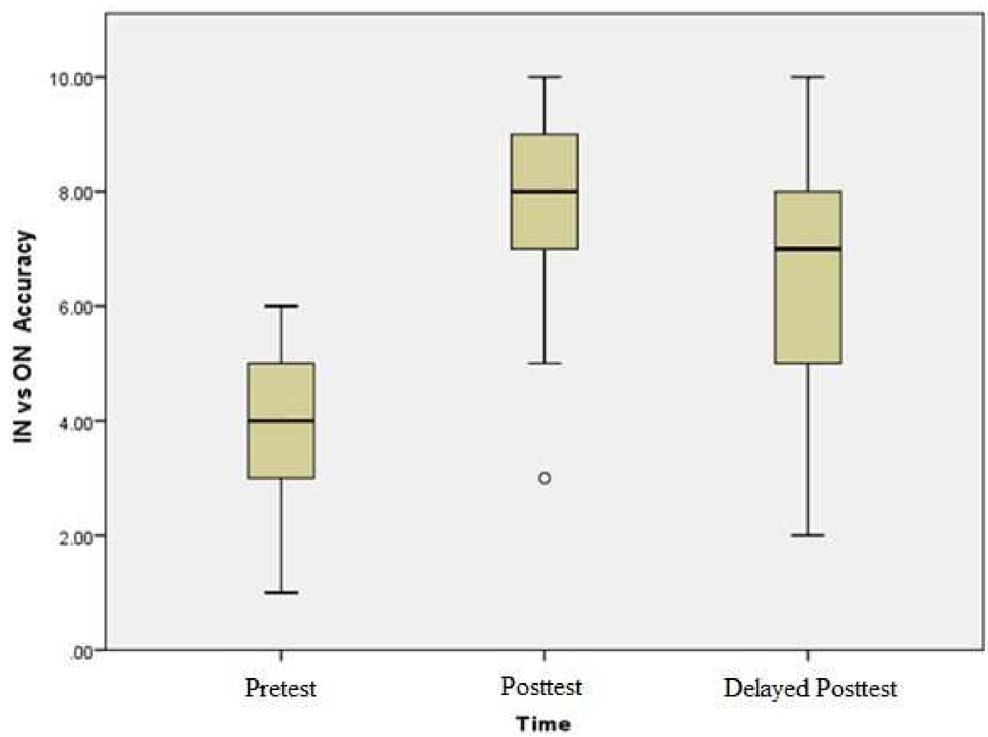

Figure 36. Processing instruction group accuracy scores of rule *in* vs. *on* in the FIB test.

Table 34

Within Group Differences of the FIB by vs. in/on Scores from Pre-Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank						Wilcoxon Signed Rank					
							Pre to Posttest				95% CI		Post to Delayed				95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*R*	r^2	*LL*	*UL*	*p*	z Score	*R*	r^2	*LL*	*UL*
Control	32	0.75 (1.74)	32	1.09 (1.51)	32	1.03 (1.53)	0.057	-1.9	-0.23	0.056	0.9	1.85	0.64	-4.66	-0.58	0.339	0.33	1.91
Enhancement	30	1.03 (2.09)	30	4.03 (2.10)	30	4.70 (2.08)	< .001	-4.25	-0.54	0.301	0.35	4.81	0.12	-1.55	-0.20	0.040	3.25	5.61
Metalingusitic	31	1.22 (2.04)	31	5.38 (2.64)	31	4.22 (3.43)	< .001	-4.37	-0.55	0.308	0.55	6.15	0.6	-1.88	-0.23	0.057	4.61	5.12
Processing	31	0.67 (1.64)	31	5.51 (2.24)	31	5.5 (2.63)	< .001	-4.71	-0.59	0.357	0.01	6.28	0.9	-0.12	-0.01	<.001	4.74	6.44

	Wilcoxon Signed Rank					
	Pre to Delayed				95% CI	
	p	z Score	*R*	r^2	*LL*	*UL*
Control	0.161	-1.40	-0.17	0.030	-0.34	0.47
Enhancement	< .001	-4.48	-0.57	0.335	-1.51	0.18
Metalingusitic	<.001	-3.50	-0.44	0.198	-4.35	-1.6
Processing	< .001	-4.97	-0.63	0.398	-5.87	-3.86

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

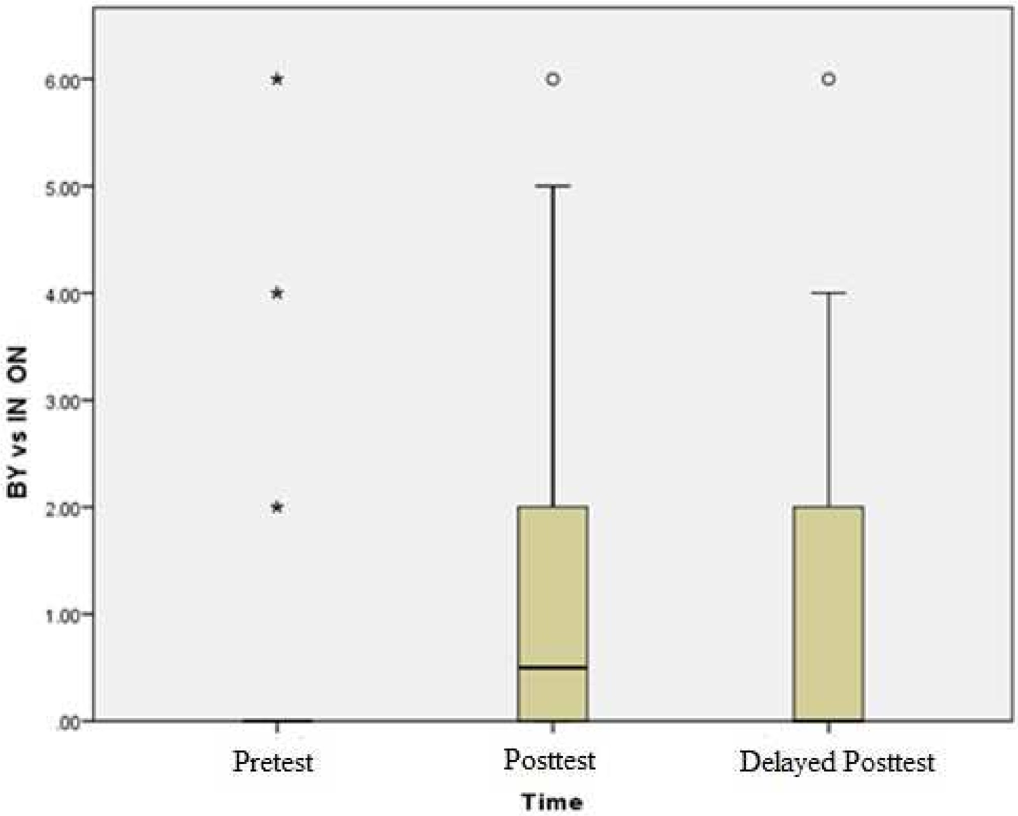

Figure 37. Control group accuracy scores of rule *by* vs. *in/on* in the FIB test.

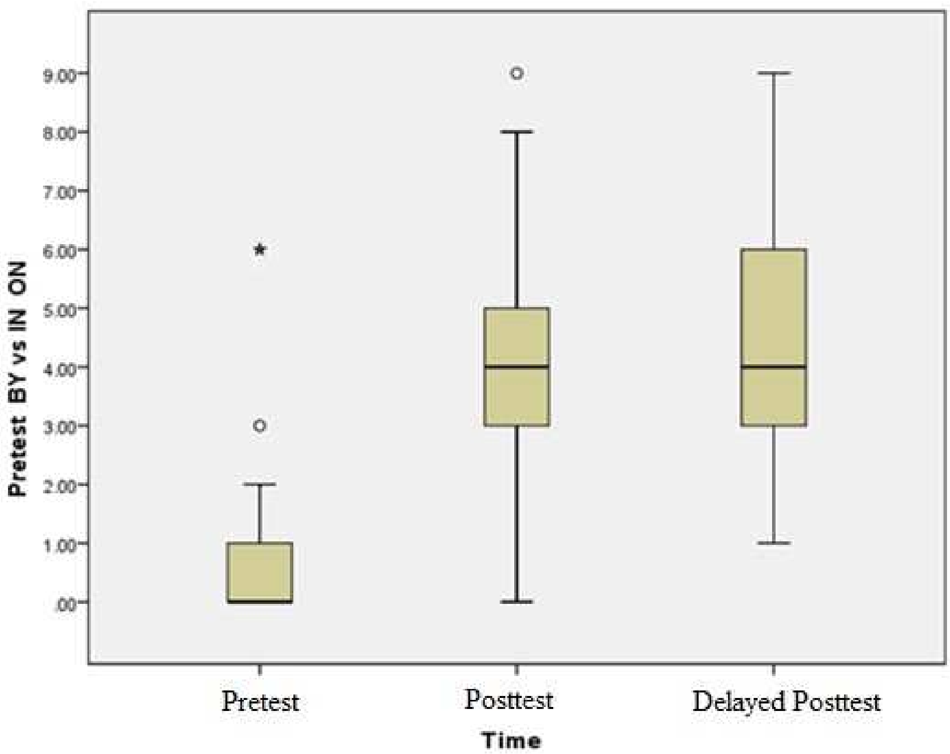

Figure 38. Textual enhancement group accuracy scores of rules *by* vs. *in/on* in the FIB test.

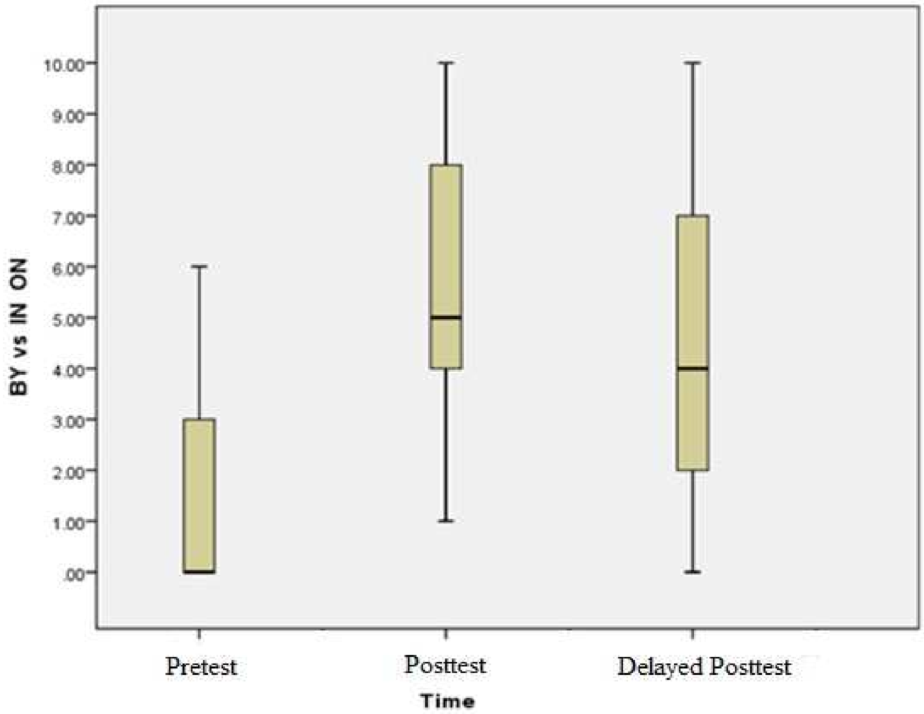

Figure 39. Metalinguistic instruction group accuracy scores of rules *by* vs. *in/on* in the FIB test.

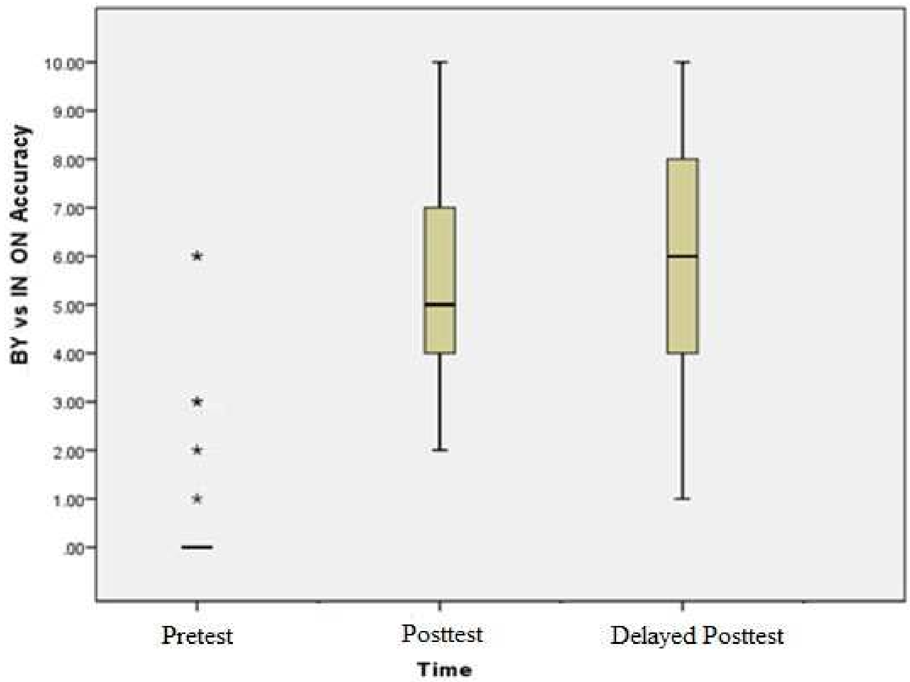

Figure 40. Processing instruction group accuracy scores of rules *by* vs. *in/on* in the FIB test.

Between-group effects

The general scores of the FIB pretest were normally distributed. However, the general scores of the posttest and the delayed posttest were not normally distributed. Therefore, a Kruskal-Wallis test was conducted to compare the FIB pretest mean scores between groups. A Kruskal-Wallis test was also used to compare the posttest mean scores between groups and the delayed posttest mean scores respectively. No significant difference was found between the groups on the FIB pretest ($\chi^2(3, 124) = .55$, $p = .90$). Significant differences were found between groups on the posttest ($\chi^2(3, 124) = 69.21$, $p < .001$) and on the delayed posttest ($\chi^2(3, 124) = 44.23$, $p < .001$). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. After conducting a Bonferroni adjustment for pairwise comparisons, significant differences were found on the FIB posttest between the control group and the textual enhancement group ($U = 211.50$, $z = -3.80$, $p < .001$, $R = -0.3412$, $r^2 = 0.1164$), between the control group and the metalinguistic instruction group ($U = 57.00$, $z = -6.05$, $p < .001$, $R = -0.5433$, $r^2 = 0.2951$) and between the control group and the processing instruction group ($U = 26.50$, $z = -6.47$, $p < .001$, $R = -0.5810$, $r^2 = 0.3375$). In addition, significant differences were also found between the textual enhancement group and the metalinguistic instruction group ($U = 179.50$, $z = -4.13$, $p < .001$, $R = -0.3708$, $r^2 = 0.1375$) and between the textual enhancement group and the processing instruction group ($U = 92.00$, $z = -5.40$, $p < .001$, $R = -0.4849$, $r^2 = 0.2351$). No significant differences were found between the metalinguistic instruction group and the processing instruction group ($U = 415.00$, $z = -.926$, $p = .35$, $R = -0.0831$, $r^2 = 0.0069$).

In the same vein, Mann Whitney U tests were also conducted to compare between group differences on the FIB delayed posttest. Bonferroni adjustments were conducted for pairwise comparisons. Figure 41 illustrates that significant differences were found between the control group and the textual enhancement group (U = 184.50, z = -4.18, p < .001, R = -0.3753, r^2 = 0.1409) and between the control group and the metalinguistic instruction group (U = 147.50, z = -4.81, p < .001, R = -0.4319, r^2 = 0.1865). Significant differences were also found between the control group and the processing instruction group (U = 88.00, z = -5.63, p < .001, R = -0.5055, r^2 = 0.2556), but no significant differences were found between the textual enhancement group and the metalinguistic instruction group (U = 361.50, z = 1.49, p = .134, R = 0.1338, r^2 = 0.0179). A significant difference was found between the textual enhancement group and the processing instruction group (U = 226.00, z = -3.45, p = .001, R = -0.3098, r^2 = 0.0959). No significant difference was found between the metalinguistic instruction group and the processing instruction group (U = 374.50, z = -1.49, p = .135, R = -0.1338, r^2 = 0.0179).

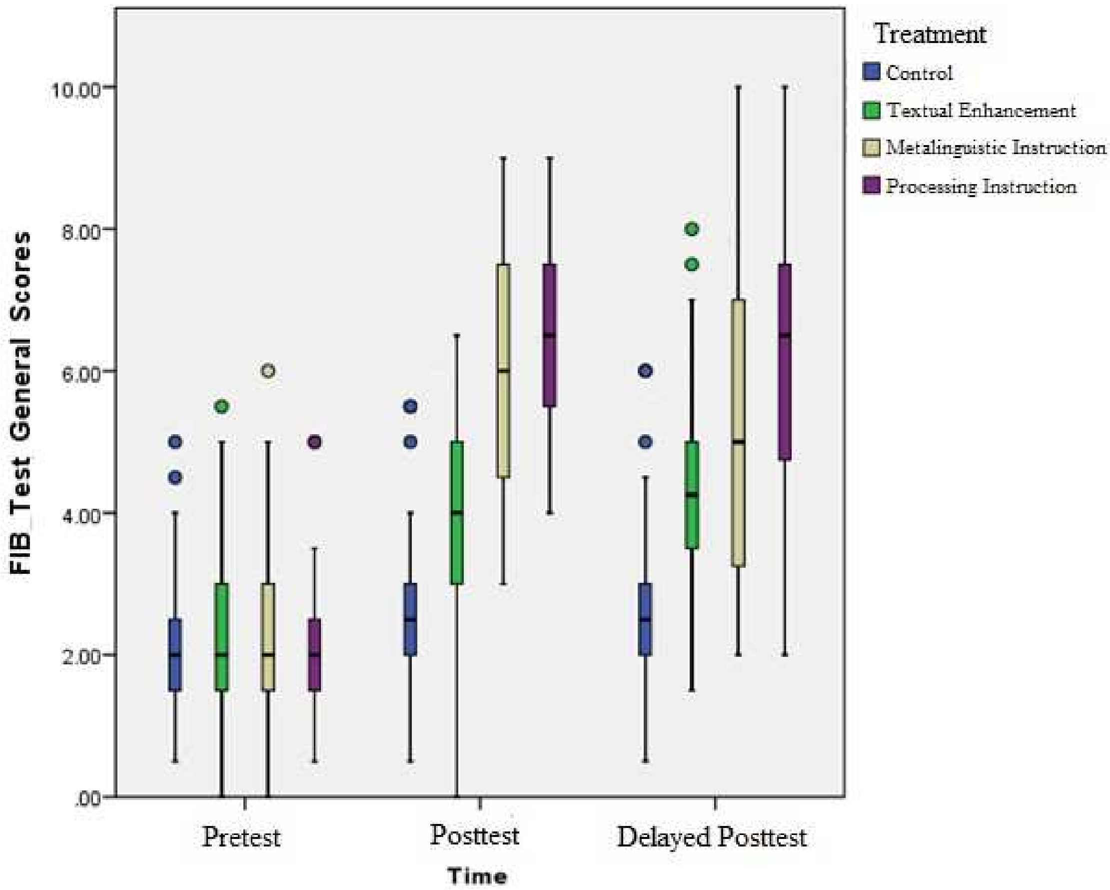

Figure 41. Between-group differences in the FIB test general scores.

