



**The Impact of Cognitive Processes on Input Enhancement
Techniques: studying Chinese Students with English as their
Second Language.**

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Submitted for the Degree of Doctor of Philosophy
at the University of Northampton

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Declaration

This thesis includes original work by Lucy Atkinson which was completed during my registration and enrolment as a PhD student at the University of Northampton, except where reference is made to the work of others. No part of this thesis has been previously submitted for a higher degree at this or any other university.

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Abstract

This thesis investigates the effects of an instructed second language acquisition method called Input Enhancement: textual using boldface, and audio enhancement, using intonation and stress and explicit rules aimed at facilitating gender pronoun grammar structures in English as a second language. Previous research on visual input enhancement has found mixed effects, and there is a scarcity of audio enhancement research thereby requiring more empirical studies. The relationship with cognitive processes is also explored in this investigation to provide a contribution to the understanding of cognitive load in instructed second language acquisition. There has been a long debate of how effective input enhancement is (typically visual input enhancement) and to what degree cognitive processes play a role in this instructed second language acquisition method.

The present thesis reports on a methodological synthesis with a meta-analysis and two experimental studies. First, the synthesis on visual input enhancement and grammar learning was performed on available studies (published and grey literature) in a 35-year period. 29 studies were included and focused on the method and design to help explain some of the variability in findings in this group of studies. A quantitative review of these 29 studies calculating and aggregating effect sizes using Cohen's d values. The results indicate mixed effect sizes ranging from small to large, $d = 0.34$, 95% CI [0.142, 0.542]. The pre to post-test results focus on the how learners have performed from with 0.78 pre, 95% CI [0.496, 1.07]. This is a large effect and shows that students with the enhanced input texts improve from their pre-test scores to post-tests scores. Results demonstrates that second language learners with enhanced texts in the studies rarely outperform with in their comparison groups (control group/unenhanced or only text groups). Conclusions from the analysis highlight the need for an improvement in methodological practices in visual input enhancement for grammar learning including reporting research design and measures more thoroughly.

In total, two experiments were then designed and conducted with a total of 416 second language learners of English participants (Experiment 1– 311, Experiment 2 – 105) participated in voluntary sessions. Experiment 1 was a four-week study which focused on the extent to which increased textually salient enhancements to a grammar form with intermediate second language learners of English in a middle school in China. With a total of six study conditions, participants were exposed to their study condition twice in two weeks and performed immediate and delayed post-tests a week later. The magnitude of visual input enhancement in Experiment 1 revealed that the rules only group performed best in the immediate short-term and that learners with rules and enhancement created possible cognitive overload.

Experiment 2 was a seven-week study which focused on the impact of modality (visual or audio-visual) on input enhancement and grammatical rules on intake with pre-session Chinese students. Audio input enhancement was designed and tested whereby the grammar form was emphasised naturally through native speaker stress and intonation. Again, in six conditions, participants studied for three sessions a week lasting a total of two weeks with immediate post-tests and then three weeks later with delayed post-tests. In both experimental studies, the participants were Chinese learners of English. Experiment 2 found no difference between audio and visual input enhancement but may have demonstrated cognitive load in audio and explicit rules condition.

Overall, the results of the studies in this thesis shed light on the notion that input enhancement may be impacted by cognitive processes and using this method does not always achieve long-term learning. Therefore, the statistical analyses demonstrate mixed findings from both input enhancement studies but do uncover how cognitive load plays a role in situations where the learner becomes overloaded with too much implicit and explicit information. This thesis concludes by suggesting that there is a relationship between cognitive processes and input enhancement techniques. Careful design of materials and staging needs to be considered before providing this form of instructed second language acquisition method to second language learners of English. In the future, there should also be more studies on audio input enhancement.

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List of Abbreviations

AE/AIE	Audio/Aural Input Enhancement
ANOVA	Analysis of Variance
CFER	Common European Framework for Reference of Language
CG	Control group
CLT	Communicative Language Teaching
<i>d</i>	Cohen's <i>d</i> , effect Size
DV	Dependent variable
EFL	English as a Foreign Language
ES	Effect size
EFL	English as a Foreign Language
ESL	English as a Second Language
FoF	Focus on form
FL	Foreign language
GJT	Grammatical Judgement Task
IL	Interlanguage
IV	Independent variable
IE	Input Enhancement
IELTS	International English Language Testing System
ISLA	Instructed second language acquisition
L1	First language
L2	Second language
LTM	Long-term memory
Max.	maximum
MCT	Multiple Choice Task
Min.	Minimum
<i>n</i>	Number of participants
NHST	Non-significant hypothesis testing
NS	native speaker
NNS	non-native speaker
<i>p</i>	P value
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PT	Production Task
RQ	Research question
SLA	Second Language Acquisition

STM	Short-term memory
TE	Textual Enhancement
TL	Target language
VE/VIE	Visual Input Enhancement
WM	Working memory

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Glossary

Acquisition of a second language (or language acquisition)	Refers to the process of learning first and second languages naturally without formal instruction
Audio enhancement (or Aural enhancement)	Enhancing a specific grammatical form or vocabulary form using audio through intonation, stress, emphasis, or increased volume when those items are presented in input
Cognitive Processes	The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.
Consciousness raising	Drawing learner's attention to formal properties of language, for example the grammatical rules of a specific structure
Explicit knowledge of the second language	Declarative knowledge of the second language accessed during controlled processing
Focus on form	Drawing second language learner's attention to linguistic forms with a focus on meaning and communication
Foreign language learning	The learning and/or teaching of a non-native language outside of the normal environment. For example, English being taught in mainland China in their primary schools
Implicit knowledge of the second language	Procedural knowledge which is intuitive and accessed automatically. At the core of automated language processing and is the goal of second language acquisition
Input enhancement	Language input becomes salient to the learners and is used to draw learner's attention to target forms (grammar points or vocabulary) by using techniques such as bold , <u>underline</u> , <i>italics</i> and/or CAPITALS
Instructed second language acquisition	Theoretical and empirically based academic field aiming to realise the systematic manipulation of the mechanisms of learning and the conditions in which they occur to enable or facilitate development and acquisition of an additional, second language
Grammatical judgement task	Task often used in second language research where participants are presented with sentences, phrases, or works and asked to rate if it is grammatically acceptable
Language acquisition	Requires meaningful interaction in the target language, with natural communication

Learning a second language (or language learning)	Refers to formal instruction or study of second or foreign languages in a classroom setting
Meta-analysis	A quantitative statistical analysis of several experiments or studies to test pooled data for statistical purposes
Methodological synthesis	A synthesis of the methodology in an area which can describe and evaluate different designs (participants, experience, materials, length, and duration of treatment)
Noticing	Input learners use becomes intake for learning. Suggested as a necessary condition for second language acquisition
Second language acquisition	The process of development of competence and proficient in a foreign or second language
Textual enhancement	Typographical changes in a text to grammar items or vocabulary to increase the salience of those items and thus, increasing the possibility that learners will notice the target forms

Chapter 1: Introduction

This thesis seeks to fill the gap in understanding the impact of cognitive processes on input enhancement techniques among Chinese students with English as their second language. This research uses quantitative methods and experimental studies to investigate how a specific grammar item can be visually and auditorily enhanced through text and audio and the impact this has on the learner's acquisition¹. This chapter provides the background and motivation of the research, key terms used throughout the research, aims and designs and the organisation and structure of the thesis.

1.1 Background and Motivation of the Research

In 2006 it was stated in "English Worldwide", a book by Professor David Crystal (British Council, 2013), that there were approximately 400 million native speakers of English. In addition, Crystal stated there were 400 million speakers of English as a second language. Further, there were around 600-700 million English as foreign language speakers. Language features that differ between one's first and second language can pose problems for the learner and so demand more cognitive resources, such as attention and working memory when learning a second language. To better address these problems, linguists, and psychologists have sought a deeper understanding of how individual differences in people's cognitive resources such as attention and memory can contribute to the learning of a second language. This thesis helps to bring together the work of linguists and psychologists who study second language learning. The context focused on in this thesis is English Foreign Language (EFL) learners and not bilinguals. Bilinguals represent an entirely different sample as they are considered native in two languages and do not have the same learning experience as a second language learner due to their cognitive control (Kroll, 2008). Where both languages are active when learners undertake standard learning practices (e.g. reading, writing, speaking, and listening).

English language teaching has expanded in recent years, and it is interesting to focus on its worth. English UK (2017) claim that over 500,000 people of all ages visit or study the United Kingdom (UK) to improve English skills and their research suggests that English Language Teaching (ELT) generates over £1.2 billion annually in the UK (English UK, 2017). Smith (2017) indicates that around 10 million people speak English in China, a figure which is fewer than one in 100. Furthermore, Wei and Su (2012) reported on the use of English in China and found from the national survey revealed that 67.4% of Chinese who

¹ In this thesis, 'acquisition' and 'learning' are used interchangeably

possessed junior secondary education qualifications or above studied at least one foreign language (SGO, 2006).

People with a foreign-language learning experience in Mainland China had, in the majority, studied English (93.8%) (Wei & Su, 2012) and English could be the first foreign language in China in a possible future, especially as it appears that the number of English learners in China are expanding. There appears to be a desire in China to speak English as a foreign language proficiently so much so that government policy actively encourages Chinese citizens to learn a foreign language. Interestingly, English has been implemented by the Chinese government in schools from the first year of a student's education. In summary, the above statistics demonstrate how influential English as a second language is within China and for Chinese students.

The steps taken for a language learner to acquire and learn a second or foreign language are a focus in the field of second language acquisition (SLA) research. There is an abundance of research which attempts to find answers to the questions of how this second language acquisition may happen, and how language learners process a second language. The next section focuses on the variations in the difficulties with English as a second language, specific difficulties with Chinese learners of English, a short introduction to the applied and tests methods of teaching grammar and what role input plays in second language acquisition along with how it should be presented to learners.

1.1.1 Variations in Difficulties in English

Specific difficulties can occur when learning English as a second language. Some of these differences can be explained by looking at the native language and English. One obvious potential problem is that between Mandarin Chinese and English, there are stark differences between the alphabet where the English language has words made up of 26 letters in an alphabet compared to 620 stroke patterns which make up the Chinese characters (Chung & Ho, 2010). The Chinese Mandarin language contains more visual information than that of the English language, and a Chinese character has a higher amount of visual information than an English word.

As far as teachers of English as a second language are concerned, there are specific vocabulary and grammatical forms that second language learners do not seem to acquire accurately despite being taught the language for many years and having direct instruction on those forms (Kim, 2010). Grammatical forms in a second language can be challenging to acquire for several reasons: meaning, lack of the structure in the first language, and lack of learning of those forms to name a few. It is, therefore, necessary to acknowledge what

teaching and learning methods are being used in the English Foreign Language classroom; how teachers and instructors are using these methods to help the learning; and what role cognitive processing plays on these methods. As a previous teacher of English as a Foreign Language and now a Lecturer in English for Academic Purposes, I have always been interested in the idea that second language could be influenced by methods and tasks which are informed by an understanding of the learner's cognitive development and processes such as attention span, short-term memory and individual differences as per learner. Now, a specific group of second language learners of English will be explored in terms of the difficulties they face, and methods that have been used in their setting. This will then provide some context for the chosen population of learners in this research.