Between-group effects by rule

As shown in the tables in appendix H, all the FIB scores targeting the preposition *in* or *on* met the assumption of normality. However, not all the FIB scores targeting the preposition *by* met this assumption. Thus, a Kruskal-Wallis test was conducted with the pretest scores of all groups. No significant difference was found between the groups on the FIB pretest ($\chi^2(2, 123) = .891$, $p = .82$). Significant differences were found between groups on the posttest ($\chi^2(2, 123) = 54.969$, $p < .001$) and on the delayed posttest ($\chi^2(2, 123) = 35.083$, $p < .001$). To find where the differences lay on the posttest, comparisons between groups on the posttest were made using a series of Mann Whitney U tests. After correcting for pairwise comparisons using a Bonferroni adjustment, no significant difference was found on the posttest between the control group and the textual enhancement group (U = 431.50, z = -.698, p = .485, R = -0.0626, r^2 = 0.0039). However, a significant difference was found between the control group and the metalinguistic instruction group (U = 181.00, z = -4.37, p < .001, R = -0.3924, r^2 = 0.1540). Significant differences were also found between the control group and the processing instruction group (U = 86.50, z = -5.67, p < .001, R = -0.5091, r^2 = 0.2592), between the textual enhancement group and the metalinguistic instruction group (U = 141.50, z = -4.71, p < .001, R = -0.4229, r^2 = 0.1789), and between the textual enhancement group and the processing instruction group (U = 66.50, z = -5.79, p < .001, R = -0.5199, r^2 = 0.2703).

To find where the differences lay on the delayed posttest, comparisons between groups on the delayed posttest were also made using a series of Mann Whitney U tests. No significant difference was found on the posttest between the control group and the textual enhancement group (U = 411.50, z = -.988, p = .323, R = -0.0887, r^2 = 0.0078). Nevertheless, significant differences were found between the control group and the metalinguistic instruction group (U = 236.00, z = -3.616, p < .001, R = -0.3247, r^2 = 0.1054) and between the control group and the processing instruction group (U = 215.00, z = -3.898, p < .001, R = -0.3500, r^2 = 0.1225). In addition, significant differences were also found between the textual enhancement group and the metalinguistic instruction group (U = 162.00, z = -4.423, p < .001, R = -0.3971, r^2 = 0.1577) and between the textual enhancement group and the processing instruction group (U = 153.50, z = -4.540, p <.001, R = -0.4077, r^2 = 0.1662).

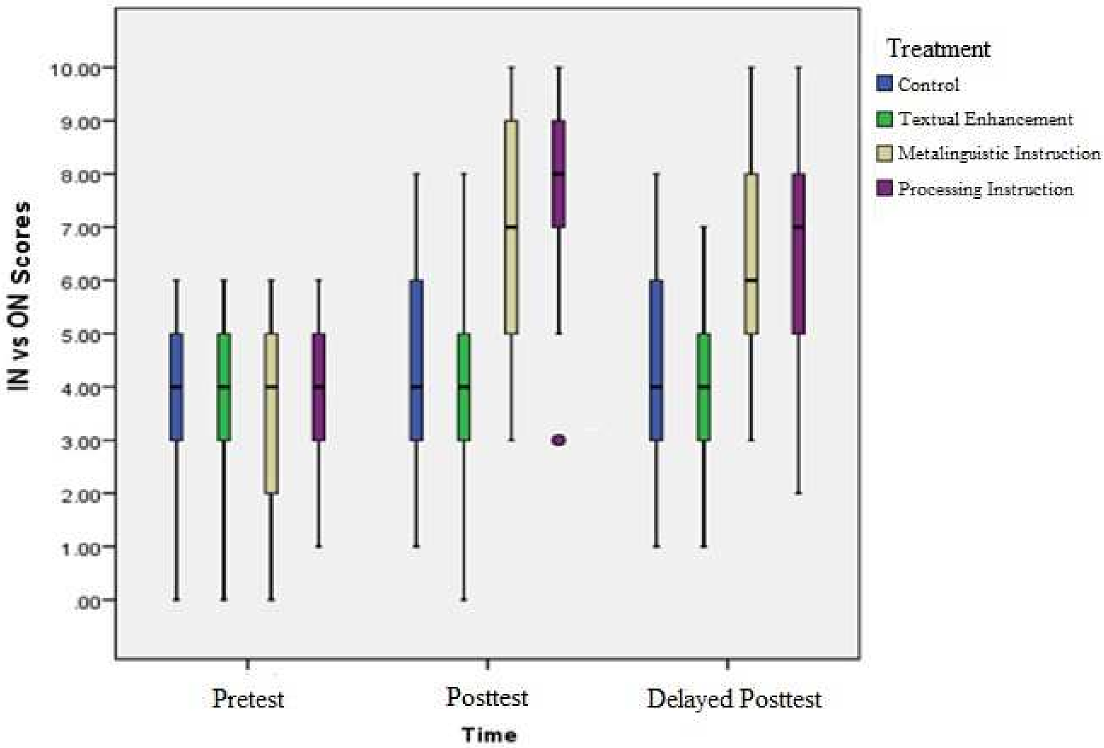

Figure 42. Between-group differences in the FIB test scores of the rule *in* vs. *on*.

The same procedure was followed in order to compare between group differences over time of items targeting the preposition *by* on the FIB tests. A Kruskal-Wallis test was conducted with the pretest scores of all groups. No significant difference was found between the groups on the FIB pretest ($\chi^2(2, 123) = 2.09$, $p = .553$). Significant differences were found between groups on the posttest ($\chi^2(2, 123) = 54.60$, $p < .001$) and on the delayed posttest ($\chi^2(2, 123) = 45.14$, $p < .001$). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. After correcting for pairwise comparisons using a Bonferroni adjustment, a significant difference was found on the posttest between the control group and the textual enhancement group ($U = 120.50$, $z = -5.154$, $p < .001$, $R = -0.4628$, $r^2 = 0.2142$). Similarly, significant differences were found between the control group and the metalinguistic instruction group ($U = 73.50$, $z = -5.87$, $p < .001$, $R = -0.5271$, $r^2 = 0.2778$) and between the control group and the processing instruction group ($U = 51.00$,

z -6.192, $p < .001$, $R = -0.5560$, $r^2 = 0.3092$). Significant differences were also found between the textual enhancement group and the metalinguistic instruction group (U = 327.00, z = -2.007, p = .045, R = -0.1802, r^2 = 0.0324) and between the textual enhancement group and the processing instruction group (U = 293.50, z = -2.49, p = .012, R = -0.2236, r^2 = 0.0500).

A series of Mann Whitney U tests were also conducted with the FIB delayed posttest scores of items targeting the preposition *by*. A significant difference was found between the control group and the textual enhancement group (U = 74.00, z = 5.820, p < .001, R = 0.5226, r^2 = 0.2731). Significant differences were also found between the control group and the metalinguistic instruction group (U = 210.00, z = -4.055, p < .001, R = -0.3641, r^2 = 0.1326) and between the control group and the processing instruction group (U = 70.00, z = -5.943, p < .001, R = -0.5336, r^2 = 0.2848). Similarly, the analyses revealed that from pre to posttest all groups improved their scores on the FIB on items targeting the form *by* in comparison to the control group which did not improve.

4.8.5 Metalinguistic knowledge test

This subsection presents the analysis performed with the scores of the metalinguistic knowledge test. Just as in the case of the TGJT and the FIB, the MKT analysis focused on the 20 target items. The 20 distractors were not included in the analysis. Also, the analysis conducted with the MKT data focused first on the general scores, and then it focused separately on the scores by rule. In the next subsection I will present the findings of comparisons made with the general scores of each group across time.

Shapiro Wilk tests were conducted with the data sets of each group in order to find if the data score distribution of the MKT pre, post and delayed posttest met the assumption of normality. The columns containing the p-value in the tables in appendix

I illustrate that all of the groups on the pre, post and delayed posttest scored lower than .05 on the Shapiro-Wilk test indicating that none of the group scores met the assumption of normality on any of the tests. Thus, non-parametric tests were conducted to compare within-groups effects across time.

Within-group effects

Wilcoxon signed ranks tests were conducted with the MKT general scores of each group. Table 61 shows the descriptive and inferential statistics of each group on the MKT across time.

Table 35

Within Group Differences of the MKT General Scores from Pre-Posttest and from Post-Delayed Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank						Wilcoxon Signed Rank					
							Pre to Posttest				95% CI		Post to Delayed				95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*R*	r^2	*LL*	*UL*	*p*	z Score	*R*	r^2	*LL*	*UL*
Control	32	0.26 (1.05)	32	0.28 (0.87)	32	0.20 (0.86)	0.85	-0.184	-0.023	< .001	-0.03	1.22	0.41	-0.816	-0.10	0.010	-0.66	1.15
Enhancement	30	0.23 (0.72)	30	0.40 (0.75)	30	0.28 (0.59)	0.34	-0.938	-0.121	0.014	-0.08	1.37	0.46	-0.732	-0.09	0.008	-0.57	1.26
Metalingusitic	31	0.30 (0.78)	31	5.37 (3.89)	31	3.16 (3.36)	< .001	-4.349	-0.552	0.305	-0.002	6.32	0.005	-2.786	-0.35	0.125	4.41	4.12
Processing	31	0.41 (0.85)	31	6.83 (3.53)	31	4.67 (4.11)	< .001	-4.549	-0.578	0.333	0.111	7.79	<.001	-4.117	-0.52	0.273	5.88	5.64
													Wilcoxon Signed Rank					
													Pre to Delayed				95% CI	
													p	z Score	*R*	r^2	*LL*	*UL*
Control													0.102	-1.633	-0.20	0.043	-0.01	0.13
Enhancement													0.831	-0.213	-0.02	<.001	-0.32	0.22
Metalingusitic													<.001	-4.084	-0.51	0.269	-4.07	-1.6
Processing													<.001	-4.120	-0.52	0.273	-5.72	-2.7

Note. *CI = Confidence interval; LL = lower limit; UL = upper limit.*

The following subsection will first explain each group's development across time on the MKT scores of items targeting prepositions *in* or *on*. Then it will show each group's improvement on the MKT items targeting the preposition *by*.

Within-group effects by rule

Wilcoxon signed ranks tests were conducted with each groups' scores of items targeting *in* or *on*. The columns containing the p-values in table 36 illustrate that for the control group there was no learning from pre to posttest or from the immediate posttest to the delayed posttest. In the same vein, for the textual enhancement group there was no learning from pre to posttest nor from the immediate posttest to the delayed posttest. In contrast, the metalinguistic instruction group improved from pre to posttest, and although its scores were lower on the delayed posttest in comparison to the immediate posttest, the learning was sustained. The processing instruction group also improved from pre to posttest, but its scores were significantly lower on the delayed posttest compared to the immediate posttest. However, the delayed posttest results indicate that the processing instruction group sustained some of the learning in comparison to the initial scores on the pretest. In order to investigate if there were within group differences across time for the scores of items targeting the preposition *by*, a Wilcoxon signed ranks test was conducted with each groups' MKT scores of the preposition *by*.

Table 36

Within Group Differences of the MKT in vs. on Scores from Pre-Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank						Wilcoxon Signed Rank					
							Pre to Posttest				95% CI		Post to Delayed				95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*R*	r^2	*LL*	*UL*	*p*	z Score	*R*	r^2	*LL*	*UL*
Control	32	0.31 (1.12)	32	0.34 (1.0)	32	0.28 (1.11)	0.705	-0.378	-0.047	0.002	-0.083	1.31	0.705	-0.378	-0.047	0.002	-0.6	1.32
Enhancement	30	0.26 (0.83	30	0.60 (1.13)	30	0.40 (0.93)	0.215	-1.24	-0.160	0.025	-0.142	1.6	0.475	-0.714	-0.092	0.008	-0.4	1.48
Metalingusitic	31	0.38 (1.26)	31	5.96 (4.02)	31	4.19 (3.89)	< .001	-4.275	-0.543	0.294	-0.015	6.95	0.028	-2.191	-0.278	0.077	4.97	5.25
Processing	31	0.61 (1.26)	31	7.19 (3.54)	31	4.58 (4.30)	< .001	-4.564	-0.580	0.335	0.211	8.18	< .001	-3.938	-0.500	0.250	6.2	5.64

	Wilcoxon Signed Rank					
	Pre to Delayed				95% CI	
	p	z Score	*R*	r^2	*LL*	*UL*
Control	0.317	-1	-0.125	0.015	-0.03	0.09
Enhancement	0.33	-0.973	-0.126	0.015	-4.2	0.15
Metalingusitic	< .001	-3.969	-0.504	0.254	-5.2	-2.3
Processing	< .001	-3.859	-0.490	0.240	-5.5	-2.4

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

Table 37

Within Group Differences of the MKT by vs. in/on Scores from Pre-Posttest

	Pretest		Posttest		Delayed Posttest		Wilcoxon Signed Rank						Wilcoxon Signed Rank					
							Pre to Posttest				95% CI		Post to Delayed				95% CI	
Condition	*n*	M(SD)	*n*	M(SD)	*n*	M(SD)	*p*	z Score	*R*	r^2	*LL*	*UL*	*p*	z Score	*R*	r^2	*LL*	*UL*
Control	32	.219 (1.069)	32	.218 (.792)	32	0.125 (.707)	1	< .001	< .001	< . 001	-0.047	1.18	0.18	-1.342	-0.168	0.028	-0.8	1.09
Enhancement	30	.200 (.664)	30	.200 (610)	30	.166 (.746)	0.915	-0.11	-0.014	< .001	-0.074	1.2	0.713	-0.368	-0.048	0.002	-0.8	1.16
Metalingusitic	31	.225 (.560)	31	4.77 (3.96)	31	2.12 (3.30)	< .001	-4.19	-0.532	0.282	-0.044	5.75	0.003	-2.998	-0.381	0.144	3.79	3.11
Processing	31	.225 (.616)	31	6.48 (3.73)	31	4.77 (4.33)	< .001	-4.56	-0.578	0.334	-0.044	7.46	< .001	-3.544	-0.450	0.202	5.5	5.76

	Wilcoxon Signed Rank					
	Pre to Delayed				95% CI	
	p	z Score	*R*	r^2	*LL*	*UL*
Control	0.18	-1.342	-0.168	0.028	-0.05	0.234
Enhancement	0.786	-0.271	-0.035	0.001	-0.35	0.419
Metalingusitic	0.003	-2.938	-0.373	0.139	-3.1	-0.71
Processing	< .001	-3.85	-0.489	0.239	-6.12	-2.98

Note. CI = Confidence interval; LL = lower limit; UL = upper limit.

The following subsection will explain how each group had different general score gains across time on the MKT. It will namely focus on how each treatment group improved from pre to posttest compared to the control group. Comparisons between treatment groups will also be explained.

Between-group effects

None of the general scores of the metalinguistic knowledge pretest, posttest and delayed posttest were normally distributed. Therefore, in order to compare mean scores between groups, I used non-parametric tests.

Kruskal-Wallis tests were conducted to make between-group comparisons with the mean general scores of the MKT pretest, posttest and the delayed posttest respectively. No significant difference was found between the groups on the MKT pretest ($X^2(3, 120) = 3.484$, $p = .323$). Significant differences were found between groups on the posttest ($X^2(3, 120) = 64.133$, $p < .001$) and on the delayed posttest ($X^2(3, 124) = 48.103$, $p < .001$). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. Bonferroni adjustments were used for pairwise comparisons. No significant differences were found on the immediate posttest between the control group and the textual enhancement group ($U = 403.00$, $z = -1.525$, $p = .127$, $R = -0.1369$, $r^2 = 0.0187$). However, significant differences were found between the control group and the metalinguistic instruction group ($U = 133.50$, $z = -5.478$, $p < .001$, $R = -0.4919$, $r^2 = 0.2420$) and between the control group and the processing instruction group ($U = 77.50$, $z = -6.179$, $p < .001$, $R = -0.5548$, $r^2 = 0.3079$). In addition, significant differences were also found between the textual enhancement group and the metalinguistic instruction group (U = 143.50, z = -4.884, p < .001, R = -0.4385, r^2 = 0.1923) and between the textual enhancement group and the processing instruction group (U = 81.50, z = -5.740, p < .001, R = -0.5154, r^2 = 0.2657).

Comparisons between groups on the MKT delayed posttest were done using a series of Mann Whitney tests. Bonferroni adjustments were conducted for pairwise comparisons. There was no significant difference on the delayed posttest between the general scores of the control group and the textual enhancement group (U = 404.00, z = -1.748, p = 0.81, R = -0.1569, r^2 = 0.0246). In contrast, there was a significant difference on the delayed posttest between the control group and the metalinguistic instruction group (U = 172.00, z = -5.102, p <.001, R = -0.4581, r^2 = 0.2099) and between the control group and the processing instruction group (U = 148.50, z = -5.410, p < .001, R = -0.4858, r^2 = 0.2360). Significant differences were also found on the delayed posttest between the textual enhancement group and the metalinguistic instruction group (U = 188.50, z = -4.316, p < .001, R = -0.3875, r^2 = 0.1502) and between the textual enhancement group and the processing instruction group (U = 174.50, z = -4.500, p < .001, R = -0.4041, r^2 = 0.1633). Figure 43 contains each group's different increases of general score on the MKT.

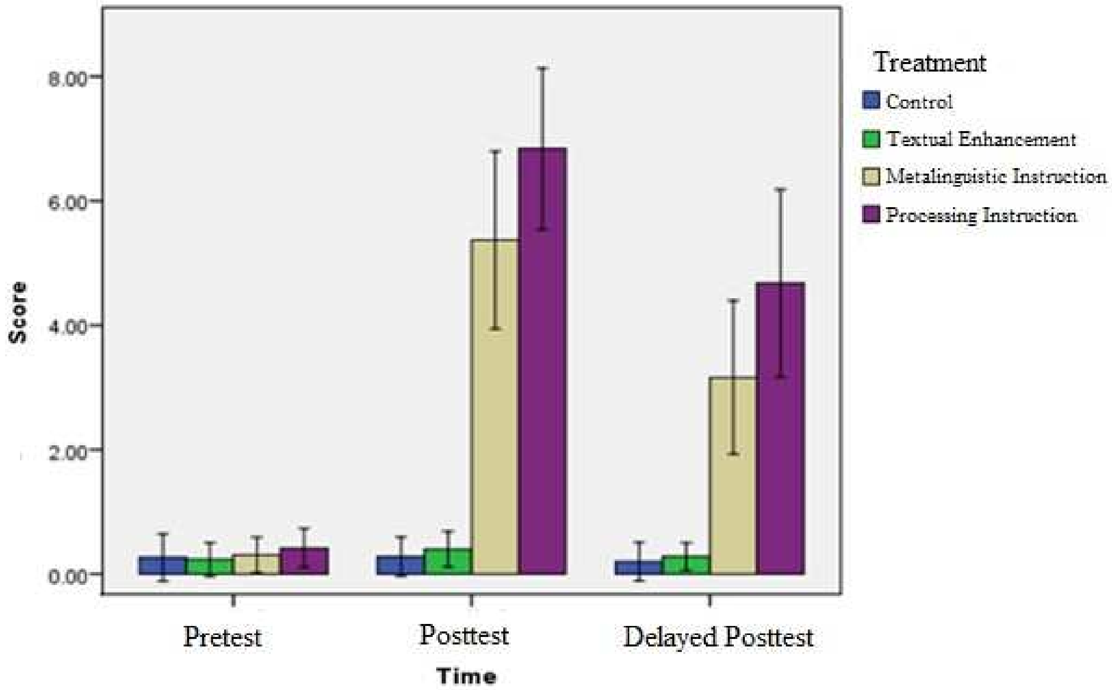

Figure 43 . General scores between groups across time in the MKT.

The following subsection starts by showing the differing ways in which each group increased its MKT scores of items targeting prepositions *in* or *on* across time. Then it presents the differences in increase of gain scores across time of the preposition *by*.