1.1.2 Grammar Learning

Further to the variability in learning English as a second language, and the method of input enhancement (enhancing a chosen form in second language input) which can be used with chosen grammar forms in the input. There is also the on-going debate into the learning and teaching of grammar in the second language. In sum, this debate refers to the notion of grammar teaching and whether it should be taught explicitly or implicitly.

ISLA research has demonstrated and wants to determine what type of learning and instruction method helps with language learning. Long (2017) suggested three key ways second language instruction can support second language acquisition: (1) Focus on forms, (2) Focus on form and, (3) Unintrusive input enhancement. The use of unintrusive input enhancement relies on the learner focusing on specific second language features of the enhanced form, which is usually chosen by the researcher or teacher (if in a classroom environment). Cintr n-Valent n and Ellis (2015) researched this method by studying second language Latin morphology by native English speakers. The rationale for this research was the concept that the first language relied on adverbial cues which, in turn, block learners' attention to more significant verbal morphology. Their results found that by using computer-delivered input, which was textually enhanced highlighting the cues through colour, learners paid more attention to this highlighted salient feature. This finding suggests that explicit rules-based grammar teaching is not necessary for learning.

Explicit instruction of grammar is the ability to help learners produce grammatically correct speech and such methods are technical and use memorisation and drilling in the language classroom. In this form of instruction, the focus is on the fluency of the language rather than how accurate it is. Moreover, debates exist as to whether grammar is as essential in the second language. The difficulty of English language acquisition depends on one's

native language. Krashen (1981) emphasised his input hypothesis, where it was argued that language is best learned through meaningful input and use. Scholars began to move away from the idea of grammar learning which was form-based (i.e. learners are made aware of the grammatical form of language features and use this communicatively) (Long, 1981) and to a meaning-based approach (i.e. understanding the meaning of the grammatical form before use). Focus on Form allowed learners to understand interlanguage (i.e. the learner's current version of the language they are learning) through form-function mapping (Doughty, 2001; Jung, 2018; Gardener, 2018). This form-function mapping allows the language learner to look at the meaning and linguistic form. One way to attend to this type of learning is through the enhancement of input (e.g. selected grammar forms in a text). Directly related to this thesis is the idea that grammar learning should be one which focuses on form-meaning connections. Therefore, one goal of this thesis is to focus on this teaching method - used widely in second language learning and acquisition - and explore the cognitive processing behind it. The results of this research may lead instructors to understand the nature of this teaching method better and understand some of the restraints with many of their current teaching methods.

Further to this, Malone (2016) studied vocabulary learning through reading with and without an oral voice. The findings revealed that the multi-modal condition (reading and hearing) produced better learning. As a result, Malone suggests that teachers recommend that learners read along with audiobooks to improve incidental learning. Taking account of these two short research summaries, Long (2017) claims that basic research has shown that unintrusive input enhancement works, and that controlled laboratory studies should now be undertaken.

One instructed second language method, which is at the forefront of this investigation is Input Enhancement, which is artificial and externally induced salience. Input enhancement is a term created by Sharwood Smith (1993) and was previously known as 'consciousness raising' (Smith, 1991) which refers to any intentional attempt made to draw a learner's attention to a grammatical form while at the same time directing them to process for meaning. Research on input enhancement has investigated the types of input manipulations that can facilitate the making of form-meaning connections (Rott & Williams, 2003; Kasproicz, Marsden; VanPatten, 2015). The premise of input enhancement is to direct a learners' attention to the target forms, while at the same time, keeping meaning in focus. This learning attempts to accomplish different ways for learners to process meaning, while at the same time, drawing learners' attention to the relevant linguistic form. The overall goal is to increase the saliency of the target features in the input, thereby boosting the likelihood that

learners will notice the forms. One possible way to accomplish learners' noticing of forms is through different methods of enhancing the input. Attentional processes, therefore, would play a crucial role in input processing. There are various forms of input enhancement, and the types used in the studies in this thesis are visual input enhancement and aural input enhancement. The main terms used in this thesis are described in the glossary). Figure 1.1 highlights the two instructed second language acquisition methods which are focused on in this research and originate from second language acquisition, and more critical instructed second language acquisition research.

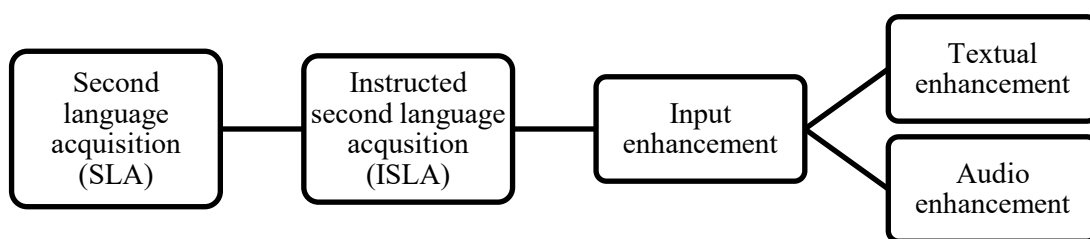


Figure 1.1. Overview of the two instructed second language acquisition methods used in this research originating from second language acquisition.