Between-group effects by rule

All groups' MKT scores of pretest items targeting the preposition *in* or *on* were analysed using a Kruskal-Wallis test. There was no significant difference between any of the group's general scores on the pretest ($\chi^2(3, 120) = 2.341$, $p = .505$). However, there were significant differences between the groups on the immediate posttest ($\chi^2(3, 120) = 62.726$, $p < .001$) and on the delayed posttest ($\chi^2(3, 120) = 43.108$, $p < .001$). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. After conducting Bonferroni adjustments for pairwise comparisons, no significant differences were found on the immediate posttest between the control group and the textual enhancement group (U = 402.00, z = -1.545, p = .122, R = -0.1387, r^2 = 0.0192). However, significant differences were found between the control group and the metalinguistic instruction group (U = 146.00, z = 5.346, p < .001, R = 0.4800, r^2 = 0.2304) and between the control group and the processing instruction group (U = 76.00, z = -6.227, p < .001, R = -0.5592, r^2 = 0.3127). There were also significant differences between the textual enhancement group and the metalinguistic instruction group (U = 158.00, z = 4.698, p < .001, R = 0.4218, r^2 = 0.1779) and between the textual enhancement group and the processing instruction group (U = 83.50, z = -5.737, p < .001, R = -0.5151, r^2 = 0.2654).

On the delayed posttest no significant differences were found between the control group and the textual enhancement group (U = 419.50, z = -1.463, p = .143, R = -0.1313, r^2 = 0.0172). However, significant differences were found between the control group and the metalinguistic instruction group (U = 184.50, z = -4.967, p < .001, R = -0.4460, r^2 = 0.1989), and between the control group and the processing instruction group (U = 180.00, z = -5.042, p < .001, R = -0.4527, r^2 = 0.2050). Significant differences were also found between the textual enhancement group and the metalinguistic instruction group (U = 195.00, z = -4.288, p < .001, R = -0.3850, r^2 = 0.1482) and between the textual enhancement group and the processing instruction group (U = 205.00, z = -4.132, p <.001, R = -0.3710, r^2 = 0.1376). Figure 44 explains each group's increase of the MKT scores of items targeting prepositions *in* or *on*.

In order to compare between group differences on the use of the preposition *by* across time, all groups' MKT scores of pretest items targeting the preposition *by* were analysed using a Kruskal-Wallis test. There was no significant difference between any of the groups' general scores on the pretest ($\chi^2(3, 120) = 1.486$, $p = .685$), but there were significant differences between groups on the immediate posttest ($\chi^2(3, 120) = 65.541$, $p < .001$), and on the delayed posttest ($\chi^2(3, 120) = 40.014$, $p < .001$). To find where the differences lay, comparisons between groups on the posttest were done using a series of Mann Whitney U tests. After correcting for pairwise comparisons using a Bonferroni adjustment, no significant differences were found on the immediate posttest between the control group and the textual enhancement group ($U = 463.50$, $z = -.423$, $p = .672$, $R = -0.0379$, $r^2 = 0.0014$). Significant differences were found between the control group and the metalinguistic instruction group ($U = 164.50$, $z = -5.163$, $p < .001$, $R = -0.4636$, $r^2 = 0.2149$) and between the control group and the processing instruction group ($U = 77.50$, $z = -6.232$, $p < .001$, $R = -0.5596$, $r^2 = 0.3132$). In addition, significant differences were also found between the textual enhancement group and the metalinguistic instruction group ($U = 156.50$, $z = -4.948$, $p < .001$, $R = -0.4443$, $r^2 = 0.1974$) and between the textual enhancement group and the processing instruction group ($U = 74.00$, $z = -6.026$, $p < .001$, $R = -0.5411$, $r^2 = 0.2928$).

4.8.6 Summary

To summarise the main findings from the pretest, posttest and delayed posttest, tables 38, 39 and 40 show an overview indicating which treatments had a learning effect or lack thereof. They also illustrate the instances in which there was learning decay.

Table 38

Summary of General Accuracy Scores across Time

	Measure	Control	Textual Enhancement	Metalinguistic Instruction	Processing Instruction
FIB Test	Pre to Posttest	↑	↑	⬆	⬆
	Post to Delayed Posttest	⇔	⇔	↓	↓
TGJT Test	Pre to Posttest	⇔	↑	⬆	⬆
	Post to Delayed Posttest	⇔	↓	⇔	⇔
MKT	Pre to Posttest	⇔	⇔	⬆	⬆
	Post to Delayed Posttest	⇔	⇔	↓	↓

Note. ↑ = increase; ↓ = decrease; ⬆ = large increase; ⬇ = large decrease; ⇔ = no effect;

Table 39

Summary of Accuracy Scores across Time of in vs. on Items

	Measure	Control	Textual Enhancement	Metalinguistic Instruction	Processing Instruction
FIB Test	Pre to Posttest	⇔	⇔	⇧	⇧
	Post to Delayed Posttest	⇔	⇔	⇔	↓
TGJT Test	Pre to Posttest	⇔	⇔	⇧	⇧
	Post to Delayed Posttest	⇔	⇩	⇩	⇧
MKT	Pre to Posttest	⇔	⇔	⇧	⇧
	Post to Delayed Posttest	⇔	⇔	↓	⇩

Note. ↑ = increase; ↓ = decrease; ⇧ = large increase; ⇩ = large decrease; ⇔ = no effect;

Table 40

Summary of Accuracy Scores across Time of by vs. in and on items

	Measure	Control	Textual Enhancement	Metalinguistic Instruction	Processing Instruction
FIB Test	Pre to Posttest	⇔	⇧	⇧	⇧
	Post to Delayed Posttest	⇔	⇔	⇔	⇔
TGJT Test	Pre to Posttest	⇔	⇧	⇧	⇧
	Post to Delayed Posttest	⇔	⇔	⇔	⇔
MKT	Pre to Posttest	⇔	⇔	⇧	⇧
	Post to Delayed Posttest	⇔	⇔	⇧	⇧

Note. ↑ = increase; ↓ = decrease; ⇧ = large increase; ⇩ = large decrease; ⇔ = no effect;

4.9 Discussion of Main Study

The previous chapter presented the results of the main experiment. This section will focus on answering each of the research questions. The first question aimed at comparing the effectiveness of three form-focused-instruction treatments ranging in their level of explicitness. The second research question aimed at finding the delayed effects of each treatment. Research question 3a investigated whether the type of training condition affects the type of knowledge that is acquired by learners (implicit/explicit). Research question 3b investigated the possibility that different training conditions may affect the target forms *in* or *on* and *by* in different ways. In other words, some forms may be learned implicitly while others may require a metalinguistic explanation prior to an implicit treatment. Finally, research question 3c was directed at finding if any of the training conditions reflected a learning effect during the training sessions. It also sought to assess participants' development of accuracy and identify the stages of training in which participants became more accurate in the use of the target forms.

4.9.1 Effects of Implicit and Explicit Instruction

Research question 1 aimed at finding how each pedagogical condition boosted the learning of the target forms. The findings indicate that input flood was not powerful enough to result in increased accuracy on the TGJT, a measure which assesses primarily implicit knowledge, nor on the FIB and MKT tests which measure mainly explicit knowledge. That is, the participants in this group did not learn any of the target rules from pre to posttest nor from pre to delayed posttest. Textual enhancement showed positive gains on two of the tests (the TGJT and the FIB) but not on the MKT. In contrast, both the group receiving metalinguistic instruction and the group receiving processing instruction had a learning effect in all the tests.

The hypothesis to this research question predicted that the two explicit training conditions (metalinguistic instruction and processing instruction) would promote the learning of the target forms more substantially than the implicit training condition (textual enhancement). This hypothesis was confirmed given that the two explicit training conditions scored higher than the implicit training condition in all tests especially in the MKT. The hypothesis was also supported by the fact that processing instruction was more effective than metalinguistic instruction although just marginally. However, the finding that textual enhancement was effective in promoting some knowledge of the target forms is contrary to what had been hypothesized. Exposure to textual enhancement during the training sessions was beneficial considering that learners receiving only textual enhancement were able to increase their scores in the TGJT of items *by* vs. *in/on* from pre to posttest and that the effect size was moderate as shown in table 31. That is, 27 % of the increase in accuracy can be explained by the exposure to enhanced input. On the other hand, the control group had a minimal increase of accuracy and the effect size was very weak. Thus, mere exposure to unenhanced texts accounted for only 2% of the increase in accuracy from pre to posttest, which was marginal. This performance comparison between the control group and the textual enhancement group indicates that textual enhancement can be more effective than providing learners with repeated exposure to unenhanced target forms.

That the textual enhancement group also had no accuracy increase from pre to posttest on the FIB for the prepositions *in* vs. *on*, but they did become more accurate in the use of the preposition *by* echoes the aforementioned findings in the TGJT. Not only were the gains in the FIB test significant, but the effect size was moderate and 30% of the increase in accuracy from pre to posttest was explained by the exposure to enhanced input as shown in table 31. Textual enhancement was not effective in promoting metalinguistic knowledge of either one of the target forms. The exposure to enhanced input can only account for two percent of the non-significant increase of scores from pre to posttest of the prepositions *in* and *on* in the MKT.

The outcomes in the current study indicate that the implicit training condition of textual enhancement was effective in promoting learning of the target forms even though awareness at the level of understanding was not necessary. However, that the textual enhancement did not promote metalinguistic rule knowledge, and the scores were not as high as those in the explicit groups suggests that awareness at the level of understanding may be needed in order for learners to be able to score higher on tests of both implicit and explicit knowledge. It seems that without this higher level of awareness, learners may not be able to make the connection between form-meaning function of a linguistic target.

In the case of both metalinguistic instruction and processing instruction, the increase in accuracy between the pre and posttest on TGJT, FIB and MKT had a moderate effect size. Metalinguistic instruction in combination with implicit training accounted for 30% of the improvement in all the tests and more than 30% in the case of processing instruction. These effect sizes show that the higher improvement made by the two explicit groups was not the result of chance. Thus, these findings underscore the benefits of adding an explicit component to the implicit training.

These findings, however, should be interpreted with caution because as mentioned previously, the tests implemented in this study are not pure measures of implicit or explicit knowledge. Also, the study was intentionally designed so that not all of the items in the tests would overlap during the training sessions. That is, participants received training on a number of prepositional phrases, and they were later tested on some of those prepositional phrases and also on other new items that followed the same rules. This was done in order to determine whether participants had actually gained productive knowledge of the target forms or whether they had learned the target forms as lexical items. In total, there were four target items in the tests comprising the preposition *in* and *on* and three using the preposition *by* which were not provided during the training sessions. The results of the MKT show some evidence that participants from the metalinguistic instruction group and from the processing instruction group implemented rule knowledge as they were able to improve their accuracy of the following items that had not been included during the training sessions (in a rowboat, on a bicycle, on a tractor, on a skateboard, by bicycle, by subway and by taxi). However, the control group and the textual enhancement group did not show any increase in knowledge of these specific target forms. These findings indicate that implicit instruction did not enable learners to gain productive rule knowledge, but instead participants in this group learned lexical items (chunks) of the prepositional phrases containing the preposition *by*.

These findings should be interpreted with caution because although the explicit groups showed some gain in productive rule knowledge, there is no evidence that they only used this rule knowledge to complete those items that were included in the training sessions and in the tests. It is plausible that the increase in accuracy by learners receiving an explicit treatment was a result of both item learning and rule learning.

The two explicit training conditions (metalinguistic instruction and processing instruction) were effective in promoting learning, and the findings indicate that participants relied on awareness at the level of understanding. Textual enhancement led to implicit and explicit knowledge, but it did not promote metalinguistic knowledge of the target forms. These results concord with those found in previous studies such as Jahan and Kormos (2015) where textual enhancement was effective "in drawing learners' attention to the target forms" (p. 61), but was not sufficient for most learners to acquire metalinguistic awareness of the target forms *will* and *be going to*. The authors suggested that perhaps providing explicit instruction prior to the exposure to textual enhancement may be necessary for "helping learners to expand their existing conceptualizations of this grammatical construction" (p. 62). This assertion is borne out by the results of the current study since only textual enhancement presented after metalinguistic instruction or processing instruction was successful at helping learners to make the form-meaning mapping necessary for them to verbalize the target rules in the metalinguistic knowledge test, whereas textual enhancement without any form of explicit instruction was not effective. The enhancement was designed to increase the likelihood that participants would notice the target forms, but it did not offer any explicit meaning cue that could help them interpret the use of the appropriate preposition. Therefore, even if input and output enhancement had increased the salience of the target forms, it is plausible that participants may not have perceived and subsequently discovered the underlying abstract rules.

However, there is a contradiction between the findings in the current study showing a learning effect due to textual enhancement and the outcomes reported by Park et al. (2012). Their experiment revealed that instructing participants to pay attention to the target forms was necessary in order for learners to improve their use of the linguistic targets, so Park et al. concluded that textual enhancement was not effective in promoting learning and that an additional component was needed. They argued that deliberate attention to the target forms is a fundamental factor in order for learning to occur. One possible reason for the lack of noticing and intake due to textual enhancement in the study by Park et al. could perhaps be that their treatment was very brief only lasting one session in which learners read one text with 20 tokens of the target form (Gerund vs. Infinitive). As mentioned previously, research has shown that in order for implicit instruction to be effective, learners need extensive exposure to the input. This lack of a significant effect resembles the findings reported by Leow (2001), Tanaka (2011), Lyddon (2011) and Loewen and Inceoglu (2016) who gave participants a brief training. In contrast, in the current study, the treatment lasted three sessions over a period of three weeks.

In the current study, a metalinguistic rule explanation prior to the exposure of enhancement boosted the scores on the FIB more than the treatment comprising only textual enhancement without any explicit information. These findings concord with previous research on textual enhancement such as the study by Indrarathne and Kormos (2016). In their study, two types of explicit instruction in combination with textual enhancement were more effective than mere exposure to textual enhancement. The authors' explanation was that providing participants with the target rule may have increased the expectancy value of the target forms, thus making them more salient. Indrarathne and Kormos found that explicit instruction can improve learners' attention directed at the linguistic targets. However, while they aimed at measuring participants' attention to the target forms, the current study did not measure attention, focusing instead on assessing learners' increase of accuracy of the target forms in tests of implicit and explicit knowledge. Nevertheless, in spite of the methodological differences between previous studies and the current one, the benefit of using explicit instruction in addition to textual enhancement is underscored.

Giving learners processing instruction prior to exposure to enhanced input in the main study was more effective than giving them only textual enhancement. These results converge with those obtained by Russell (2012), where participants receiving metalinguistic instruction or processing instruction were able to explain the target rules significantly better than those in the textual enhancement only group. The findings in the main study indicate that rule explanation and processing instruction can be beneficial for the acquisition of target forms. However, an important caveat to consider is that participants in the metalinguistic instruction group and in the processing instruction group also received substantial implicit exposure to the target forms during the training sessions. Reading the story at the beginning of every training session and completing the follow up tasks implied that participants in all groups received exposure to implicit instruction. Thus, based on these findings, it is not possible to determine whether providing explicit instruction is more effective than providing implicit training. Instead, these findings suggest that explicit instruction can be beneficial when it is used in combination with implicit training provided over several sessions.

As such, the current findings are in line with theoretical accounts in SLA that attention is beneficial in order for the learning of a target form to occur (Schmidt, 1990; Tomlin & Villa, 1994). The findings in the main study can potentially shed some light with regard to the issue of whether awareness is required in order for intake or learning of an L2 to occur. Not everyone who advocates that awareness is necessary agrees on the level that is needed.

As mentioned previously, there are different levels of awareness. The most basic type is awareness at the level of detection which only requires peripheral perception from the learner, but it does not require the learner to either become aware of the experience when the stimuli is present nor is she required to understand the stimuli. A higher type of awareness occurs at the level of noticing which entails focal attention but no analysis or metalinguistic understanding. A further type is awareness at the level of understanding which involves the ability to analyse the stimuli and to verbalize form-meaning functions.

The design of the current study does not allow to confirm the statement made by Tomlin and Villa that mere awareness at the level of detection is needed and is sufficient for intake to occur or whether awareness at the level of noticing is necessary as Schmidt had hypothesized. However, the findings indicate that awareness at the level of understanding was not necessary in order for learners to improve their knowledge of the target forms. Nevertheless, it does seem to be beneficial considering that both groups (metalinguistic instruction group and processing instruction group) which were taught the target rules scored higher on the posttests than the group that did not show any understanding of the target rules (the textual enhancement group). In addition, these findings seem to offer support to Schmidt's noticing hypothesis, and his statement that the goal in any L2 instructional setting is to help learners increase their noticing of the forms in the target language. It makes sense then, to assume that the more explicit the type of instruction, the more likely it will be for learners not only to become aware of the target forms at the level of noticing, but also to understand the form-meaning connections from the stimuli. Moreover, the findings in the current study suggest that in order for learners to understand the function and meaning of some linguistic targets, explicit instruction can be helpful if it is provided in addition to some type of implicit training such as the completion of a pedagogical task.

There is another possible explanation for the effectiveness of explicit instruction in boosting the scores on the MKT compared to the lack of effectiveness of simply providing learners with implicit exposure. As Szudarski and Carter (2016) explain, participants receiving exposure to a textual enhancement treatment may be able to notice the target forms, but a more explicit type of treatment might be necessary in order for learners to process them semantically. Nonetheless, semantic processing does not always occur. As Izumi (2013, pp. 26-27) explained, "one may notice only form without necessarily connecting it with meaning or function." When this lack of semantic processing happens, learners may acquire perceptual characteristics from the input such as an inflection without being able to understand when and how to use them.

The superior results due to the explicit instruction that was provided in combination with implicit training also goes in accordance with the theory in cognitive psychology. Researchers such as Reber et al. (1980) had long estimated that when learners are not provided with any cues about the target to be learned, explicit instruction promotes better results than no instruction. This statement was not limited to language learning but could be extended to the learning of any domain which required the acquisition of patterns, conceptual knowledge or regularities.

4.9.2 Long Term Effects of Implicit or Explicit Instruction

Research question 2 sought to find if implicit or explicit instruction would result in any delayed sustained knowledge. Additionally, the aim of this question was to know if the effects of each treatment were equally long-lasting. The hypothesis for this question predicted that it was plausible for the groups that had had a learning effect on an immediate posttest to show sustained acquired knowledge in the delayed posttest. Conversely, it was expected that the groups that had not improved on the immediate posttest would not have any sustained learning on the delayed test. The FIB results partially confirm this hypothesis in that all the groups that had had a learning effect on the delayed posttest, had a learning effect on the immediate posttest as well.

Nevertheless, the hypothesis is only partially confirmed in that the metalinguistic instruction group had a learning effect on the immediate posttest, but there was a significant decrease of knowledge on the delayed posttest. Similarly, the TGJT results partially confirmed the hypothesis in that the explicit instruction groups gained knowledge on the immediate posttest, and it was sustained on the delayed posttest. However, contrary to the hypothesis, implicit instruction had an immediate effect, but it did not result in any delayed knowledge. Finally, the MKT results partially corroborate the hypothesis since the textual enhancement group did not have an immediate learning effect on the MKT, and thus it did not have a delayed learning effect either. However, the results of the MKT go counter the hypothesis in that neither one of the two types of explicit instruction enabled learners to sustain any long-term metalinguistic knowledge of the target forms which they had already acquired on the immediate posttest.

Overall, the results on the delayed posttests are consistent with the findings in some of the previous research on textual enhancement, metalinguistic instruction and processing instruction. However, they also differ from the findings in several studies. In the remaining paragraphs of this subsection, a discussion will be presented separately for each training condition: textual enhancement, metalinguistic instruction and processing instruction.