Visual input enhancement (also known as written or textual enhancement) is the means of making visual input more perceptibly noticeable to second language learners (Lee & Huang, 2008). Input is manipulated by employing typographical differences such as underlining, boldfacing, capitalisation and/or different fonts and sizes of text. By incorporating their distinctive features in texts, the target (usually a grammatical form) should become perceptually salient to the extent that processing that target is facilitated. The *noticing hypothesis* posits that for input to be processed for acquisition and consequently learning, the input must first be consciously noticed (Schmidt, 2001). The idea is that enhancing input using typographical techniques increases the chance that the visually prominent input will be noticed, processed, and will thus establish a trace in long-term memory.

To further understand input enhancement, it is necessary to take on board previous research and their recommendations (see Combs, 2004; Han, Park and Lee, 2008) as well as recognising gaps in the research. For example, more studies need to investigate issues of timing and length of study using longitudinal studies and multiple treatments (Han, Park and Lee, 2008). Furthermore, understanding the effect of these factors would help indicate how this technique activates the learner's cognitive processes in the memory stores. More importantly, it is important to define 'salience' which in the language learning world refers to the 'ease with which a linguistic term is perceived' (Ellis, 2017; Schmidt, 1990) whereas

salience in psychology refers to perception and cognition that stands out from the rest (Ellis, 2017).

Further to this, Cintrón-Valentín and Ellis (2017, p. 203) posit that "input enhancement involves relatively unobtrusive methods to direct learners' attention to non-salient forms in the input" (Doughty & Williams, 1998; Sharwood Smith, 1993). Therefore, the choice of grammar or vocabulary form used in input enhancement is essential as it needs to be a form which is considered as not being easy to perceive. This item would depend on several factors such as the learner's level and exposure to the language in different contexts, to name a couple. Further to this are cognitive explanations and findings where visual salience can improve spatial memory (Santangelo & Macaluso, 2013).

This research has chosen to use a focus on form method, input enhancement but test the difference in modality on the learners. More importantly, the motivation of the research fits in line with the primary goal of instructed second language acquisition (ISLA) which is mainly research-based and frees second language instruction of unnecessary artificial aids, helping to identify the least intrusive but still efficient means of achieving second language instructional goals (Long, 2017). This type of research has vast implications for language teaching, and there is a focus on learning, but this research and thesis will also focus on some of the teaching tools in the second language classroom.

1.1.3 Chinese Learners of English

Chinese learners are interesting to focus on when reviewing English as a second language as their native language is entirely different from the second language. Their language system and structure share few similarities with the English language (Hu et al., 2010; Wong, 2013). Moreover, Chinese culture places a significance on the value of learning (Wong & Zou, 2017). Swan and Smith (2001) go as far as stating that the English language teacher's jobs in China are highly demanding and often labour intensive. Within Chinese culture and in the student's minds, there is a perception that education and learning should be severe and that fun activities are detrimental to the learning success (Swan & Smith, 2001). Therefore, teachers within China are respected and regarded as being influential authority figures. One key difference between European and Chinese students is the use of opinions and questions within the classroom. For example, Chinese students are often not as eager to share their opinions.

Furthermore, it is apparent in China that learning, and teaching rely heavily on memory and repetition, also known as rote memory (Huang & Hoi, Teo, 2018). The idea is that learners can quickly recall the meaning of the material the more one repeats it (Huang &

Hoi, Teo, 2018). This has influenced teaching methods, the student's learning styles, and their behaviour and is something worth considering when exploring instructed second language teaching methods and acquisition with Chinese learners.

There are variations in difficulties that English language learners face depending on the language learner. For example, the problems faced by a French-speaking student and those of a Chinese Mandarin speaking student will be different. There are similarities in language between French and English, but not so much between Chinese Mandarin and English. As a result, some sources of difficulty might be articles (e.g. a/an/the) (Swan & Smith, 2001). Furthermore, another example is pronouns which are less typically in Chinese than they are in English. Chinese speakers often drop pronouns when speaking and using English (Swan & Smith, 2001). The lack of a gender distinction in the Chinese language is noteworthy (DeKeyser, 2005; Swan & Smith, 2001). In Chinese, he/she/it share the same sound. Therefore, Chinese speakers of English often fail to differentiate between these pronouns in English. An example shared by Swan and Smith below (2001, p. 318) demonstrates how typical Chinese speakers of English fail to recognise the differences between gender when utilising pronouns. For example, they may reiterate the below sentences despite being intermediate and advanced learners of English as a second language:

I've a brother, and she's working in a factory.

That is my Auntie over there, have you met him? (Swan & Smith, 2001, p. 318)

Although we can focus on the reasons behind learning a new form which is not evident in the learner's first language, research is also needed to understand what cognitive processes (memory, attention, awareness) are triggered when students are given specific second language instruction tasks. For example, those that use teacher-controlled manipulation, such as highlighting the grammar point in a task.

One method which has been utilised and incorporated grammatical elements into the instruction of a second language is Input Enhancement (audio² & visual³). This method is central to this entire research project. It is one which has been previously suggested as being an 'optimal intervention to promote learning of grammatical elements with minimal interruption to the meaning and communication-oriented language instruction' (Kim, 2010, p. 38). Input enhancement may be better understood and further developed when the cognitive processes involved are considered (Combs, 2004; Lee & Lee, 2005; Kolati & Raikou, 2017). Considerable research has been conducted in both areas of cognition and second language

² Audio enhancement and auditory enhancement are used interchangeably throughout this thesis

³ Visual enhancement and textual enhancement are used interchangeably throughout this thesis

learning. A relationship has been established for some time between cognitive processes and second language learning (Combs, 2004; Larsen-Freeman & Long, 2014; Mackey & Gass, 2015). Findings in these areas have helped to develop techniques for effective English, foreign language (EFL) and English language learning (ELL) teaching methods and understanding of the cognitive underpinnings of learning and improving the second language. For example, by understanding second language learner's cognitive systems being constrained by context and timing of the acquisition of the second language, methods used can take this into account. The context here could be the learning technique and method.

1.2 Key Terms in the Research

As already established earlier in this chapter (see §1.1), there is a consistent demand for second language learning worldwide. Research into second language and bilingualism (speaking two languages fluently) takes place in the domains of linguistics, psychology, applied linguistics and psycholinguistics, which investigates how a second language is acquired, taught and facilitated (e.g. Dörnyei & Ryan, 2015; Gathercole & Baddeley, 1993; Larsen-Freeman & Long, 1995; Schmidt, 1990; Wen, 2015, 2018). This section will now define most of the key terms used within this research and provide some context of the disciplines and pre-existing models and theories which are utilised in the research.

Linguistics is the study of language and its accompanying structures that involve grammar, syntax, and phonetics (Lei & Liu, 2019). Further to this field is psycholinguistics, the combination of psychological or neurobiological factors that impact on humans in acquiring, comprehending, and producing language (Rowland & Monaghan, 2017). There has been an effort in both fields to work together to improve the understanding of second language learning. Moving forward, learners do not always take in what they see or hear. In linguistics, input refers to what learners see visually and hear auditory, and intake refers to what learners take in. The role of attention, translating the input to intake and its importance in facilitating the processing and memory of the input is recognised (see Combs, 2004; Jung, 2009). Cognitive processes can be studied in second language acquisition and learning in a variety of activities and teaching methods such as consciousness-raising (Sharwood Smith, 1981), focus on form (Long, 1991), and analytic teaching (Lyster, 1994). Therefore, the role of cognitive processes can be applied to how learners acquire a second language and what restraints may be placed on their learning in relation to their available cognitive processes at that given time. Second language research has historically focused on conscious processes. Krashen (1977, 1982) argued that a distinction exists between unconscious acquisition and conscious learning. Contrary to most researchers, he maintains that adult second language

learners have access to the same, non-conscious innate mechanisms that guide their first language acquisition. Therefore, conscious learning has a minimal impact on the ability to acquire and use a second language.

In education and teaching, one of the potential areas that should be researched more closely in this area of second language acquisition and instructed second language acquisition is the idea of teaching methods which could lead to a deeper processing of grammar or vocabulary items (e.g. cognitive load or cognitive involvement load) (Hulstijn & Laufer, 2001; Laufer & Hulstijn, 2001; Sweller, 2017). This can be referred to as cognitive load, and the role of this could be very easily applied to input enhancement (audio and textual) where these enhancements, making items perceptually salient involves cognitive involvement.

However, other researchers suggest the importance of the role of conscious attention in learning (Schmidt, 1993, 1994, 1995; Schmidt & Frota, 1986). For example, if a second language learner consciously notices a specific grammar form in the input (e.g. in a text), Schmidt claims they are more likely to learn that aspect of the second language. Other researchers (Tomlin & Villa, 1984) suggested that attention without conscious awareness is fundamental to second language acquisition. Cognitive and psycholinguistic analyses enable a clearer understanding of the conscious and unconscious cognitive functions that underlie second language development. The role of consciousness is an ongoing debate in the psycholinguistic field, which also impacts on the discussions of the role of instruction in second language acquisition.

In summary, research on consciousness, attention, and cognitive processing as they relate to second language learning is still growing. Coupled with the idea that manipulating learners' input in their second language (e.g. enhancing specific grammar forms in a presented material), it is apparent that these input-enhancing techniques may help to engage with learners' focal attention and, therefore, lead to deeper processing. But the depth of the processing is likely to vary according to individual differences.

It was not until the 21st century that research on Second Language Acquisition (SLA) began to include a focus on the cognitive underpinnings of language input and how learners process second language components (reading, writing, speaking, and listening) (Combs, 2004). One method taken to investigate how second language instruction and teaching methods can impact on second language learners is the study of manipulating input and ensuing possible impacts on intake and learning. Attention and memory models and theories can be applied to Second Language Acquisition, including their implications for input enhancement methods of teaching and learning.

Attention and working memory are seen to have capacity limitations. When this capacity is exceeded, learning suffers (Fougnie, 2008; Mayer et al., 2007). Repetition might be a way to reduce the demands on working memory because the familiar material and meaning based content may be "chunked" and therefore require less capacity (Ericsson, Chae and Falcoo, 1980, Glanzer & Adams, 1985). With working memory being limited in capacity, this capacity may impose constraints on attentional processes. As research in this area develops and throughout the studies in this thesis, second language learners' processing of input enhancement techniques will become more evident, leading to a better understanding of second language learners' individual differences (such as attention, cognitive load, motivation) and how those may affect second language learning.

More importantly, is the notion of how these defined terms work alongside each other. Existing research on input enhancement and noticing has produced mixed results in two aspects: the impact of attentional demands and when the technique should be used (Ellis, 2010). High attentional demands sometimes help learning (Horst, 2013; Juss & Harrington, 2011) and sometimes impair learning (DeCaroa, 2018; DeCaroa, Thomas & Beilock, 2008;). It is also unclear whether optimal learning occurs from presenting input enhancement immediately following evidence that the learner has problems producing or comprehending the grammar forms (reactively) may help learning or presenting it prior to evidence of problems. Based on general evidence about which forms student may have trouble attending to (proactively). As suggested by scholars (Lee, 2007) research in this area needs to search for the answer to underlying questions of what influences learners' perceptions of enhanced forms and how the processing of these enhanced forms might facilitate second language grammar learning. Empirical work in noticing and Input Enhancement studies which employ strict psychological experimental methods will help the evidence base of this area of instructed second language acquisition.