There has been limited empirical work focusing on textual enhancement that has included delayed measures. Thus, it is only possible to compare the sustained implicit knowledge in the current experiment to just a few studies such as the ones conducted by Szudarski and Carter (2016), Jahan and Kormos (2015) and De Santis (2008) who found that textual enhancement had a significant learning effect on a delayed posttest. The findings in these three studies partially converge with those in the current study in that participants in the three treatment conditions of the present study were able to show sustained learning at least on one of the delayed posttests (FIB). They are also similar in that the nature of their target forms is morphological. That is, the target forms in the study by Szudarski and Carter were adjective noun collocations. Jahan and Kormos focused on the use of *will* and *going to*, and De Santis enhanced the *–s* morpheme used for the third person in English. In the current study the focus was on the use of three prepositions in English. The morphological nature of the target forms may play a role in determining whether participants learn them and sustain the acquired knowledge.

However, there are additional variables that may also play a role such as the type of enhancement used, learners' age and proficiency level and the length of the treatment. The current diversity of experimental designs and target constructions of research on textual enhancement does not allow a systematic comparison. Therefore, results across studies do not give a conclusive picture.

In the current study the group receiving metalinguistic instruction in addition to textual enhancement showed an increase of scores on a measure of implicit knowledge and on two measures of explicit knowledge. Moreover the learning was sustained on the TGJT and on the FIB test two weeks after the treatment had ended. These results are similar to those found by Akakura (2012) where metalinguistic rule explanation enabled participants to significantly improve on tests measuring implicit and explicit knowledge. In addition, participants in Akakura also sustained their learning effects on a delayed posttest delivered six weeks after their treatment had ended.

An interesting finding in the present study is that participants in the metalinguistic instruction group lost significant metalinguistic knowledge of the target forms two weeks after the treatment had ended. There was a low effect size in the decrease in accuracy on the TGJT indicating that 15% of the decrease was due to the attrition of metalinguistic knowledge. However, participants were still able to make grammaticality judgements under time pressure significantly better than they had done on the pretest. This suggests that the explanation of the target rules helped participants to become aware of the correct use of the target forms initially, and thanks to their metalinguistic knowledge, participants were able to perform better on the tasks during the training sessions and on the immediate tests that measured both implicit and explicit knowledge. It is also plausible that because participants received explicit instruction of the target items at the beginning of each training session, this may have triggered them to focus more on the enhanced forms. That is, it was not only the explicit instruction that was effective, but also giving participants exposure to enhanced input may have helped them to make the necessary form-meaning connections. This finding points to the strong interface position (DeKeyser, 1997; DeKeyser, 2008) which explains that after explicit declarative knowledge is used to practice a target form, it can promote implicit procedural knowledge.

The delayed effects of processing instruction show that there was no attrition from the TGJT and FIB immediate posttest to the delayed posttest. The weak effect sizes confirm this. Nevertheless, there was attrition on the delayed MKT, but the effect size was weak suggesting that in the case of the prepositions *in* and *on* only 25% of the decrease in scores can be accounted by the treatment, and in the case of the preposition *by* 20% of the decrease was caused due to the treatment. This finding resembles those on delayed tests of the metalinguistic instruction group. The rule explanation and the structured input activities given to the processing instruction group at the beginning of every training session seem to have enabled learners to gain metalinguistic knowledge of the target forms which helped them to increase their implicit and explicit knowledge during the training sessions and on the immediate posttest, but two weeks after their training ended, they were not as accurate at verbalizing the target rules. The fact that the learners in the processing instruction group sustained their explicit and implicit knowledge, as shown on the delayed TGJT and on the delayed FIB test, suggests that it was possible for this group to proceduralize some of their declarative metalinguistic knowledge of the target forms while sustaining some of their explicit knowledge. That is, processing instruction plus the exposure to textual enhancement led to both delayed implicit and explicit knowledge although participants had no metalinguistic knowledge of the target forms by the end of the experiment. The finding in the current study showing that the three treatment groups had a learning effect on the FIB test, and that the learning effect was sustained on the delayed posttest is similar to the findings in Russell's (2012) work, which revealed that textual enhancement, metalinguistic rule explanation and processing instruction can result in sustained knowledge of the target forms. In his study, participants receiving either explicit instruction or processing instruction became better at interpreting the subjunctive in Spanish on an immediate posttest, and their scores were sustained on a delayed posttest. Russell additionally found textual enhancement to be beneficial on the immediate and delayed posttest as well.

In sum, processing instruction prior to textual enhancement was the treatment promoting more long term explicit and implicit knowledge as the increase of scores in the immediate posttest was sustained in the delayed posttest. Metalinguistic instruction prior to textual enhancement was only effective in promoting sustained explicit knowledge, but not implicit knowledge. Textual enhancement was the least effective in leading to sustained knowledge as it was the one showing more knowledge decay from the immediate posttest to the delayed posttest.

4.9.3 Effects of Different Training Conditions on the Type of Knowledge Acquired

This section will focus on how each treatment condition in the current study was more or less likely to result in explicit or implicit knowledge. The hypothesis for this research question predicted that participants receiving an intervention which contained some form of explicit instruction would gain explicit knowledge of the target forms, and they could potentially also gain implicit knowledge because they had received implicit training throughout the pedagogical sessions. It additionally projected that learners receiving an implicit treatment would improve their implicit knowledge of the target forms, but perhaps they would not gain explicit knowledge.

The learning effect from pre to posttest shown by the two explicit groups confirms the hypothesis, and it converges with previous research (see R. Ellis, 2015) showing that explicit instruction can lead to the increase of explicit knowledge. However, an unexpected finding, which goes counter to the hypothesis, is the increase of accuracy of the textual enhancement group on the FIB posttest measuring primarily explicit knowledge. Because this implicit group (receiving only textual enhancement) and the two explicit groups showed a learning effect on the FIB posttest, this can be taken as evidence that it is plausible for implicit instruction to promote explicit knowledge.

The inverse logic applies to measures of implicit knowledge. That is, the results showed that the implicit group (receiving textual enhancement) and the two explicit groups had a learning effect on the TGJT which measures primarily implicit knowledge. That the implicit group had significant gains on this test goes in accordance with previous research of implicit learning (R. Ellis, 2015) and confirms the hypothesis to this research question. The hypothesis was also confirmed by results showing that the explicit groups also improved significantly on this measure of implicit knowledge (TGJT). However, this may have been due to the fact that explicit groups also received implicit training. In order to test if explicit instruction results in some implicit knowledge, it would be necessary to test a pedagogical treatment consisting of no implicit training.

The results of the MKT indicate that the hypothesis was confirmed as only the two groups that had received exposure to an explicit type of training had a learning effect on this test which measures explicit knowledge. In the same vein, the group receiving implicit training (textual enhancement only) did not have a learning effect on the MKT, which also confirms the hypothesis. The literature has shown that providing a combined treatment composed of both implicit and explicit instruction can promote implicit knowledge. For instance, based on his results of an artificial language study, DeKeyser (1997) suggested that teaching a rule explicitly and providing learners with a brief period of focused practice where they can use their explicit knowledge followed by a long period that allows learners to use that explicit knowledge repeatedly can result in automatized knowledge. DeKeyser did not state a precise number of instances of exposure to a target form in order for it to become automatized, but he did emphasize that long and repeated practice was needed. In addition, Hulstijn (2015) suggested that it is feasible for an implicit representation to emerge after learners receive repeated exposure to a linguistic target combined with a declarative understanding of its form-meaning function. Similarly, Hulstijn (2002) emphasized that even when learners deliberately focus on a grammar rule and acquire explicit knowledge of a linguistic target, they may also simultaneously gain implicit knowledge of it.

There is empirical evidence from implicit learning studies attesting that it is possible for explicit instruction to promote implicit knowledge. For example, Hamrick and Rebuschat's (2012) study accords with previous research (see Rebuschat, 2008; Rebuschat & Williams, 2009) and serves as additional evidence that it is plausible for learners who are instructed to focus on a linguistic form to acquire both explicit knowledge and some additional unconscious knowledge simultaneously. However, it is important to emphasize that the aforementioned studies showing the plausibility of explicit instruction leading to implicit knowledge have used artificial languages. In contrast, the findings in the current study are based on the learning of a natural language. Therefore, this study contributes to the literature in SLA by confirming that the impact of explicit instruction on implicit knowledge may also be found when teaching at least some forms of a natural language.

The implicit training in the current study resulted in both types of knowledge. The fact that the learners in the textual enhancement group were able to improve their scores across time on the TGJT and the FIB but not in the MKT suggests that metalinguistic knowledge may not be essential in order for learners to improve their accuracy on restricted response tasks. Previous research such as an experiment conducted by Doughty (1991) has shown that providing metalinguistic rule explanation combined with meaning oriented tasks did not boost the learning of relative clauses in comparison to a group that did not receive a metalinguistic rule explanation. Similarly, Sanz and Morgan-Short (2004) found that explicit presentation of the target rules did not make a difference in the learning of target forms. Instead, what made a difference was having learners focus their attention on the target forms while completing structured input activities.

Textual enhancement was effective in promoting an increase in accuracy of the preposition *by* in the TGJT and the FIB from pre to posttest. However, the effect size of the increase in the TGJT was moderate, so any interpretation suggesting that textual enhancement caused a delayed increase of implicit knowledge must be taken with caution. The effect size of the increase of the preposition *by* in the FIB test was moderate, suggesting that 33% of this increase can be explained by the exposure to the enhanced texts during the training sessions. The groups receiving metalinguistic instruction and processing instruction both improved their scores in all tests from the pretest to the delayed posttest. However, their effect sizes were moderate, so the increase in improvement from the pretest to the posttest should be interpreted with caution. Perhaps other additional factors play a role when measuring improvement effects over a two-week period.

The overall response to research question 3a is that as shown in the TGJT and FIB results, the implicit treatment and the two explicit treatments allowed the acquisition of both explicit and implicit knowledge. However, the explicit treatments promoted metalinguistic knowledge while the implicit treatment did not. When it comes to metalinguistic knowledge, it seems that explicit instruction may be needed in order for learners to be able to express the target rules. This outcome of the current study accords with a theoretical explanation provided by Roehr (2008, p. 71) in which she hypothesized that explanations given to learners about grammar rules have the advantage of being more precise than the type of inductive knowledge that learners acquire when they discover a grammar rule by themselves. Also, according to Shintani et al. (2016), metalinguistic explanation tends to promote explicit knowledge. This may help explain why in the present study metalinguistic knowledge was only acquired through explicit instruction.

Nonetheless, as is shown in the above examples, although metalinguistic knowledge can be beneficial to SLA, it is not always needed in order for learners to perform tasks successfully. For example, learners receiving textual enhancement without any form of explicit instruction were able to improve their accuracy of the use of the preposition *by* even though they did not receive any metalinguistic explanation. There are also instances when learners may not be able to improve their performance in spite of having metalinguistic instruction. It is still a major goal in SLA to find the characteristics of target forms that are adequate for implicit instruction to promote noticing, intake and learning, and to discover the nature of the linguistic targets that are not suitable for such training and thus require some type of explicit instruction. The following subsection explains how each of the target forms in the current study was more or less appropriate for implicit and explicit instruction.

4.9.4 Differential Effects of Type of Training Condition of Forms *in*, *on* and *by*

This section discusses the research questions focusing on whether the target forms are equally likely to be learned through implicit or explicit training. The hypothesis for this research question predicted that the effect of implicit instruction operationalized as textual enhancement would be different for each target form. This hypothesis was confirmed by the findings in the present study revealing that implicit instruction was not equally effective in the learning of both target rules.

The results show that implicit instruction was not effective in promoting learning of the rule governing the use of prepositions *in* or *on* as the control group did not learn through mere exposure to the target forms and neither did the group receiving textual enhancement. On the other hand, the results also show that explicit instruction was effective in promoting the learning of the rule for prepositions *in* or *on* of both explicit groups (metalinguistic instruction group and processing instruction group) from pre to posttest on the TGJT, FIB and MKT.

Implicit and explicit instruction had a positive effect on the learning of the rule for preposition *by*. That is, except for the control, all groups had a learning effect on the TGJT and the FIB. These results also suggest that although the FIB test is mostly explicit, it does not require participants to verbalize any metalinguistic rules, and thus, an implicit training condition such as textual enhancement can potentially be beneficial for boosting the scores in this type of assessment measure depending, among other factors, on the target form. However, only explicit instruction resulted in a learning effect in the MKT thus suggesting that learners are not likely to implicitly discover the rule of some target forms to the extent of verbalization.

The results in this study are similar to those found by Shook (1994) and by Leung and Williams (2012) in that learners in the current experiment receiving an implicit treatment (textual enhancement) were able to gain both implicit and explicit knowledge of one of the target rules, but they did not gain knowledge of both rules. Specifically, they learned the rule governing the use of *by*, but they did not gain implicit or explicit knowledge of the rule governing the use of *in* or *on*. One possible explanation could be that the meaning conveyed by the use of *by* seems to be more salient than the meaning conveyed by the use of *in* or *on*. That is, due to the enhancement, learners may have been able to allocate attention to the target forms, and this may have allowed them to unconsciously infer the entrenched meaning distinction between the form *by* and the prepositions *in* or *on*, but, still they may not have been able to distinguish the semantic distinction between *in* and *on* in the context of forms of transportation because of its abstract nature. After all, there are no semantic cues in the input that express the distinction of whether the form of transportation is small and private or large and public.

Also, in the context of forms of transportation the semantic distinction between *by* and *in* or *on* exists in Spanish as well whereas the distinction between the two prepositions *in* and *on* does not. This may have also contributed to the results as participants probably had concept availability of the distinction between *by* and prepositions *in*/*on* because they use this concept in their L1, but they probably did not have concept availability of the distinction between *in* and *on* because this distinction does not exist in participants' L1. As DeKeyser and Prieto-Botana (2015, p. 290) explain, "students' L1 processing routines sometimes seem to prevent them from paying enough attention to the morphosyntactic elements of the input". These findings resemble those reported in the experiments conducted by Shook (1994) and Leung and Williams (2012). In the work by Shook, Spanish L2 learners receiving textual enhancement had more intake of the present perfect than of the use of relative pronouns. Similarly, in the study by Leung and Williams (2012), participants were able to pick up the form-meaning connection of animacy, but they could not detect the form-meaning connection of relative size. In both studies the interpretation was that in order for learners to pick up some forms, focused attention to morphosyntactic cues in the input seems to be required whereas for the acquisition of other target forms that have a more obvious form-meaning function, simply focusing on meaning appears to be sufficient. For instance, some concepts such as animacy can be detected more easily than other concepts such as relative size. Thus, both experiments concluded that not all forms are equally suitable for implicit instruction, and the findings in the current study seem to show support for this statement.

Another plausible explanation for implicit instruction resulting in learners' improvement of the preposition *by* but not of the prepositions *in* and *on* seems to be related to the concept of subjective difficulty. Subjective difficulty is defined by DeKeyser (2016, p. 356) as "the degree of difficulty experienced, for a given structure in a given context, by different learners". In the current study it appears that discovering the form-meaning mapping of the prepositions *in* and *on* and understanding the subtle semantic distinction between these two forms may have imposed a higher subjective difficulty for learners in contrast to noticing and understanding the form-meaning mapping of the preposition *by*.

In addition, in the case of the current study participants' ability to improve their production of the preposition *by* both in the training sessions and their receptive knowledge on the posttests goes in accordance with VanPatten's (2005) claim that the communicative value of a target form is an important factor that may determine whether or not there is intake. That is, the underlying rule of usage for preposition *by* collocated with forms of transportation seems to have a more apparent referential meaning than the rule of usage for prepositions *in* or *on* collocated with forms of transportation. VanPatten (2005, p. 270) defined referential meaning as the extent to which a form is "related to some semantic concept in the real world". In order for learners to understand the referential meaning conveyed by the preposition *by* (that the speaker is referring to a form of transportation in general), learners can rely on their L1 which has a similar form that is used for the same purpose. However, there are no cues that provide learners with hints to help them understand the referential meaning that underlies the distinction between prepositions *in* or *on*.

The findings in the current study then suggest that some forms can be learned implicitly, but others cannot. These findings also confirm the hypothesis proposed by Morgan-Short et al. (2010) that implicit and explicit instruction could potentially have different effects depending on the target form. As Hernández (2011) stated, in order for learners to notice and acquire certain target forms that are not salient, explicit instruction and metalinguistic awareness are needed.

4.9.5 Participants' Output during the Training Sessions

Research question 3c focuses on how participants' production of each target form developed over the course of the three training sessions completed within a three-week period. The hypothesis to this research question predicted that participants receiving an explicit training would be more likely to increase their output accuracy in comparison to the participants receiving implicit instruction. It also predicted that an explicit intervention would make participants increase their production accuracy of the target forms sooner than implicit instruction. Overall, the analysis of participants' output produced during the training sessions partially confirmed this hypothesis, revealing that the explicit treatments (metalinguistic instruction and processing instruction) promoted the accurate production of the forms *in* and *on*, but the implicit treatment (textual enhancement) did not. In contrast, the accurate production of *by* was boosted both through explicit and implicit treatments. These patterns shown during the training sessions are similar to the participants' learning trend from pre to posttest in the current study where only the explicit treatments enabled participants to learn the distinction between *in* and *on*, but both the explicit and implicit treatments facilitated learning of the use of *by*. These findings from the training sessions also provide further support to Leung and Williams' (2012) claim that not all forms are equally adequate for either implicit or explicit instruction. I will illustrate this in the following paragraphs by analysing the progress made by each of the groups separately throughout the sessions.

The control group's failure to improve its accuracy in the use of either one of the target forms throughout the training sessions suggests that providing participants with exposure to the target forms without any form of enhancement or without any metalinguistic rule presentation does not promote learning. This finding can be also seen in previous studies such as those conducted by White (1998) and Szudarski and Carter (2016) where exposure in the form of input flood was not effective. The following are some excerpts from a participant in the control group showing the learner's trajectory from session one to session three.

Excerpt from session one:

> Hi! I was checking the prices for the transportation and i decided go in the afternoon bus from London to Manchester, the next day im go in to the morning train to Liverpool, in the night im gonna go in the night plane to Belfast, then from there im gonna take the morning plane to Edinburgh and the last day im rent a small car to return to London.
>
> Thanks a lot for your time!

In this excerpt above, this participant produced the target forms twice, and in both instances the preposition was incorrect. The participant typed "in the morning train" and also "in the night plane". In both instances, the participant should have written the preposition *on*. This excerpt suggests that the participant did not know how to use the target forms *in* or *on* at the beginning of the training sessions. The following excerpt shows a piece of text written by the same participant during training session two.

Excerpt from session two:

> Hi, how are you? I how you are fine.
>
> I know you want to do a travel from Mexico. Im gonna tell you some recomentations. I think the best form of transportation is a bus because its cheap and safe. But also be careful with you things cause yo can lose it. Use bus from centro historico to Xochimilco.

As shown by the excerpt above, the participant did not produce any of the target forms. Rather than using phrases such as "you should travel on a bus or you should travel by bus", the participant typed "the best form of transport is a bus". There was no evidence at this stage that this participant was able to use the target prepositions accurately. The following excerpt shows a section of a text typed by the same participant.

Excerpt from session three:

> Hi Emily, how are you? i hope fine. I have many things to tell you.
>
> Im go to travel to México! First im go to Guanajuato to see the mommies, then im go to Guadalajara. The next day im go to Monterrey and from there im come back to Hermosillo. I am exciting to tell you all about it. Good bye

Once more, in session three this participant did not produce any of the target forms. It seems that reading the stories with the target forms did not help this participant to implicitly learn how to use them. That is, there is no evidence that this participant's writing was influenced by the implicit exposure to the target forms in the stories.