One underpinning cognitive theoretical framework is cognitive load theory. Cognitive load research has been explored in relation to the second language (Kozan, Erçetin & Richardson, 2015; Wynder, 2017). Cognitive load theory has been a critical theory in psychological literature and application based on the idea that there needs to be a careful balance between learning materials and human cognition. The theory works on the basis that working memory can become limited and therefore inhibited when there are difficulties with the learning materials which could be due to inadequate design (Lin, Liu & Paas, 2017; Sweller, 2003). However, minimal research has been produced based on the cognitive load in relation to input enhancement. While there has been research conducted based on second language and cognitive load, there are no specific attempts to understand if cognitive loads

are associated with the different kinds of input enhancement methods. This is a gap which this research aims to fill. In the early years of cognitive load theory, researchers concentrated on the development of best practice guidelines for designing materials to help eliminate extraneous cognitive load which may lead to a decreased learning ability (Mayer & Moreno, 2003; Moreno, 2010; Paas et al., 2004 Sweller, 2005; Sweller et al., 1998).

1.3 Aims and Designs of the Research

1.3.1 Aims

As previously outlined, the research tackles an instructed second language acquisition method, input enhancement, in terms of the magnitude of the method in terms of learning by analysing relevant previous empirical studies and researching input enhancement (audio and textual) with explicit rules. The research hopes to negate some of the issues from previous input enhancement studies and provide a series of studies which focus on different modalities of input enhancement with grammar learning. Some of the findings of earlier studies have small sample sizes, and there is little research on the area of grammar learning through audio input enhancement. Thus, this present thesis attempts to address these gaps and contribute to second language classroom teaching for EFL learners and explore the role of input enhancement in second language learning. This section briefly describes the aims of the research presented in this thesis, the research questions, a definition of critical terms, the research approach, and a summary of the significance of the research. The research included in this thesis goes beyond previous research by:

- providing an up-to-date methodological synthesis of visual input enhancement and grammar,
- using true experimental designs for the input enhancement studies with the inclusion of true control groups and delayed post-test, and
- studying two different types of learners (high school and higher education).

To address research gaps in previous studies from the use of cognitive psychology in second language acquisition, this project will present the outcomes of a meta-analysis and two experimental studies. The meta-analysis focuses on published and unpublished research on visual input enhancement and aims to uncover the conditions in which input enhancement is more effective. The experimental studies will provide evidence and present findings for cognitive processes featuring in second language learning. Experiment 1 concentrates on evaluating the impacts of the grammar learning techniques of visual input enhancement and explicit rule learning. Experiment 2 builds from the previous study and findings and

incorporates the ideas of multi-modality learning with input enhancement (visual and auditory) and explicit rule learning.

The research contributes to the database of input enhancement (visual, textual, and auditory) studies on grammar learning, exploring grammar learning (gender pronouns) concerning the following variables: attention, type of input enhancement, modality, and eye gaze. This research is timely because research on cognitive processing in second language acquisition and second language learning research is a relatively new and growing area. Despite there being a small body of evidence for input enhancement and grammar learning and its effectiveness, there are no conclusive findings, and results are often mixed. This thesis examines cognitive strategies and attention associations with input-based techniques (input enhancement and audio enhancement) and more specifically, how input and intake occur within a select population of second language learners (i.e. Chinese second language learners to English). Moreover, the research investigates an area which will generate useful pedagogical implications for teachers in the classroom and use of materials such as reading texts. The longer-term aims for the topic are that it creates a piece of contributory knowledge to the psycholinguistics perspective of second language learning, and more specifically the implications for teaching English foreign language (EFL), English as a foreign language (TEFL), and English speakers of other languages (TESOL).

Three main areas which are related to this thesis are studies of input enhancement, the changing modality of learning about input enhancement focusing on visual and audio modes, and finally, eye-tracking as a measure of cognitive processing. Based on the methodological synthesis and experimental studies, this thesis recognises that within these areas, there has been limited analysis related to the cognitive processes involved when using input enhancement with second language learners. The general aim of the thesis is to contribute to the evidence on the input enhancement (both audio and textual) and explicit rules empirical base and focus on the scope of cognitive processes involved. The experimental studies in this thesis concentrate on one population of second language learners to provide homogeneity (Chinese second language learners of English). Through previous chapters, this research project concentrates on the cognitive factors which may influence the second language learning of English. The overall nature of the research project has evident strands and phases. Table 1.1 illustrates this.

1.3.2 Research Questions and Approach

The research studies in this thesis take the form of a meta-analysis (including a methodological synthesis) of studies in visual input enhancement and grammar learning over

the past 35 years, Experiment 1, and Experiment 2. Research questions are outlined in Table 1.1.

Table 1.1.

Research Questions in This Thesis

Research Questions	Meta-analysis	Experiment 1	Experiment 2
Research Question 1	How has visual input enhancement and grammar been investigated in the literature to date (1981-end of 2016)?*	Does visual input enhancement have any effects on learners' learning of English gender pronouns?	Does the type of input enhancement (visual, auditory) have any effects on learners' learning of English gender pronouns?
Research Question 2	What is the overall effectiveness of visual input enhancement for grammar learning?***	What are the effects of visual input enhancement on noticing?	Does studying explicit grammar roles of English gender pronouns alongside input enhancement have any effects on learners' learning of English gender pronouns?
Research Question 3	-	Does studying explicit grammar roles of English gender pronouns have any effects on learners' learning of English gender pronouns?	-

Note. *Research question 1 in Chapter 4: Meta-analysis was investigated through a systematic synthesis of the literature on visual input enhancement and grammar learning. **Research questions 2 was investigated through the quantitative meta-analysis.

To answer the research questions in §1.3.2, the research is mostly quantitative. The site of data collection varied per experiment and all studies were completed with two different yet similar student populations. Experiment 1 was completed in a government middle school in South China. The school was a boarding school, where students sat an entrance exam to qualify for the enrolment. Their first language was either Cantonese or Mandarin and their second language was English. All participants were between ages 15 and 18, and this school had students who had been learning formal English for between 7-10 years (in line with Chinese national primary schools). Chinese students formed a reasonably homogenous group in terms of age and English experience, thereby reducing uncontrolled and unnecessary variability associated with different cultures and their first languages. Participants from this setting were classed as being intermediate level. This level is in connection with Lee and Huang's (2008) meta-analysis where most learners used in the input enhancement studies were at an intermediate level (56%).

Table 1.2.

Details of The Research Design Used in Each Study

Experiment	Brief Description	Rationale	Context
1	Input enhancement and explicit rules	Understand the effect of input enhancement, the effectiveness, and whether it can help form processing (intake) and meaning comprehension	Effects with younger and less experienced students of English as a second language. Intermediate level of the second language
2	Input enhancement (audio and textual) and explicit rules	Understand and investigate the different effect types of input enhancement have on student's intake of the grammar form, with reference made to the modality of the input enhancement	Effects with different types of input enhancement, with the issue of modality Intermediate users of English in a university setting completed tests on computers- modality of input enhancement was varied (audio and visual)

Experiment 2 was completed at a university in the UK, where a substantial number of Chinese students' study. This higher education institution has mandatory pre-sessional academic English courses, and this was where most of the participants for Experiment 2 were recruited from. Participants in these experiments were admitted to the university by taking a six or 12-week academic English course at the university based on their IELTS scores. Their course primarily focuses on English for Academic Purposes (EAP) and general English Language. The English for Academic Purposes (EAP) part of the course focused on reading and writing, speaking, and listening. These classes included academic skills such as paraphrasing, referencing, citations, structuring essays and academic presentation skills are spread within the four parts of the curriculum. General English Languages cover vocabulary, grammar, and sentence structure. English for Academic Purposes components of the curriculum are taught based on the materials related to the specific disciplines, and language components are taught based on general English materials. All learners from these courses are regarded as the intermediate level where they possess an advanced understanding, knowledge and application of English and have had some experience in common grammatical structures. All students have a similar motivation to improve their English to support their degree studies.

All materials for the experiments were made specifically for these studies; many English learning and testing resources were used to assist with the materials development. The participants in Experiment 2 were students enrolled at the University of Northampton.

The participants belonged to B1 to B2 level⁴ according to the CEFR scale. Insights from popular English language course books were taken into consideration when designing the text topic and grammar activities to test for learning and acquisition. The language medium of instruction at the university is English, and learners are expected to possess the correct level of English once enrolled on their undergraduate (IELTS overall level of at or above 6.0) or postgraduate (IELTS overall level at or above 6.5) courses. The students from this setting were capable and had adequate English language learning to mark them as intermediate.

1.4 Organisation of the Research and Thesis

This section will provide a full overview of each chapter of the thesis. The thesis is split into eight chapters in total, including the introduction. The first three chapters provide a literature review and rationale behind the meta-analysis study, and both experimental studies of the thesis. Chapter four includes a meta-analysis on visual input enhancement and grammar learning studies from 1981 to the end of 2016. Chapters five and six include the two experimental studies with aims, methods, analysis, results, discussions, and conclusions. Chapter seven is a general discussion of all research studies with specific reference to the literature raised previously in §2 and 3. Implications, limitations and possible future research directions are discussed. To gain a more succinct understanding of each chapter, each chapter is introduced below with critical details. Next, the chapters are summarised individually by focusing on aims, objectives and strategies taken to achieve them.

Chapter one is the introduction to this thesis which includes a background to English as a second language globally, variations in difficulties with English as a second language, difficulties faced by native Chinese speakers when learning English as a second language and the demand for English as a second language and the need to overcome these difficulties. The idea that more cognitive approaches to understanding variation in learning English as a second language could help explain possible findings and variability.

Chapter two provides the literature review and outlines theoretical knowledge on second language acquisition and learning which are adopted by this study. The chapter includes studies on the acquisition of gender pronouns; second language acquisition; noticing; input processing; saliency; implicit and explicit techniques; focus on form, form meaning connections; input enhancement; types of different input enhancement; and examples of empirical research on input enhancement over the past 37 years. The chapter

⁴ These levels refer to the Common European Framework of Reference for Languages (CEFR) which are equivalent to IELTS level 4.5 to 6.5; independent users of English as a Second Language in reading, writing, speaking and listening.

ends with some of the issues related to input enhancement, especially methodological design and the role cognitive processes play in input enhancement methods.

Chapter three includes analysis of cognitive factors in second language learning and sets out to define and understand the relationship between cognitive psychology and pertinent issues within input enhancement and cognitive processes. The theoretical frameworks and methods considered are: cognitive mechanisms in second language learning, cognitive load theory, working memory theories, multi-sensory learning, cognitive architecture, concept acquisition theories eye-tracking, and individual differences.

Chapter four discusses meta-analytic reviews in the case of second language research and more importantly, their ability to help understand the effectiveness of such learning and teaching methods in this discipline. The chapter also contains a full meta-analytic review on visual input enhancement and grammar learning from 1981 to 2016 on all available studies (published and grey literature). This chapter aims to collate relevant research studies and explore the search strategies for a meta-analysis. The chapter then contains the search results and analysis (statistical and qualitative) of the magnitude of visual input enhancement.