The textual enhancement group's lack of significant improvement of the use of *in* and *on* throughout the training sessions suggests that textual enhancement may not have enabled participants to increase their attention towards the target forms. Nevertheless, one question arises from these results as to why the textual enhancement group produced the target form *in* and *on* above chance in training session one, in spite of previously scoring below chance on the pretest items targeting the prepositions *in* or *on*. One possible explanation is that the textual enhancement provided during the reading of the stories in sessions one, two and three may have made the target forms *in* and *on* more salient, and as a result participants may have been able to use the forms more accurately during the production tasks. In addition, the increase in accuracy of *in* and *on* during the training sessions seems to have been stabilized suggesting that learners were only able to improve so much until they reached a point where there was no more improvement. As two meta-analyses have shown (see Goo et al., 2015; Spada & Tomita, 2010), implicit treatments such as textual enhancement usually have a smaller effect size on learning than explicit treatments. Thus, it is likely that participants receiving the textual enhancement treatment may have needed additional sessions in order for them to further increase their accuracy.

In the case of the preposition *by*, the increase in accuracy emerging until training session three suggests that the textual enhancement had an effect, but it was delayed. That is, participants had to receive exposure to the enhanced forms during the receptive and productive tasks throughout sessions one, two and three, and only after the third session, did they show any improvement in the accuracy of their production. Again, this finding concords with previous literature (e.g. Szudarski & Carter, 2016) that has shown that in those cases when textual enhancement is effective, learners require extensive exposure to the target forms throughout several training sessions. The following excerpts were taken from a participant in the textual enhancement group.

Excerpt from session one:

> Hello, my Name is Carlos and I´m sending this e-mail to explain you the forms of transportation that I will use while I'm in England. First I´ll stay two days in London and then I will use the midnight bus to get to Manchester and I'll stay two days there too. After those days I will

take the evening train to Liverpool and two days later I will take the night plane to Belfast. I´ll be one day there and then I'll take the night plane to Edinburgh from Belfast. Finally, I will take the night plane to London and stay one more day. The total cost would be £114 so the money won´t be a problem. I hope everything was well explained so I wouldn´t have any problem during the trip. Thank you very much for your attention.

In the excerpt above, the participant did not use any of the target forms. Thus, after receiving exposure to textual enhancement of the target prepositions in the story during the first training session, this participant does not show any evidence that she has learned how to use the target forms. However, not producing the target forms does not necessarily mean that the participant does not know how to use them accurately. This only suggests that she was not influenced by the exposure to the enhanced forms during the first training session. The following is an excerpt of the output produced by this same participant during session two.

Excerpt from session two:

Hello, I heard that you are going to travel to Mexico so I wanted to give you some advices of the ways to travel to go from Centro Historico to Xochimilco I´d recommend you to travel by subway, it is cheap but also is a little bit dangerous so if you don´t want to go by subway try going by bus. when you want to go to the pyramids you should go by bus. after what you can go to Castillo de Chapultepec by bus because both places are near of each other. to go from Mexico City to Hermosillo you should go by plane because if you go by bus is a really long trip so the plane is faster. after you get to Hermosillo you should rent a car to go to Kino bay to visit the beach and when you arrive there visit Isla Tiburon, you can get there by boat.

You will spend less than 4000 pesos so it will be a cheap vacation.

The participant produced the target form *by* collocated with forms of transportation eight times, and each of these instances was accurate as seen in the excerpt above. However, she did not produce the target prepositions *in* or *on*. As mentioned previously, the avoidance of a target form does not mean that the participant did not know how to use them accurately, but this suggests that the participant did know how to use the target form *by* during training session two. The following excerpt shows a piece of output written by the same participant during training session three.

Excerpt from session three:

This are my plans for travel across mexico. You can change some things from this plans if you don't like something. I think we should first go to Guanajuato from hermosillo by plane. Then after three days we should go to Moterrey in a bus because is not far away. In Monterey we can stay three days and visit the city center. Then we can goto Guadalajara in a train. I think it is a good way to see the country. Then

> for the end we can to visit Cancun in a bus. We can stay in cancun for five days and then we should go back to hermosillo on plane because the travel is very long to do in a bus.

In the excerpt shown above, the participant produced the target form *by* collocated with forms of transportation once, and she produced it accurately. In addition, the participant produced the target form *in* four times and the target form *on* once. However, the four instances in which the preposition *in* was produced were incorrect. Similarly, the use of the phrase *on plane* was incorrect as it was missing the article *the*. The participant may have been trying to express the phrase *by plane* as in Spanish in order to refer to a non-specific form of transportation. The article is omitted such as in the phrase "en avión*"*. The participant's output suggests that by the third training session she was able to use the preposition *by* accurately, but she still could not produce the target forms *in* or *on* accurately.

The learning pattern shown by the metalinguistic instruction group throughout the training sessions also accords with the literature on implicit and explicit instruction. More specifically, the fact that the metalinguistic instruction group scored above chance on training session one suggests that the initial enhancement provided during the first training session along with the metalinguistic rule explanation helped participants to become accurate on their production of the target form. Moreover, the significant improvement from training session two to session three suggests that the metalinguistic rule explanation in addition to the enhancement was effective. Previous textual enhancement studies (see Indrarathne & Kormos, 2016) have shown that providing a metalinguistic rule explanation helps learners to make the form-meaning connections that are needed in order to know when and how to produce a linguistic target more accurately. In the current study, the metalinguistic rule explanation provided at the beginning of each training session may have also helped learners to become more accurate in their production of the target forms. Some studies (see VanPatten & Borst, 2012; White & DeMil, 2013), have only provided learners with one single explanation of the target form. However, as shown in the current study, it may be recommendable to present the metalinguistic rule explanation to learners several times before it becomes part of their interlanguage.

By session three, the metalinguistic instruction group was more accurate than the textual enhancement group. This trend showing more learning due to the metalinguistic rule explanation corresponds to the existing literature which has consistently found that explicit instruction helps learners to notice the target forms and to become aware of their use at the level of understanding (see Norris & Ortega, 2000; Spada & Tomita, 2010). The following excerpts were taken from the output produced by a participant that belonged to the metalinguistic instruction group. Each excerpt corresponds to one of the training sessions.

Excerpt from session one

> How are you? I hope you are OK. I'm very good. I plan to travel around some cities in the UK, and I will tell you about the transportation I would like to use. I'd like to go to manchester on the midnight plane,

> then I'd like to go to liverpool by bus because it is not far from Liverpool. Then from liverpool I'd like to go to Belfast on the morning ship. After that there I'd like to go to Edinburgh by plane. It can be on then night plane or the morning plane it doesn't matter. Finally to return to London I'd like to travel on a motorcycle. i want to know what you think about the plans. Please tell me if this sound like a good plan.

The excerpt above demonstrates how this participant was able to produce the target preposition *on* four times, and all the instances were accurate. This participant also produced the preposition *by* twice, and produced them accurately. At this stage the participant did not produce the preposition *in*. The participant's output during session one suggests that the explicit instruction provided at the beginning of the training session was beneficial. The following excerpt shows the output produced by the same participant during training session two.

Excerpt from Training Session Two:

> You will start in the Centro Historico in Mexico city and you will go on a bus to Xochimilco and be careful with you suitcases because its very common to lose it in a trip. When you arrive you can eat something and on Mexico city rent a car to go to the Pyramids in Teotihuacan to appreciate this nice place, when you finish you will go in an taxi from Zocalo to Castillo de Chapultepec but you have to rest before to go because you will walk a lot. Then before you go to Hermosillo you have

> to go to the plane station because you can't go in a car or on a bus to go Hermosillo, so you will take another taxi to go to the airport and you will take a airplane. When you are at Hermosillo you will rent a car to go to Kino Bay in few minutes and you can buy some protector solar if you want to care your skin and some potato chips to enjoy the beach. After you was here you will use a bot to travel to Isla del Tiburon so you can see a lot of things in these view.

The excerpt above shows that the participant produced both target prepositions *in* and *on* twice. In this second training session, each occurrence of these prepositions was accurate, but the participant did not produce the preposition *by*. Therefore, this excerpt provides additional evidence suggesting that this participant benefited from the metalinguistic rule explanation at the beginning of the training session. The following excerpt was taken from the same participant's output on training session three.

Excerpt from training session three:

> These are my plans for our travel around Mexico. i hope you like my plans. First we can travel to Guadalajara on a bus. We can stay there for three days. There are many things in Guadalajara. Then we can go in a rented car to Guanajuato. Then we can travel from Guanajuato to Monterrey by train. In Monterrey we can stay for two days and then we can take a plane to Cancun. In Cancun we should stay two day to, then we can return to Hermosillo on an airplane. If we travel by airplane it will take us only 4 hours. What do you think. I hope you like my plans.

The excerpt above shows that the participant produced the target preposition *in* once, and also produced the target prepositions *on* and *by* twice each. She was accurate every time that she produced each of these target forms. Again, this excerpt adds evidence in favour of providing a metalinguistic rule explanation at the beginning of each training session.

Considering that the pretest scores of the metalinguistic instruction group were below chance, it seems reasonable to infer that the above-chance accuracy of production of the three target forms in the first training session could be due to the explanation of the target rule given to this group at the beginning of each training session. That is, the only difference between the enhancement group and the metalinguistic instruction group was that the former received no explanation of the target rule whereas the latter did. Hence, any difference in scores between these two groups should be due to the explanation of the linguistic targets or lack thereof.

The findings showing more effectiveness due to metalinguistic rule explanation than due to implicit exposure to target forms can be explained in Schmidt's noticing hypothesis. According to Schmidt (2001), in order for learners to be able to use a target form in communication, they need to notice not just the form, but also how the form produces meaning, and how it is used in context. Schmidt emphasized that learners need to notice the form-meaning mapping conveyed by the linguistic targets. Based on the findings in the current study, it is plausible that participants who received exposure only to textual enhancement noticed the linguistic targets, but did not notice their form-meaning function. The evidence supporting this is that participants in the textual enhancement group were not able to express the target rules in the metalinguistic knowledge test. In contrast, the higher accuracy produced by the metalinguistic instruction group suggests that providing learners with a metalinguistic explanation can enable them to notice the form-meaning function, and use this knowledge in communicative tasks.

The processing instruction group scored below chance in the TGJT, FIB and MKT pretest yet in the first training session they produced the three target forms at above chance accuracy in session one (73% accuracy for the use of *in*, 78% for the use of *on* and 83% for the use *by*). This suggests that the explanation of the target rules and the structured input activities had a significant impact on participants' production accuracy. In order to provide additional support for this, I compared the production accuracy in session one of both the textual enhancement group and the processing instruction group. The processing instruction group's production accuracy of the three target forms was significantly higher than the accuracy of the textual enhancement group of the three forms in session one. This illustrates that the processing instruction group began producing the target forms more accurately during the training than the textual enhancement group although there were no significant differences between the two groups in the pretest.

The following excerpts show the output produced by a participant from the processing instruction group during the three training sessions, which illustrate this participant's production accuracy of each target form. I will first present an excerpt from training session one.

Excerpt from training session one:

> Hi, during my trip in the UK I want to travel to five cities, first I want to get to London. Then from London to Manchester I prefer to use a car, but a small one. After staying a couple of days in Manchester I will take the morning train to Liverpool. Because of the distance to Belfast I prefer to travel by plane, if I could take the morning plane it will be better. After Belfast, I want to know Edinburgh but this time it will be better to travel on the night plane. To finish my trip I want to return to London by plane, but I'm sure I will be tired so it's better to travel on the night plane.

As shown by the excerpt above, the participant was already accurately producing the prepositions *on* and *by* collocated with forms of transportation. However, there is no evidence that this participant was also accurate in her use of the preposition *in*.

Excerpt from training session two:

> There are many places to visit in Mexico. I will suggest you in this email the different ways to travel that are better and cheaper for you to move to the places that you want to visit. In Mexico City you can go from Centro historico to Xochimilco by subway because it is the cheapest and fastest transportation in Mexico City. The same logic applies for the

transfer of the Zocalo to Castillo de Chapultepec. Travelling by subway will be a good idea.

If you want to go from Mexico City to the Pyramids in Teotihuacan you should get on a bus, because the distance is relatively short and it's cheaper. To travel from Mexico City to Hermosillo you get on a plane. This is faster and less tired than get on a bus.

Then, I think that getting in a taxi it is the best idea to move from Hermosillo to Kino Bay, although it is not the cheapest way to travel, it is a bit safer than traveling by bus.

From Kino Bay to Isla del Tiburon there are not many ways to travel and travel by boat is the only way to get there. Bring your camera because you will take a lot of pictures. I hope you have a very pleasant experience in Mexico, please remember to relax and enjoy your stay.

The excerpt from session two shows that the participant was still producing the prepositions *in* and *on* accurately, and she was also using the preposition *by* correctly. Although the preposition *in* was only used once in the collocation *in the taxi*, it was used accurately. This suggests that the learner was processing the target forms as she was trained by the structured input activities.

Excerpt from training session three:

this is the itinerary of the summer vacations we need travel to cancun on the first days of july by airplane for $5000 and then we travel to to

Guadalajara on airplane for $3000 and after to Guanajuato and back to Guadalajara on airplane of the Friday evening, the return for the vacations weekend is on airplane of morning of Sunday Guadalajara to Hermosillo

The excerpt corresponding to session three shows that the participant stopped using the preposition *in* collocated with forms of transportation. In addition, she used the preposition *on* incorrectly three times in the phrase *on airplane*. Nevertheless, she still used the preposition *by* correctly.

Overall, the findings from participants' training sessions converge with the results obtained by Lyddon (2011) who found that textual enhancement operationalized as the highlighting of prepositions in French did not increase participants' accurate production of the target forms. One possible reason for the lack of accuracy improvement according to Lyddon is that the perceptual salience of the target forms may not have increased due to the textual enhancement. As Sharwood Smith (1991) explained, textual enhancement does not guarantee that the target forms will be perceived by learners. Tanaka (2011) reported similar results. She found no facilitating effect due to textual enhancement as a single treatment or in combination with explicit instruction. These results also go in accordance with those found by Indrarathne and Kormos (2016) and by Ziegler et al. (2017) who found no learning due to input flood or textual enhancement.

The lack of a learning effect due to mere exposure to the target forms in the experiment by Ziegler et al. and in the current study may be due to the fact that both used target forms that convey very abstract concepts, which are not accessible in the context of the readings. For example, in the work by Ziegler et al. (2017), participants were expected to discover through exposure to the enhanced forms when articles *a* or *an* were needed, when article *the* was required or when no article was compulsory. By receiving exposure to the colorized forms, participants did not gain implicit or explicit knowledge of them because the textual enhancement did not seem to push learners to think about the semantic differences between the target forms as was explained by Ziegler et al. (2017). In the current study, the same might have occurred with participants who received exposure to textual enhancement only. The enhancement in the current study does not appear to have triggered participants to think about the different conceptualizations that are implied by using *in*, *on* or *by*, and the context did not provide these cues either.

The findings from participants' output suggest that awareness at the level of understanding is required in order for them to produce *in*, *on* and *by* accurately in the context of forms of transportation. Simply becoming aware of the target forms at the level of noticing does not seem to be enough for learners to use the target forms accurately or even to know in which circumstances the target forms need to be used. These findings can also be explained by the literature in cognitive psychology which makes the distinction between two types of awareness: access awareness and phenomenal awareness (Block, 2007). According to Williams (2013, p. 41), "access awareness corresponds to the contents of focal attention and is reportable. Phenomenal awareness extends beyond access awareness, is fleeting, and is not reportable". The results of the current study suggest that access awareness is needed in order for learners to become accurate users of the target forms.

According to Williams (2013), there is evidence that suggests that it is plausible to learn regularities without being consciously aware of what is being learnt. However, when learners are aware of what they are learning it is possible for them to process the target forms more deeply. In the case of the current study, learners who received exposure to processing instruction showed more control of the use of those forms. On the other hand, learners who did not receive any exposure to processing instruction or any metalinguistic instruction exhibited smaller learning effects just as has been claimed by Williams.

In the same vein, Comeaux and McDonald (2017) found that when a target structure is high in complexity, and its understanding requires learners' increased attentional resources, visual input enhancement may not be effective, and other additional teaching interventions may be necessary in order for learners to acquire the target structures. Similarly, the current study showed that input enhancement was not effective in helping learners to understand the complex abstractions needed in order to verbalize the use of the target forms. However, in line with Comeaux and McDonald (2017), an additional pedagogical treatment such as the provision of a metalinguistic rule explanation or processing instruction proved to be effective.

Part of the reason why some type of explicit instruction may be required in order for learners to use certain target forms accurately appears to be related to how learners initially notice a linguistic target partially (see Izumi, 2013). It is this partial and incomplete noticing that is typically labelled as awareness at the level of noticing.

According to Doughty (2001), this initial type of noticing can become more thorough to a point in which learners can notice the gap. In other words, learners may become aware that they do not produce a target form in the same way that native speakers or more proficient speakers do. In the case of the current study, explicit instruction in the form of metalinguistic instruction or processing instruction helped participants to notice the gap.

The meta-analyses conducted by Goo et al. (2015) and by Spada and Tomita (2010) coincide with the results of the present study in that explicit treatments were more effective than the implicit treatments. Spada and Tomita even mentioned that explicit instruction is more beneficial than implicit instruction when it comes to teaching both simple and complex target forms in an L2. Therefore, the findings in the current study suggest that although an implicit treatment such as textual enhancement may enable learners to improve their accuracy of some forms on restricted response tests, such treatment may not boost the accurate production of forms which convey a meaning that is highly abstract and less available from the context. In such cases, explicit instruction in the form of metalinguistic rule explanation or in the form of processing instruction may be needed.

4.9.6 Summary

In terms of effectiveness, explicit instruction was more effective than implicit instruction. Participants in the textual enhancement group improved their general scores on the TGJT and FIB from pre to posttest. However, the participants in the two explicit groups (metalinguistic instruction and processing instruction) improved their general scores on the TGJT and FIB even more than the textual enhancement group. Only the two explicit groups acquired metalinguistic knowledge of the target forms whereas the textual enhancement group and the control group did not.

One of the main objectives was finding the long-term effects of each pedagogical condition. Analysing participants' general scores allowed finding that all groups except for the metalinguistic instruction group sustained their explicit knowledge measured by the FIB test two weeks after the pedagogical training had ended. Interestingly, the two explicit groups sustained their implicit knowledge two weeks after the end of the training as measured on the TGJT, but the group receiving implicit instruction did not. In terms of metalinguistic knowledge, the two explicit groups, which were the only ones that had gains on the MKT posttest, did not sustain their metalinguistic knowledge two weeks after the end of the training.

In addition, the present study found that textual enhancement, an implicit training condition, promoted both implicit and explicit knowledge. It also found that using metalinguistic instruction or processing instruction in combination with textual enhancement, promoted both implicit and explicit knowledge too. Adding an explicit type of instruction to an implicit pedagogical training such as textual enhancement enabled learners to acquire metalinguistic knowledge of the target forms. An important finding is that the target forms were not learned equally through implicit or explicit instruction. Participants were not able to implicitly learn the rule governing the use of *in* vs. *on*, but they were able to do so through explicit instruction. However, participants were able to learn the rule governing the use of *by* vs. *in*/*on* through both implicit and explicit instruction. This shows that the effects of implicit and explicit instruction vary depending on the target forms.

The design implemented in this study allowed analysing participants' production accuracy of the target forms during their performance of pedagogical tasks.

The pattern shown through participants' online data from the training sessions is similar to that presented from pre to posttest. The subjects in the control group did not become more accurate at using of any of the target forms throughout the three training sessions. The textual enhancement group only showed delayed improvement of the use of forms *by* vs. *in*/*on* during the third training session. The metalinguistic instruction group produced both target forms with above chance accuracy during session one, and it improved its accuracy during the following training sessions. Similarly, the processing instruction group also improved its scores during the training sessions although the metalinguistic instruction group performed better.

Section III

Chapter 5: General Discussion

5.1 Similarities and Differences between the Findings in the Pilot and Main Study

Although the pilot study and the main study comprised the same training conditions, there were differences in their findings. In the pilot there were gains of implicit knowledge of the *in* vs. *on* rule for the metalinguistic instruction group and the processing instruction group, but there were no gains of implicit knowledge of the *by* vs. *in/on* rule. In contrast, in the main study there were no gains of implicit knowledge of the rule *in* vs. *on* for the textual enhancement group, but there were gains of the rule *by* vs. *in/on* for all groups except for the control. Another difference between the two studies was that in the pilot only the processing instruction group had gains on the FIB posttest. In contrast, in the main study the textual enhancement group, the metalinguistic instruction group and the processing instruction group had gains in the FIB posttest.

The participants in the pilot study had an initial high score on the TGJT and the FIB specifically for the rule *by* vs. *in/on*. Although the participants in the pilot study had a proficiency level similar to that of the learners in the main experiment, it is possible that the initial high scores may have resulted due to the small number of participants per group. In contrast to the main study, which had a minimum of 30 participants per group, the pilot only had five. This could perhaps explain the differing results between the two experiments.

One similarity shared by both the pilot and the main study is that the metalinguistic instruction group and the processing instruction group had a learning effect on the MKT but the textual enhancement group did not. That is, in both cases it was not possible for learners to implicitly infer the target rules and verbalize them. Instead, in both experiments learners required either a metalinguistic explanation or processing instruction in order to express the target rules. However, these findings should be interpreted with caution as was mentioned in chapter 3 because the textual enhancement group had high initial scores in the TGJT and FIB pretest which made it more difficult for this group to significantly increase its scores. In contrast, in the main study there was no significant variation in the initial scores of all groups.

In terms of accuracy during the training sessions, in the pilot study the textual enhancement group scored initially high in the use of the target forms. Thus, it was not possible for this group to perform significantly better throughout the sessions because of the initial ceiling effect. In contrast, all participants in the main study initially scored low in their use of the target forms during the first training session. This enabled the main study to prove that the treatments had differing effects. As previously mentioned, it is not surprising that there was an initial variation in performance during the first training sessions in the pilot study because the population of each group was small. Ideally, the pilot study should have comprised more participants, but this was not possible due to logistical reasons. Nevertheless, the pilot study was informative as it allowed testing whether learners could complete each test and each task during the assigned time.

5.2 Theoretical Implications

A relevant contribution from the present study is showing that explicit instruction can result in metalinguistic knowledge in contrast to implicit instruction which did not enable learners to understand and verbalize the use of the target forms. This study also shows that learners can still be capable of performing tasks using implicit or explicit knowledge without having metalinguistic knowledge of a target form, but ultimately, having metalinguistic knowledge can help accelerate the process by which learners become proficient users of a target form. This issue is paramount to the field of SLA as has been evident by the differing interface hypotheses.

In terms of the interface hypothesis, the findings in the current study can also shed some light. For instance, the results suggest that it is possible to gain declarative knowledge of target forms through explicit instruction, but learners may lose some of the declarative knowledge after extensive practice and may develop procedural knowledge. This does not mean that the explicit knowledge that learners gain during their initial encounters with the target forms converts into implicit knowledge later through practice though. The findings in the current study do not refute Krashen's (1985) claim that implicit knowledge is dissociated from explicit knowledge. Also, the results do not contradict N. Ellis (1994; 1996) and Paradis (1994) in their assertion that explicit knowledge cannot become implicit knowledge. Instead, these findings point toward the possibility explained previously by N. Ellis (2005) that both explicit and implicit knowledge interact. One way in which they interact is that explicit knowledge first functions as an initial representation, but once the learner has made an explicit form-meaning connection, there can be consolidation of the form through subsequent unconscious and unintentional processing of the form during practice (see N. Ellis, 1996; Pawley, & Syder, 1983; Schmitt, 2004). Another important finding related to theory is that explicit instruction appears to be more powerful than implicit instruction in terms of delayed effects. This is a theoretical underpinning that had been previously stated by N. Ellis (2005) and is supported by the findings in the current study.

Some of the theoretical implications that derive from the current study are the following: the training conditions aimed at having learners notice the target forms. In addition, their purpose was also to help learners discover the relationships between the target forms and their meaning function. Implicit instruction operationalized as textual enhancement appears to have helped learners to make an initial form-meaning connection and the subsequent practice during the training sessions seems to have also helped learners to form generalizations without necessarily becoming aware of the underlying rule. In the case of explicit instruction in the form of metalinguistic instruction and processing instruction, learners were also capable of making the initial form-meaning connection, but having metalinguistic understanding of the rules seems to have enabled them to make conscious comparisons between the rules and their own output during the training sessions.

Overall, the findings in the current study confirm previous theoretical premises of SLA such as the beneficial role of noticing and understanding. In terms of the relevance of awareness at the level of understanding, the current study echoes previous work by Leow (1997) who found that awareness at the level of understanding promoted more learning than awareness at the level of noticing.

5.3 Methodological Implications

The methodology used in the present study has implications for future research. The underlying aim was to address fundamental issues of L2 learning such as finding the effect of implicit and explicit instruction on implicit and explicit knowledge. Namely, the methodology had three main implications: it allowed retrieving both online and offline data, it enabled the creation of automatized enhancement of participants' output and it comprised measures of implicit and explicit knowledge.

Using an interface allowed examining how participants' interlanguage developed throughout the training sessions. It was possible to detect the rate at which each group started becoming more accurate in their use of each target form. This also enabled the comparison of online data with the findings from pre-posttest and from posttest-delayed posttest. Having access to learners' output produced during the experiment is an important asset since traditional studies in the field of SLA had primarily implemented only offline measures. Future research could benefit by using such an interface as it could enrich their findings and conclusions.

The automatic enhancement created by the interface is another advantage of implementing this method for data collection. It would not have been possible otherwise to enhance participants' output. Thus, laboratory experiments are more frequently using such designs that attempt to direct learners' noticing towards specific aspects of the L2.

Also, the methodology used for testing implicit and explicit knowledge was an essential component that allowed making more accurate conclusions about the roles of implicit and explicit instruction in L2 learning. This has also been the case in the limited amount of research that has implemented this type of design such as the work by Akakura (2012) and Indrarathne and Kormos (2016). Although there are no pure measures of implicit and explicit knowledge, validated tests such as the TGJT should be used. They provide a wider picture about the type of cognitive processes on which learners rely as a result of receiving exposure to an implicit or an explicit instructional treatment. Without assessing the two different types of knowledge, it does not seem to be possible to completely understand the impact of both types of instruction.

In sum, implementing this methodology which gives the researcher access to both online and offline data is no longer an unachievable goal, but instead, it is becoming a necessary procedure. In addition, it is also desirable to conduct research on implicit instruction that requires learners to produce output rather than simply receive exposure only through reading. Finally, more studies should use a methodology that tests learners' implicit and explicit knowledge.

5.4 Pedagogical Implications

The current study aimed at shedding light on the role of explicit instruction when it is added to implicit pedagogical training in SLA. Although previous research has shown that implicit learning of target forms in a foreign language is possible, it is still not clear under what circumstances it is more appropriate to teach a form implicitly and when it is necessary for the language instructor to use a more explicit pedagogical intervention. The findings in the current study suggest that not all forms are equally likely to be learned through mere exposure. The prepositions *in* and *on* collocated with forms of transportation seem to require an explicit intervention such as providing learners with a metalinguistic rule or teaching learners processing strategies. When forms are not perceptually very salient to the learner, it may be appropriate to implement an explicit intervention. Other target forms that may call for an explicit treatment are those that do not have an equivalent linguistic item in the learners' L1, those that convey a meaning that cannot be easily interpreted from the sentence or the context, and forms that are polysemous. These characteristics are all met by the prepositions *in* and *on* collocated with forms of transportation, so L2 instructors may find it beneficial to explain the underlying rules and to ask learners to pay extra attention on how these forms function when they appear in the context of forms of transportation.

On the other hand, when the target form is perceptually salient in that it stands out from other forms, an implicit treatment such as input flood or textual enhancement may be effective. Also, when the linguistic target has an equivalent form in the learners' L1, when it conveys meaning which can be easily interpreted from the context and when it is not polysemous, implicit instruction may be powerful enough for learners to make the form-meaning connections that are needed in order for internalization to occur.

Additionally, the findings in the current study suggest that textual enhancement delivered through a computer interface can boost learners' accuracy of the prepositions *in*, *on* and *by* collocated with forms of transportation. Nevertheless, if the language instructor does not provide learners with an explanation of the rules that govern the use of these target forms or if the instructor does not teach learners how to process them, it is unlikely that they will gain any metalinguistic knowledge about the linguistic targets. In other words, the findings did not indicate that learners will discover the target rules of the preposition *in*, *on* or *by* at the level of understanding. Nevertheless, it is important to consider that the target forms in the current study convey a meaning which is not readily apparent in the context. Perhaps learners may be able to implicitly infer the underlying rules of other forms which bear a more straightforward meaning. Unfortunately, due to the scope of the current study, it is not possible to make generalizations based on the current findings. Further research is needed that tests the role of implicit and explicit instruction of other linguistic targets.

An important implication that L2 instructors should consider is that explicit instruction of the prepositions *in*, *on* and *by* should be accompanied by additional pedagogical treatments that require learners to practice the linguistic targets extensively within a specific context. The current study underscores the importance of giving learners enough opportunities to produce output during a lesson. Language instructors should design tasks that require learners to use the target forms repeatedly. One important aspect that seems to have helped learners in the current study is also the inclusion of output tasks in each session. It is important then that instruction includes tasks that require learners to focus on meaning while they are simultaneously focusing on the forms.

5.5 Ecological Validity

Some caution should be taken when using the findings in this study to make decisions about whether to implement metalinguistic instruction in an L2 class. On the one hand, language instructors should be careful not to over explain formal aspects of the target language. Although the results in the current study showed that some target forms cannot be discovered by the learner implicitly, this does not mean that teachers should rely solely on explicit instruction. That is, the presentation of a metalinguistic explanation or of processing instruction should ideally be embedded within a communicative setting where the primary goal is for learners to focus on meaning. If a target form is explained in isolation and even at the expense of meaningful communicative practice, it is unlikely that learners will gain any implicit or explicit knowledge of the L2 that they can use in real time while performing demanding tasks.

Moreover, L2 instructors often have limited classroom time, and thus, using metalinguistic instruction to explain all target forms, may not always be the most efficient choice. It is thus, recommendable that teachers only rely on metalinguistic instruction or processing instruction when learners have no other way of making the necessary form-meaning mappings. In addition, the explanation of a target form should be concise. It is not the intention of this study to mislead teachers into thinking that communicative tasks have no value, and that an L2 class should be based on the explicit presentation of target forms. Such recommendation cannot be made from the findings in the current study because none of the groups received mere explicit instruction. Instead, all groups completed tasks during the training sessions in which the primary goal was for learners to understand meaning. Thus, the beneficial effects of metalinguistic instruction and processing instruction in this study can only be accounted for in the sense that they were given in addition to implicit training that required learners to focus on meaning.

5.6 Limitations and Future Directions

The current study is not without its limitations. These have to do with the nature and the length of the treatment, with the constructs that were being measured and with the assessment that was implemented. The first limitation is that it was not possible to measure the effects of input enhancement independently from the effects of output enhancement. Ideally, the design of the study should have included a group which only received input enhancement and another group which only received output enhancement. This would have allowed testing whether each type of enhancement was beneficial for learners to improve their use of the target forms. It would have also enabled comparing whether enhancing the input is more effective than enhancing the output or vice versa. Ideally, there should have been an additional control group which only took the pre, post and delayed posttests but did not complete any of the training sessions. This would have isolated the variable of input flood. Unfortunately, it was not possible to include these additional groups. Doing so would have meant reducing the number of participants per group. Nevertheless, it was not the objective of the current study to measure input enhancement and output enhancement separately, but instead the aim was to investigate if together as a combined treatment input enhancement and output enhancement were effective.

Another limitation was that the current study only measured if the effects of each treatment were sustained two weeks after the treatment sessions had ended and one week after the delayed posttest. Although it is valid to implement such delay, it would have also been ideal to measure whether the effects of the treatments could hold for longer periods. Unfortunately, due to restrictions on the English course calendar, it was not feasible to assess learners' knowledge of the target forms over a longer period.

A third limitation was that the design of the current study did not include a measure of awareness at the level of noticing. Although the study did investigate if it was possible for learners to improve their accuracy on the use of the target forms without awareness at the level of understanding or at the level of verbal report, it did not measure whether participants' noticing increased due to any of the treatments. Ideally, interviewing participants after the treatment would have revealed if they noticed the target forms at least at the level of apperception. However, due to time constraints, it was not possible to include such measure. Also, it was beyond the scope of the current study to measure participants' noticing. Instead, the current study focused on the improvement from pre to posttest and on participants' increase of accuracy in their production during the training sessions.

An additional limitation was that only one measure of implicit knowledge was used. The reason for not using additional implicit tests such as an elicited production task or an oral narration task was to avoid providing a practice effect due to excessive testing. Also, using additional implicit tests would have taken more class time than was allowed by the institution.

A final limitation was that the study does not inform about the effects of explicit instruction in its pure sense because the groups receiving metalinguistic instruction and processing instruction also received textual enhancement which is an implicit instructional treatment. Instead, the findings contribute to the field of SLA by informing about what explicit instruction adds to implicit L2 learning.

Future research could investigate whether a treatment composed of output enhancement without input enhancement delivered through a computer interface can help learners improve their accuracy of target forms that are not very salient. This type of design could possibly increase our understanding of the characteristics that are needed in order for enhancement to be effective. That is, perhaps output enhancement requires learners to process the target forms more thoroughly than input enhancement.

However, no claims can be made about this yet as the differences between input enhancement and output enhancement have not been explored.

Also, further research could include longer assessment periods, and it would ideally analyse learners' progress qualitatively. Because it has been well established that learners' acquisition process is not linear, it would be paramount to document the evolving progress made across time due to the enhancement treatments. Additionally, studies looking into enhancement treatments could benefit by confirming that the findings found in lab studies can be generalizable to classroom settings. In the case of textual enhancement most studies have been lab based, so conducting a classroom-based study could also shed light on the effectiveness of such treatment. Finally, research on focus on form could benefit by having additional tests measuring implicit knowledge, and by including pure explicit training conditions that do not comprise any kind of implicit training.

Chapter 6: Conclusion

The study primarily aimed at investigating the effects of implicit and explicit instruction on the acquisition of English prepositions collocated with forms of transportation. The methodology implemented for the study allowed achieving this aim. This main goal is of great importance to both research and practice as this section will explain.

Previous research had shown contrasting results about the impact of implicit instruction. The current study showed that implicit training in the form of input enhancement and output enhancement can indeed result in the learning of the target forms. Another important contribution is that it confirmed previous findings revealing that explicit instruction combined with implicit training results in stronger learning effects than mere implicit instruction. The current study also contributes to the field of SLA by showing that explicit instruction appears to be fundamental in order for learners to acquire metalinguistic awareness of target forms.

In terms of practical significance, the current study is relevant because it indicates that although learning some forms implicitly is possible, learners can only accomplish certain tasks with the knowledge they acquired explicitly. That is, while it is possible for learners to improve their accuracy on constricted response tests with the knowledge that they have acquired through mere exposure, learners are not capable of performing with high accuracy on free response tasks. This is an important issue for L2 instructors to consider as normally the goal of second or foreign language courses is to help learners use the target language for real-life purposes which require high levels of knowledge, and implicit instruction alone does not appear to promote such depth of understanding.

This study additionally sought to investigate if implicit instruction would equally result in gains of explicit and implicit knowledge. By implementing tests that measured both explicit and implicit knowledge, it was possible to achieve this aim. The relevance of this finding lies on the assessment bias that has occurred particularly in textual enhancement studies. As mentioned previously, not many studies measuring the impact of implicit instruction have actually used tests that measure implicit knowledge.

Another objective was to investigate if each of the three target forms *in*, *on* and *by* could be equally learned through implicit instruction and through explicit instruction. This goal was achieved satisfactorily, and the findings concord with previous research. By achieving this aim, the current study shed some light on an issue that is at the core of SLA theory: namely, whether the usage of some forms can be discovered by learners simply through extensive incidental exposure or whether a pedagogical treatment is needed.

The current study contributes to the field of instructed second language acquisition by showing that some forms can be learned implicitly, while others need to be taught explicitly within a setting where learners receive extensive practice that requires them to focus on meaning. This is a fundamental issue in second language teaching as L2 instructors have to make decisions on a daily basis about whether to teach students a target form overtly or to provide them with extensive exposure to the form until they can learn it. The findings in this study also shed some light about the characteristics that target forms must have in order for them to be learned implicitly by mere exposure.

This study also sought to find if any learning from pre to posttest was sustained two weeks after the training had ended. By using a delayed posttest, it was possible to accomplish this aim. Finding about the delayed effects of implicit or explicit treatments is of great importance to the field of SLA because traditionally not many studies have provided such data. Also, knowing whether learners show any attrition over time is relevant for practical reasons. First, it enables L2 instructors to outweigh the advantages and disadvantages of implementing a specific pedagogical treatment by knowing whether the effects are likely to resist decay. Second, it helps language teachers avoid the implementation of practices that may seem to be effective immediately but not after extended periods.

Another aim of the current study was to investigate if the production of the target forms in participants' output by either one of the groups would become more accurate across the training sessions. Additionally, it sought to investigate if there was a relationship between the number of times that participants produced the target forms during the training sessions and their accuracy of production. Using a computer interface throughout the experiment allowed achieving these two related aims. Monitoring participants' progress throughout their training sessions was essential because it provided online data. That is, rather than only relying on the offline data gathered from the pre and posttests, it was possible to find about learners' progress from session to session.

Traditionally, SLA studies have relied primarily on pre to posttest scores, but increasingly, research is implementing different data collection methods that enable researchers to obtain online data. In terms of research methodologies, the current study contributed by showing how the implementation of a computational interface can be a useful research tool. Not only did the interface provide participants with the automatic enhancement of their output, but it retrieved their work during each of the sessions, thus allowing the researcher to assess the learning process.

Interestingly, investigating learners' output during their training sessions revealed that each group's learning pattern of each target form resembled their learning pattern from pre to posttest. That is, the groups that had a below chance score on the immediate posttest also had a below chance accuracy score in their last training session. This kind of analysis is also relevant because it shows a clearer picture of what participants in each group were capable of doing with the target forms in both constricted response tasks and in free response tasks.

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Appendix A: Ethics documents

Date: 10/06/2016

INFORMATION SHEET

As part of my PhD studies in the Department of Linguistics and English Language, I will be conducting a study on task-based language learning. The study requires participants to complete a series of tasks on a computer and to respond to a debriefing questionnaire. In total, the study takes approximately five sessions which take 30 minutes each to complete.

I have approached you because you are a learner of English as a foreign language. I would be very grateful if you would agree to take part. You are free to withdraw from the study at any time. At every stage, your name will remain confidential. The data will be kept securely and will be used for academic purposes. If you withdraw up to two weeks after your participation ended, your data will be destroyed, and it will not be used. However, if you withdraw after more than two weeks from the day that your participation ended, your data will be used for the study.

The data collected in this study will be used for my PhD thesis, and for future article publications in academic journals in second language acquisition. The consent forms will be stored in a locker, and only my supervisors and I will have access to them. The questionnaires and the rest of the data that will be collected during the sessions will be analysed in an encrypted laptop computer, and it will be stored electronically on the secure University central files (H drive). The data will be stored securely for ten years. After this period, the data will be destroyed.

If you have any questions about the study, please feel free to contact myself or my dissertation supervisors, Dr. Patrick Rebuschat, who can be contacted on p.rebuschat@lancaster.ac.uk or by phone on 01524 592433, and Dr. Marije Michel m.michel@lancaster.ac.uk. Also, if you have any concerns or complaints about the project, you can contact my supervisors at the above addresses.

Signed

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Lancaster University

Department of Linguistics and English Language

Consent Form

Project title: Input and Output Enhancement of Prepositions in Second Language Acquisition

I have read and had explained to me by José Luis Moreno Vega the Information Sheet relating to this project.

I have had explained to me the purposes of the project and what will be required of me, and any questions have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

I understand that my participation is entirely voluntary and that I have the right to withdraw from the project any time.

I have received a copy of this consent form and of the accompanying information sheet.

Name:

Signed:

Date:

Appendix B: Background Questionnaire

Background Questionnaire

Note: In accordance with Lancaster University's Research Ethics guidelines, all information provided in this questionnaire will be anonymized in order to protect your privacy.

Name: ____ Subject ID _____________

Sex: ________ Female _________ Male

Nationality: ______________________ Country of Birth: ________________ Age: ____________

What language(s) did you speak at home while you were growing up?

____

Foreign language ability: Please rate your overall proficiency in English by ticking one:

- ❑ Upper Intermediate level and over: Able to converse about general matters of daily life and topics of one's specialty and grasp the gist of lectures and broadcasts. Able to read high-level materials, such as newspapers, and write about personal ideas.

- ❑ Intermediate level: Able to converse about general matters of daily life. Able to read general materials related to daily life and write simple passages.

- ❑ Lower Intermediate level: Able to converse about familiar daily topics. Able to read materials about familiar everyday topics and write simple letters.

- ❑ Post-Beginner level: Able to hold a simple conversation such as greeting and introducing someone. Able to read simple materials and write a simple passage in elementary English.

❑ Beginner level: Able to give simple greetings using set words and phrases.

Able to read simple sentences, grasp the gist of short passages, and to write a simple sentence in basic English.

What foreign languages have you learned? For each language, please indicate how you have learned the language, how many years you have learned it for, and what you estimate your proficiency level to be. Do not include information about English in this section.

Language	How did you learn it (e.g. school, study abroad, at home)?	How many years have you been learning the language for?	What is your estimated proficiency level (1 beginner, 2 Postbeginner, 3 Lower intermediate, 4 intermediate, 5 upper intermediate level or over)?

Have you spent a longer period (three months or more) in foreign language-speaking countries (travelling, studying, e.g.)? If so, please indicate, for each stay, what countries, the purpose of the visit, and the length of the visit.

Countries	Purpose of visit (e.g. school, study)	Length of visit

How often do you communicate in English with native speakers of English?

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

How often do you communicate in English with non-native speakers of English?

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

Use the following scale to explain how often you speak English in each situation. You may use each option more than once.

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

I try to speak English to:

_____ a. my English teacher outside of class

_____ b. friends who are native or fluent speakers of English

_____ c. classmates

_____ d. strangers whom I thought could speak English

_____ e. service personnel in The United States or another country (e.g. cashier, a waiter)

_____ f. people at work / my boss

For each of the items below, choose the response that corresponds to the amount of time you estimate you spent on average doing each activity in English.

a. watching English language television

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

b. reading English language newspapers

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

c. reading novels in English

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

d. listening to songs in English

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

e. reading English language magazines

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

f. watching movies or videos in English

0) never 1) a few times a year 2) monthly 3) weekly 4) daily

Click on one of the following options.

When did you start taking English classes?

a) In pre-school
b) In elementary school
c) In junior highschool
d) In highschool
e) At the university

How old were you when you started taking English classes?

a) Less than 5 years old _______
b) From 5 to 7 years old _______
c) From 8 to 11 years old _______
d) From 12 to 15 years old _______
e) From 16 to 19 years old _______
f) From 20 to 25 years old ______
g) Older than 25 years ______

Answer the following questions by clicking “yes” or “no”.

Did you study English in elementary school?

Did you study English in secondary school?

Did you study English in highschool?

Did you attend a public or a private elementary school?

Did you attend a public or a private secondary school?

Did you attend a public or a private highschool?

Appendix C: Tests used in the Pilot Study and in the Main Study

Timed Grammaticality Judgement Test

Only Version

Instructions: You will read 40 sentences at a time. Decide if the underlined part in each sentence is grammatical or ungrammatical. You will have only five seconds to read each sentence, and then the sentence will disappear. Then you will see two options: *grammatical* and *ungrammatical*. You will have two seconds to click on one of the two options. If the underlined phrase or word is ungrammatical, correct it by clicking on the underlined section of the sentence.

Example 1: Helen read very interesting book on the weekend.

grammatical ungrammatical

Correct: Helen read a very interesting book on the weekend.

Example 2: I met several interesting people at work yesterday.

grammatical ungrammatical

Click here to start.

1 Jason goes in his car to his karate lesson every day.

2 Rebecca bought two present for her children.

3 George travels in his motorcycle without insurance.

4 A new car nowadays is really expensive, doesn't it?

5 Claudia usually goes to her tennis lessons by car.

6 Does Elaine live in Nogales?

7 Michael went shopping in car this morning.

8 My neighbors are going to travel on the weekend.

9 John lives in San Pedro but work in Hermosillo.

10 Robert was taken quickly to school on a bus.

11 I will visit some friends tomorrow.

12 Luis usually goes to work by taxi.

13 The bird that my brother caught it has died.

14 Ronda travelled around California on bus with her friends.

15 Did Martin visited his father yesterday?

16 Steve went to the gym this morning on his car.

17 Joseph flew to Washington to meet the President's advisor.

18 Jose likes to go around town by scooter.

19 Julia works very hard but earns very little.

20 Mike likes to go to his ranch in his truck every weekend.

21 Her English vocabulary increased a lot last year.

22 Sheila will go to the mountains in truck during the winter break.

23 An accident was happened on the highway.

24 My kitchen have a big refrigerator.

25 Alice was travelling in the train when she dropped her cell phone.

26 The boat that my father bought it has sunk.

27 Consuelo travelled to Chicago on airplane last month.

28 John went to the library in his bicycle to get the book that he needed.

29 Martha said that she wanted to go to Cuba by ship.

30 She likes watching television all the time.

31 Jessica went to an appointment yesterday on her motorcycle.

32 Frank left some pens and pencils at school.

33 I was cleaning my house when you called.

34 Traffic is big problem in Hermosillo.

35 Jason went home on bicycle last night.

36 Japan is <u>a very interesting</u> country.

37 Becky goes to her English class <u>on her bicycle</u>.

38 Ashley goes to her basketball games <u>by bicycle</u> every Monday.

39 James <u>received letter</u> from his father yesterday.

40 I will go to work <u>in my scooter</u> tomorrow.

Fill in the Blanks Test Version A

Instructions: Each sentence has one missing word. Fill in the blanks in each of the sentences with the missing word.

Example 1: _____ you know where the nearest grocery store is?

Complete Sentence: Do you know where the nearest grocery store is?

Example 2: I've had this job _____ several years now. I've had this job for several years now. Click here to start.

1 Travelling to the supermarket ___ car is a lot faster than taking the bus.

2 James will go to the park ___ bicycle tomorrow.

3 Claudia bought ___ same blouse as Mary.

4 In the summer we went to Arizona ___ a van that my brother had bought.

5 What time ___ you get up every day?

6 ___ Robert know how to fix a car?

7 I went downtown yesterday ___ my new bicycle.

8 Luke has been having a lot of fun ___ 2010, the year when he retired.

9 You may not bring any liquids when you travel ___ an airplane.

10 I was late yesterday, and I missed my bus to school, so I had to go ___ taxi.

11 ___ Martha live in Hermosillo?

12 This job gets easier once you've been working ___ several years.

13 Jeremy went to the game ___ a motorcycle that he bought and fixed last year.

14 Sally went to the baseball game ___ truck.

15 David visited ___ friend that he hadn't seen in several years.

16 Travelling ___ bus in some countries in Latin America can be very dangerous.

17 Jose has been waiting in line ___ an hour in the bank.

18 I'd prefer not to travel ___ the car that's in the driveway because it has no seatbelts.

19 Wendy likes to try ___ cup of coffee once in a while.

20 I've always dreamt of traveling around the country ___ motorcycle.

21 ___ Frank have a car?

22 Today I had a chance to go to school ___ a motorcycle that a friend lent me.

23 Mary hasn't called me ___ last month. I wonder how she's doing.

24 It can be exciting to tour around the country ___ car.

25 What ___ you eat for breakfast this morning?

26 Last year my family and I went to Mexico City ___ a train that was very fancy. 27 Susan wrote ___ complaint letter to the store manager.

28 There were many students going to the university ___ bus today.

29 Where ___ Greg work?

30 Carlos saw ___ movie yesterday, and he said it was very interesting.

31 ___ Luis going to the party?

32 My father came home today ___ his new truck.

33 Ted has ___ most expensive house in the neighbourhood.

34 I have never travelled ___ plane before.

35 ___ David and Tina angry at each other?

36 Rita travelled to Nogales ___ a very old bus

37 My friends will travel around Europe ___ train next summer.

38 Fred went to the store ___ his bike this morning.

39 ___ you like to watch comedy movies?

40 ___ you feeling very tired today?

Metalinguistic Knowledge Test
Version A

Instructions: Each of the following sentences is ungrammatical. To correct each sentence click on the underlined word or phrase and then type the correct word or phrase correctly. After correcting the error, type the rule that was used for correcting the error.

Example 1: John go to the zoo last weekend.

Correct: John went to the zoo last weekend.

What is the rule? The verb *go* needs to be in the past tense because last *weekend* refers to the past.

Example 2: Kelly go to the gym every morning at six.

Correct: Kelly goes to the gym every morning at six.

What is the rule? The verb needs to be conjugated in third person singular.

Click here to start.

1 Alma goes to the university on the car that she bought last year.
Correct: What is the rule?

2 I buy a new bicycle yesterday.
Correct: What is the rule?
3 Tina will go around town today by motorcycle that her boyfriend lent her.
Correct: What is the rule?

4 Whenever I take the plane, I take parachute.
Correct: What is the rule?

5 Maria travelled on bus last weekend to visit her parents.
Correct: What is the rule?

6 A large ship can carries over a thousand passengers.
Correct: What is the rule?

7 Meg got from her ranch to the next town in her horse.
Correct: What is the rule?

8 A ferry leave every hour.

Correct: What is the rule?

9 A huge ship has just depart from New York harbour.

Correct: What is the rule?

10 Samantha went to the concert on the truck that she had just repaired.

Correct: What is the rule?

11 The computer doesn't working right now.

Correct: What is the rule?

12 Rebecca went to the party in truck.

Correct: What is the rule?

13 Sarah will go to the park by bicycle that looks funny.

Correct: What is the rule?

14 I am interesting in learning a new language.

Correct: What is the rule?

15 Tracy travelled to Cuba in a ship that was huge.

Correct: What is the rule?

16 A helicopter fly over my house every morning.

Correct: What is the rule?

17 Mark flew to Los Angeles in an airplane which was not working properly.

Correct: What is the rule?

18 My dog doesn’t likes to eat dog food.

Correct: What is the rule?

19 Richard wanted to travel in a train that had bunk beds.

Correct: What is the rule?

20 I took ferry to La Paz.

Correct: What is the rule?

21 Luke went to a business meeting in car.

Correct: What is the rule?

22 A car cost a lot of money to run.

Correct: What is the rule?

23 Jerry went to the amusement park yesterday by scooter that his father gave him for his birthday.

Correct: What is the rule?

24 Wearing a parachute is the more fastest way of getting out of a plane.
Correct: What is the rule?

25 Juan travels to the mountains in his scooter on the weekends.
Correct: What is the rule?

26 A bicycle is cheap form of transport.
Correct: What is the rule?

27 Teresa will go to her doctor's appointment in taxi.
Correct: What is the rule?

28 This was the most hardest test that I have ever taken.
Correct: What is the rule?

29 Donna was going in a bus to her French class, when she had an accident.
Correct: What is the rule?

30 A bus ticket cost very little.
Correct: What is the rule?

31 A car crash into my house yesterday.
Correct: What is the rule?

32 Jesus used to go to his classes by truck that he didn't like.
Correct: What is the rule?

33 A helicopter can lands just about anywhere.
Correct: What is the rule?

34 Stephany got to the airport on a taxi that smelled like cheese.
Correct: What is the rule?

35 The movie that I saw yesterday was very interested.
Correct: What is the rule?

36 Albert went to his grandmother's house on subway.
Correct: What is the rule?

37 I bought a bus tickets with my last dollar.
38 Correct: What is the rule?

39 Jeremy travelled to the factory every day in his bicycle.
Correct: What is the rule?

40 Ted went to the museum on Friday by bicycle that belonged to his brother.
Correct: What is the rule?

41 Is going to rain all day tomorrow.
Correct: What is the rule?

Appendix D: Stories used in the main study

The Family Trip

Juan told his family one day that they were going to take a trip around the country. His wife asked him: "but how are we going to travel?", and Juan responded: "We will travel **in our car**." The wife responded: "traveling around the country **by car** is dangerous". Juan said: "not at all. I have planned everything. Besides, would you prefer to travel across the country **by plane**?... It would be too expensive, and we would miss all the adventure."

They all packed and started their journey on the first day of their summer vacation. Before the trip, Juan checked the tires and the engine. Everything seemed fine. They drove for several hours, but before they left the state, the engine started to overheat. They stopped at a rest area, and Juan had to ask a driver for a ride **in his truck** to the next town. He got to the next town **by truck** and found a mechanic. The mechanic told Juan that he could drive him back to the rest area. So they went back to where the family was. The mechanic fixed Juan's car quickly. It was only a water hose that needed to be replaced. So the family continued their trip. They saw a hotel by the beach and decided to stay there.

The next morning, Pablo, Juan's son, asked his father if they could go to a nearby island. He said: "I want to go to the amusement park at the island across the bay. We could go there **by boat**." The father said: "You're right! Let's rent a boat! " The mother was not so sure. She said: "It's dangerous! What if we fall from the boat? There could be sharks!" The father said: "No, it's not dangerous. Let's see how much it costs to rent a boat".

The whole family traveled **in the small rowboat**. They rowed for an hour. The landscape was beautiful, but suddenly, Ana, Juan's daughter, noticed that there was water coming into the boat. They were all very scared, so they started to cry for help. Laura, Juan's wife, said: "I told you we shouldn't have **rented a boat**! I hate **boats**!" Fortunately, there was a fisherman nearby who saw them and rescued them, and they arrived safely on land.

The next day, the family continued their journey. They arrived in a big city. The kids were hungry, so the family stopped at a restaurant to eat lunch. When they went into the restaurant, Laura asked Juan "Did you lock the car?", and Juan responded: "No, it will lock automatically. Don't worry". After two hours, once the family had eaten lunch and dessert, they came out of the restaurant, but they could not find their car. Someone had stolen it. Laura said: "But all my things were inside the car! What are we going to do now?" They saw a police officer **on a motorcycle**, and they screamed for help. The police helped them, and told them about a hotel where they could stay. **It was impossible for the police officer to offer the family a ride by motorcycle, so the family had to go to the hotel by bus.**

The family could not continue their trip, so they decided to stay for a few days in the city hoping that the police would find the car. After three days they got tired of waiting, so they got **on the bus** that goes to the airport. They decided to go back home **on the first plane** like Laura had suggested from the beginning. Unfortunately, their flight got cancelled because of bad weather, so they decided that the only option was to go home **by train**. They went to the train station and got **on the train** that was going to Hermosillo. When they got back, they were happy that their trip was over. **Juan finally admitted that he should have listened to his wife from the beginning.**

Instructions: Read the following story, and try to understand the most important events.

Run Away from the Zombies

Mary was leaving her home to go to work one day. As she was **driving**, she noticed that there was no traffic. Suddenly, she saw a strange man on the street walking really slowly. Mary stopped her car, so that the man could cross the street. **Unfortunately, the man crossing the street did not notice that there was that someone traveling by motorcycle** heading towards him. Ted, the man **on the motorcycle,** didn't see the man walking and accidentally hit him.
The victim fell in the street. Both Mary and Ted tried to help the person who was injured. However, they immediately noticed that something about this person was not normal. His skin was pale, and he smelled like rotten meat. He looked as if he were dead, but he was still moving.

The injured man got up, and tried to bite Mary and Ted. Then the man started to chase them. They realized that they were being chased by a zombie! They didn't know what to do. **Mary thought that their only solution was to escape by car or by truck.** They started running, and saw a truck in the street. They tried to get away from the zombie **in the truck**, but then they saw more zombies inside the truck. They thought that they would be safer if they left the city, so they decided to go to the nearest town **by train**. They went to the train station, and got **on a train**. They believed that they would be safe, but they were wrong because there were more zombies traveling with them.

The train started to move, so the only choice that they had was to jump from the moving train. They landed next to a river. So Mary had an idea: "Why don't we leave town **by boat**?" Ted said: "I'm not sure that's a good idea. We are in the middle of a zombie apocalypse. Are you sure you want to **do that** right now? Besides, which boat can we take?" "Mary said: Let's go **in that small boat** over there." They had to row **because the boat had no engine**. It was very foggy, so they couldn't see anything, but they heard a creepy noise. Suddenly, they saw **a boat full of zombies** that was coming towards them. Ted told Mary "I told you this was a terrible idea!" So they jumped into the water, and swam to the shore.

Once they moved away from the shore and ran back into town, they noticed that there were more zombies in the street. They thought about traveling outside of town **by bus**, but then they saw zombies traveling **on a bus** that was going to the next town. They didn't know what to do. Ted tried to find a solution, and said: "Let's leave town **in your car**! We will be safe from the zombies." Mary told ted: "Let’s find my car. Ted responded: "**It’s over there.** They will never catch us this way."

They got out of town, but it wasn't long until they noticed that their tires were losing air. The zombies had chewed on the tires, so they had to find another solution. Mary received a message on her cell phone that zombies were all over the country. Mary and Ted were very close to the airport. Fortunately Ted was a pilot. So he suggested: "Why don't we leave the country **by plane**? We could go to Mexico. Maybe there are no zombies in Mexico." There were no people at the airport, but there were many zombies. So, they ran as fast as they could, and they **saw a plane** that had its doors open. It was a small airplane, that was not locked. They took off. Once they were traveling **on the airplane**, they could see many hungry zombies on the ground. They realized that they were lucky to be alive.

Instructions: Read the following story, and try to understand the most important events.

An Unplanned Trip

Miguel was a man that lived in a small American town. Every day he went to work **by truck**. He worked in a farm where he spent most of his days working the land. **The farm was next to a river, so some of the other workers arrived every day to work by boat.** One day Miguel was watering the field when he heard a noise. He went to see what it was. He saw some border patrol officers arriving **in their cars and other officers arriving by motorcycle**. Miguel was not afraid of them because he was an American citizen. He had been born in the United States, but he had a Mexican last name. The officers **on their motorcycles** started chasing the workers in the field. Some of the workers **ran towards the river, so that they could get away. A lot of them were able to escape in their boats. They** were able to **escape**, but Miguel didn't even try. He got arrested and was sent to the immigration office **on a bus** that was full of people. When he got there, Miguel tried to convince the officers that he was a citizen. They asked him for his ID, but he didn't have it with him. He remembered he had left it **in his truck**. He told the officers to let him call his wife, so she could **bring him his passport**. The officers didn't believe him, so they decided to deport him. They told him they were going to send him back to Mexico **by plane**.

Miguel had never flown before, so he was scared at first. But once he was traveling **on the plane**, he met someone who tried to help him. This person told Miguel to calm down. She said: "**flying** is safer than traveling **on other forms of transportation**, so don't worry." She told him of a place where he could stay in Mexico. Miguel arrived in Mexico, and he didn't know what to do. He had never been in that country before. He went to a hotel where he spent the night. The next day he called home, and his wife answered. She told Miguel that she would go to the border and pick him up, and she would bring his passport.

So Miguel told the receptionist at the hotel that he wanted to go to the border, and asked her: "What is the fastest way to get there? Should I travel **by bus** or should I **fly**?" The lady said: "You should travel **by train**. It is faster. Why don't you go **on the train** that leaves in the afternoon?" Then Miguel asked her: "And how can I get to the train station?" The lady said: "you can get there **by car.**" Miguel said: "I don't have a car. Can you call a taxi for me?" **Luckily for Miguel, a woman who was listening to the conversation said that she was going to the train station, and she could give him a ride.**

Miguel got to the train station. He was planning on going to the border, so he boarded the train that was going north. He finally arrived at the border, and he saw his wife waiting for him. They went back home, and now Miguel always carries his ID with him. It was a bad experience for Miguel, but he was happy to be back home, and he was also thankful with the people who helped him in Mexico. He was very angry with the officers that had arrested him, but he decided to forget everything that happened.

Appendix E: Task 4 (Decision Making Tasks)

Task 4 – First Training Session

Task 4

Instructions:

Imagine that you will travel to the United Kingdom, and you will stay there for ten days. You will travel to the following five cities (in the following order): *London, Manchester, Liverpool, Belfast* and *Edinburgh*. Then you will travel back to London where you will take a plane back home. You cannot spend more than **£150** on transportation on all these trips.

Write an email to your travel agent where you explain the forms of transportation that you will use for each of the trips.

The following table shows the prices of different forms of transportation that you can use.

"**£**": British Pounds

						
London to Manchester	£50 Big car £30 Small car	£10 Afternoon bus £5 Midnight bus	£55 Morning train £45 Evening train	£30 Afternoon plane £20 Midnight plane		£60 Big motorcycle £35 Small motorcycle
Manchester to Liverpool	£20 Big car £12 Small car	£5 Afternoon bus £3 Night bus	£15 Morning train £9 Evening train	£15 Morning train £9 Evening train		£22 Big motorcycle £15 Small motorcycle
Liverpool to Belfast				£35 Morning plane £20 Night plane	£20 Morning ship £12 Night ship	
Belfast to Edinburgh				£40 Morning plane £30 Night plane	£60 Morning ship £40 Night ship	
Edinburgh to London	£100 Big car £60 Small car	£20	£110	£60 Morning plane £40 Night plane	£80 Morning ship £50 Night ship	£120 Big motorcycle £70 Small motorcycle

Write your email here:

Please, write your email about the travel plans here. The email should be at least ten sentences long. It should include a welcome message at the beginning and a greeting at the end. Please, use full sentences in a paragraph format (do not write isolated points as a list). Be very specific about the exact forms of transportation that you will use.

SUBMIT

Task 4 – Second Training Session

Task 4

Instructions:

Some friends from England will be visiting Mexico for a month. Write them an email explaining to them what forms of transportation they can use to make the following journeys:

- From Centro Histórico in Mexico City to Xochimilco
- From Mexico City to the Pyramids in Teotihuacan
- From Zócalo to Castillo de Chapultepec in Mexico City
- From Mexico City to Hermosillo
- From Hermosillo to Kino Bay
- From Kino Bay to Isla del Tiburón

They cannot spend more than **six thousand pesos** on all of these trips.

Also, explain what forms of transportation they should not use when they are in any of these places, and tell them about the precautions that they need to take.

The following table shows the prices of different forms of transportation that you recommend to use.

	 rented car	 bus	 taxi	 subway	 plane	 boat	 rented motorcycle
From Centro histórico in Mexico City to Xochimilco	1000 pesos (per day)	200 pesos	500 pesos (one way)	10 pesos (one way)			800 pesos (per day)
From Mexico City to the Pyramids in Teotihuacan	1000 pesos (per day)	300 pesos	600 pesos (one way)				800 pesos (per day)
From Zócalo to Castillo de Chapultepec in Mexico City	1000 pesos (per day)	10 pesos	100 pesos (one way)	8 pesos (one way)			800 pesos (per day)
From Mexico City to Hermosillo	1000 pesos (per day)	3000 pesos			2000 pesos (one way)		
From Hermosillo to Kino Bay	1000 pesos (per day)	200 pesos	300 pesos (one way)				800 pesos (per day)
From Kino Bay to Isla del Tiburón						1000 pesos (one way)	

Write your email here:

Please, write your email about the travel plans here. The email should be at least ten sentences long. It should include a welcome message at the beginning and a greeting at the end. Please, use full sentences in a paragraph format (do not write isolated points as a list). Be very specific about the exact forms of transportation that you expect your friends to use.

SUBMIT

Task 4 – Third Training Session

Task 4

Instructions:


Cancún


Guadalajara


Monterrey


Guanajuato

You and a friend are planning to take a two-week vacation around Mexico during July. Decide from the following options below which places you would like to visit, and what form of transportation you would like to use for each trip.

You only have **$20,000** pesos for transportation for the entire trip, and your trip cannot last more than two weeks. You want to visit as many places as you can with the money that you have.

Write an email to your friend where you explain the forms of transportation that you want to use for each of the trips.

The following table shows the prices of different forms of transportation that you recommend to use.

Airplane Tickets (one way)

	Hermosillo	Cancún	Guadalajara	Guanajuato	Monterrey
Hermosillo		5000 pesos	3000 pesos	2000 pesos	1500 pesos
Cancún	5000 pesos		3000 pesos	3500 pesos	2500 pesos
Guadalajara	3000 pesos	3000 pesos		1000 pesos	2000 pesos
Guanajuato	2000 pesos	3500 pesos	1000 pesos		1500 pesos
Monterrey	1500 pesos	2500 pesos	2000 pesos	1500 pesos	

Other Forms of Transportation

	compact rented car	mid-size rented car	rented van	economic bus	business class bus
Price	1000 pesos per day	2000 pesos per day	2000 pesos per day	5000 pesos from one city to the next	7000 pesos from one city to the next

Write your email here:

Please, write your email about the travel plans here. The email should be at least ten sentences long. It should include a welcome message at the beginning and a greeting at the end. Please, use full sentences in a paragraph format (do not write isolated points as a list). Be very specific about the exact forms of transportation that you will use.

SUBMIT

Appendix F: Descriptive Statistics of Normality of Training Scores

Table 23

Descriptive Statistics of Normality of the Occurrences during Training Tasks

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Preposition *in* Control	0.736	32	1.05	0.6	0.09	0.41	-0.63	0.8
Preposition *in* Textual Enhancement	0.137	30	0.78	0.49	0.64	0.42	-0.03	0.83
Preposition *in* Metalinguistic Instruction	0.007	31	0.86	0.45	1.15	0.42	1.29	0.82
Preposition *in* Processing Instruction	0.077	31	0.8	0.45	0.78	0.42	1.1	0.82
Preposition *on* Control	0.06	32	0.65	0.49	0.83	0.41	0.5	0.8
Preposition *on* Textual Enhancement	<.001	30	0.57	0.47	1.83	0.42	4.5	0.83
Preposition *on* Metalinguistic Instruction	0.261	31	0.9	0.36	-0.49	0.42	0.7	0.82
Preposition *on* Processing Instruction	0.77	31	0.96	0.38	0.14	0.42	-0.27	0.82
Preposition *by* Control	0.005	32	0.61	0.53	1.07	0.41	0.8	0.8
Preposition *by* Textual Enhancement	0.693	30	1.1	0.5	-0.03	0.42	-0.31	0.83
Preposition *by* Metalinguistic Instruction	0.971	31	1.24	0.67	0.29	0.42	-0.06	0.82
Preposition *by* Processing Instruction	0.15	31	1.41	0.53	-0.57	0.42	-0.33	0.82

Table 24

Descriptive Statistics of Normality of the Accuracy during Training Tasks

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Preposition *in* Control	0.002	32	0.38	0.29	1.29	0.41	1.84	0.8
Preposition *in* Textual Enhancement	0.043	30	0.45	0.28	-0.02	0.42	-1.34	0.83
Preposition *in* Metalinguistic Instruction	0.017	31	0.59	0.37	1.1	0.42	1.71	0.82
Preposition *in* Processing Instruction	0.39	31	0.64	0.24	0.39	0.42	-0.17	0.82
Preposition *on* Control	0.001	32	0.22	0.22	1	0.41	0.19	0.8
Preposition *on* Textual Enhancement	0.007	30	0.38	0.32	0.72	0.42	-0.54	0.83
Preposition *on* Metalinguistic Instruction	0.237	31	0.76	0.4	0.65	0.42	0.57	0.82
Preposition *on* Processing Instruction	0.699	31	0.82	0.41	0.3	0.42	-0.17	0.82
Preposition *by* Control	<.001	32	0.29	0.36	1.78	0.41	3.56	0.8
Preposition *by* Textual Enhancement	0.27	30	0.64	0.39	0.43	0.42	-0.17	0.83
Preposition *by* Metalinguistic Instruction	0.78	31	1.17	0.65	0.32	0.42	-0.2	0.82
Preposition *by* Processing Instruction	0.33	31	1.2	0.53	-0.22	0.42	-0.87	0.82

Appendix G: Descriptive Statistics of Normality of Training of TGJT Pre, Post and Delayed Posttest

Table 34

Descriptive Statistics of Normality Tests for the General TGJT Pretest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.389	32	3.96	1.03	-0.187	0.414	-0.092	0.809
Textual Enhancement	0.191	30	3.88	0.784	0.07	0.427	-0.757	0.833
Metalinguistic Instruction	0.085	31	3.88	1.01	0.149	0.421	-0.989	0.821
Processing Instruction	0.066	31	3.85	0.993	-0.414	0.421	-0.713	0.821

Table 35

Descriptive Statistics of Normality Tests for the General TGJT Posttest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.343	32	4.07	0.925	0.049	0.414	-0.346	0.809
Textual Enhancement	0.014	30	5.03	0.982	0.252	0.427	-1.15	0.833
Metalinguistic Instruction	0.243	31	5.77	1.569	0.545	0.421	0.006	0.821
Processing Instruction	0.02	31	6.38	1.13	-0.917	0.421	1.65	0.821

Table 36

Descriptive Statistics of Normality Tests for the General TGJT Delayed Posttest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.019	32	3.96	1.03	0.066	0.414	-0.611	0.809
Textual Enhancement	0.196	30	4.21	1.56	0.329	0.427	-0.463	0.833
Metalinguistic Instruction	0.005	31	5.46	1.06	1.28	0.421	2.59	0.821
Processing Instruction	0.325	31	6.24	1.23	0.401	0.421	-0.139	0.821

Table 38

Descriptive Statistics of Normality Tests for the TGJT Pretest in vs. on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.059	32	4	1.29	-0.29	0.41	-0.41	0.8
Textual Enhancement	0.081	30	3.8	1.37	-0.29	0.43	-0.46	0.83
Metalinguistic Instruction	0.058	31	3.94	1.39	-0.12	0.42	-0.76	0.82
Processing Instruction	0.058	31	3.94	1.39	-0.12	0.42	-0.76	0.82

Table 39

Descriptive Statistics of Normality Tests for the TGJT Posttest in vs. on Items

Treatment	Shapiro-Wilks	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.057	32	3.94	1.34	-0.22	0.41	-0.68	0.80
Textual Enhancement	0.23	30	4.33	1.52	-0.23	0.43	-0.39	0.83
Metalinguistic Instruction	0.15	31	6.03	1.72	0.03	0.42	-0.81	0.82
Processing Instruction	0.11	31	6.26	1.77	-0.03	0.42	-0.87	0.82

Table 40

Descriptive Statistics of Normality Tests for the TGJT Delayed Posttest in vs. on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.053	32	3.97	1.33	-0.28	0.41	-0.57	0.8
Textual Enhancement	0.27	30	4.23	1.55	-0.06	0.43	-0.63	0.83
Metalinguistic Instruction	0.25	31	4.97	1.45	0.06	0.42	-0.52	0.82
Processing Instruction	0.07	31	6.39	1.75	0.001	0.42	-0.95	0.82

Table 42

Descriptive Statistics of Normality Tests for the TGJT Pretest by vs.in/on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.055	32	3.94	1.37	-0.12	0.41	-0.68	0.8
Textual Enhancement	0.055	30	3.97	1.38	-0.28	0.43	-0.74	0.83
Metalinguistic Instruction	0.056	31	3.83	1.46	-0.18	0.42	-0.69	0.82
Processing Instruction	0.06	31	3.77	1.38	0.03	0.42	-0.84	0.82

Table 43

Descriptive Statistics of Normality Tests for the TGJT Posttest by vs. in/on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.07	32	4.21	1.29	0.04	0.41	-0.59	0.8
Textual Enhancement	0.06	30	5.73	2.26	0.28	0.43	-1.13	0.83
Metalinguistic Instruction	0.53	31	5.52	2.32	0.17	0.42	-0.44	0.82
Processing Instruction	0.26	31	6.52	2.06	-0.24	0.42	-0.54	0.82

Table 44

Descriptive Statistics of Normality Tests for the TGJT Delayed Posttest by vs. in/on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.08	32	3.97	1.64	-0.28	0.41	-0.72	0.8
Textual Enhancement	0.29	30	5.8	2.16	-0.25	0.43	0.29	0.83
Metalinguistic Instruction	0.69	31	5.97	1.87	0.05	0.42	-0.18	0.82
Processing Instruction	0.1	31	6.09	1.97	0.39	0.42	-0.49	0.82

Appendix H: Descriptive Statistics of Normality of Training of the FIB Pre, Post and Delayed Posttest

Table 46

Descriptive Statistics of Normality Tests for the General Scores of the FIB Pretest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.4	32	2.21	1.03	0.848	0.414	0.899	0.809
Textual Enhancement	0.154	30	2.45	1.34	0.612	0.427	0.051	0.833
Metalinguistic Instruction	0.083	31	2.37	1.39	0.822	0.421	0.57	0.821
Processing Instruction	0.03	31	2.19	1.09	0.879	0.421	1.15	0.821

Table 47

Descriptive Statistics of Normality tests for the General Scores of the FIB Posttest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.25	32	2.64	1.21	0.834	0.414	0.615	0.809
Textual Enhancement	0.391	30	3.95	1.39	-0.712	0.427	1.036	0.833
Metalinguistic Instruction	0.125	31	6.09	1.86	-0.039	0.421	-1.097	0.821
Processing Instruction	0.302	31	6.53	1.46	-0.068	0.421	-1.002	0.821

Table 48

Descriptive Statistics of Normality Tests for the General Scores of the FIB Delayed Pretest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.004	32	2.73	1.30	1.065	0.414	0.971	0.809
Textual Enhancement	0.261	30	4.35	1.48	0.596	0.427	0.667	0.833
Metalinguistic Instruction	0.148	31	5.29	2.18	0.278	0.421	-0.950	0.821
Processing Instruction	0.745	31	6.14	2.08	-0.198	0.421	-0.573	0.821

Table 50

Descriptive Statistics of Normality Tests for the FIB pretest in vs. on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.89	32	3.68	1.42	-0.48	0.41	0.25	0.8
Textual Enhancement	0.63	30	3.86	1.5	-0.6	0.43	0.2	0.83
Metalinguistic Instruction	0.105	31	3.52	1.69	-0.14	0.42	-0.78	0.82
Processing Instruction	0.05	31	3.7	1.32	-0.35	0.42	-0.41	0.82

Table 51

Descriptive Statistics of Normality Tests for the FIB Posttest in vs. on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.11	32	4.19	1.73	0.37	0.41	-0.19	0.8
Textual Enhancement	0.22	30	3.87	1.74	0.26	0.43	0.42	0.83
Metalinguistic Instruction	0.09	31	6.8	2.17	-0.13	0.42	-1.07	0.82
Processing Instruction	0.09	31	7.55	1.65	-0.54	0.42	0.53	0.82

Table 52

Descriptive Statistics of Normality Tests for the FIB Delayed Posttest in vs. on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	0.11	32	4.44	1.74	0.37	0.41	0.02	0.8
Textual Enhancement	0.12	30	4	1.41	0.24	0.43	0.21	0.83
Metalinguistic Instruction	0.15	31	6.35	2.02	0.2	0.42	-0.62	0.82
Processing Instruction	0.17	31	6.74	2.25	-0.33	0.42	-0.72	0.82

Table 54

Descriptive Statistics of Normality Tests for the FIB pretest by vs. in/on

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	<.001	32	0.75	1.74	2.28	0.41	4.16	0.8
Textual Enhancement	<.001	30	1.03	2.09	1.91	0.43	2.14	0.83
Metalinguistic Instruction	<.001	31	1.23	2.04	1.45	0.42	0.76	0.82
Processing Instruction	<.001	31	0.67	1.64	2.59	0.42	6.06	0.82

Table 55

Descriptive Statistics of Normality Tests for the FIB Delayed Posttest of in vs.on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	<.001	32	1.09	1.51	1.74	0.41	3.19	0.8
Textual Enhancement	0.39	30	4.03	2.1	0.31	0.43	0.24	0.83
Metalinguistic Instruction	0.25	31	5.39	2.64	0.16	0.42	-0.84	0.82
Processing Instruction	0.19	31	5.52	2.25	0.35	0.42	-0.47	0.82

Table 56

Descriptive Statistics of Normality Tests for the FIB Delayed Posttest by vs. in/on Items

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	<.001	32	1.03	1.53	1.66	0.41	2.47	0.8
Textual Enhancement	0.16	30	4.7	2.09	0.31	0.43	-0.66	0.83
Metalinguistic Instruction	0.01	31	4.23	3.43	0.39	0.42	-1.09	0.82
Processing Instruction	0.24	31	5.55	2.63	-0.15	0.42	-0.81	0.82

Appendix I: Descriptive Statistics of Normality of Training of the MKT Pre, Post and Delayed Posttest

Table 58

Pretest General Scores: Descriptive Statistics of Normality Tests for the MKT Pretest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	<.001	32	0.265	1.05	4.51	0.414	21.22	0.809
Textual Enhancement	<.001	30	0.233	0.727	3.69	0.427	14.65	0.833
Metalinguistic Instruction	<.001	31	0.306	0.781	3.21	0.421	10.60	0.821
Processing Instruction	<.001	31	0.419	0.857	2.176	0.421	4.015	0.821

Table 59

Posttest General Scores: Descriptive Statistics of Normality Tests for the MKT Posttest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	<.001	32	0.281	0.879	3.38	0.414	11.382	0.809
Textual Enhancement	<.001	30	0.4	0.758	1.948	0.427	2.766	0.833
Metalinguistic Instruction	.001	31	5.371	3.894	-0.216	0.421	-1.529	0.821
Processing Instruction	<.001	31	6.838	3.534	-0.972	0.421	-0.484	0.821

Table 60

Delayed General Posttest Scores: Descriptive Statistics of Normality Tests for the MKT Delayed Pretest

Treatment	Shapiro-Wilk	*N*	*M*	*SD*	Skewness	*SE*	Kurtosis	*SE*
Control	<.001	32	0.203	0.86	4.591	0.414	21.832	0.809
Textual Enhancement	<.001	30	0.283	0.597	2.108	0.427	3.414	0.833
Metalinguistic Instruction	0.001	31	3.161	3.36	0.852	0.421	-0.676	0.821
Processing Instruction	<.010	31	4.677	4.114	-0.019	0.421	-1.878	0.821

Appendix J: Test Assignment Order

Table 20

ABC Test Assignment Order

	Pretest	Posttest	Delayed Posttest
TGJT	A	B	C
FIB	A	B	C
MKT	A	B	C

Table 21

CBA Test Assignment Order

	Pretest	Posttest	Delayed Posttest
TGJT	C	B	A
FIB	C	B	A
MKT	C	B	A

Table 22

BAC Test Assignment Order

	Pretest	Posttest	Delayed Posttest
TGJT	B	A	C
FIB	B	A	C
MKT	B	A	C