The aim of the meta-analysis was to contribute to the methodology in input enhancement studies; the meta-analysis seemed the appropriate choice. The meta-analysis focused on visual input enhancement over a 35-year period. The 35-year period enabled a more extensive breadth of studies in comparison to the only other published and existing unpublished meta-analysis on this topic (see Lee & Huang, 2008). Findings from the meta-analysis are relevant in the discussion of how effective visual input enhancement is and how the field can move forward in terms of planning empirical work based on this phenomenon. The meta-analysis also thoroughly discusses methodological implications for visual input enhancement research for grammar learning. While the meta-analysis did not focus on other types of input enhancement (such as aural/audio input enhancement, and enhancement of vocabulary items); some of the findings and recommendations can nevertheless be applied.

Chapter five reports on Experiment 1 which focuses on input enhancement effectiveness and explicit rules with Chinese second language learners of English. The experimental study aimed to understand the effect of input enhancement, the effectiveness in terms of learning and acquisition, and whether it can help form processing (intake) and meaning comprehension. The study focused on the effects with younger and less experienced students of English as a second language at an intermediate level of the second language.

Chapter six reports on Experiment 2 which focuses on different modalities of input enhancement (visual and audio enhancement) with Chinese second language learners of

English. Rationale, methodology, results, discussion, and conclusion are offered. The aims of this experiment were to understand and investigate the effect different types of input enhancement have on students' intake of the grammar form, with special reference made to the modality of the input enhancement. By focusing on visual enhancement and audio enhancement (which is under-researched), the study set out to test the hypothesis, based on dual coding theory and multi-media learning theory, that cross modal presentation of the enhanced forms would confer a benefit to learning of the grammar form.

Chapter seven features an overview of the achievements of the thesis, outcomes of the three studies (meta-analysis, Experiment 1 and 2). Outcomes on cognitive psychology and awareness due to cognitive psychology to input enhancement are included. Reflections on the methodology are presented and potential future areas of related research and a conclusion.

Chapter 2: Literature Review - Second Language Learning and Acquisition

2.1 Introduction

This chapter begins with a reviewing existing material (theory and empirical studies) on acquiring a second language and introduces the reader to the key concepts in second language acquisition and then considers some technical descriptions of features of SLA. One of the difficulties Chinese learners struggle with grammatically is the English gender pronouns, and as this is the selected grammar form throughout the research project (see §2.2).

Second language acquisition is then discussed comprising of theoretical considerations of noticing, input (i.e. the learner's exposure to a second language in a form that enables them to acquire that language), input processing, salience, implicit and explicit techniques and focus on form. Input enhancement is introduced provided with examples and prior research on this phenomenon, including a review of relevant empirical studies. Concluding comments from the previous studies are considered. The chapter closes with comments on the issues related to input enhancement and the pedagogical implications leading into Chapter three, a literature review on the cognitive approaches to second language learning.

For the most part, this section focuses on providing a comprehensive review of the literature relevant to input enhancement methods for grammar learning and cognitive psychology implications with second language learning. The following chapter reviews cognitive psychology literature pertinent to second language learning and input enhancement. Overall, the research is timely due to the progression of cognitive processing in second language acquisition and second language learning research. The review is conducted to update knowledge on the key areas and to illustrate gaps in the research.

2.2 Acquiring a Second Language – An Introduction

A host of theories and empirical research has been undertaken on first language acquisition for many decades. Many people learn another language different from their first. This could be learning some phrases in a foreign language or learning a second language for education, career, or job prospects. Second language learner's narratives can be extremely different from one another; however, it is fundamental that a field exists to explore, research and theories on this topic. As a result, the field of Second Language Acquisition which is described by some to be influenced by Cognitive Psychology (Doughty & Long, 2003) and by linguistic principles and first language acquisition (White, 2003), began in the late 1960s. A broad

definition of Second Language Acquisition is that it is the recognised academic study of human's ability to learn a language different from their first language (Mauranen, 2018). This learning could take place as a child, teenager or as an adult, but only once the first language had been acquired (Mauranen, 2018). The past thirty years have seen a rapid advancement to the field of second language acquisition in terms of scope and methodology (Ellis, 1993; Jung, 2016; Larsen-Freeman, 2000). According to Larsen-Freeman (2000), the field can now be defined as an autonomous field. Furthermore, in the previous 30-40 years, there has been a considerable amount of research on second language acquisition and influence on the teaching of grammar.

Historically, research on second language learning has involved the conscious aspects of learning. Krashen (1982) claimed that a distinction existed between unconscious acquisition and conscious learning and was related to conscious awareness. He suggested that adult second language learners retain access to the innate mechanisms that guide their first language acquisition. Therefore, resulting in conscious learning, having a minimal impact on the ability to use a second language. However, other researchers have suggested the role of conscious attention and the necessity of it for learning to occur (Schmidt, 1993, 1994, 1995; Schmidt & Frota, 1986). For example, if a second language learner consciously notices a specific form in the input (for example, a grammar form in some text), Schmidt postulated that they would learn the second language.

Further to this claim, other researchers posit that attention without conscious awareness is essential to second language acquisition (Jung, 2009; Leow, 2012; Tomlin & Villa, 1994). Nonetheless, more importantly, are the cognitive psychological and psycholinguistic considerations made by which application of these psychological backgrounds, enables a clearer understanding of the conscious and unconscious cognitive functions that underlie language development. The role of conscious awareness is an ongoing debate in the psycholinguistic field, which also impacts on the discussions of the role of instruction in second language acquisition.

One theory well-known to linguists and researchers in this area is Krashen's (1985) theory of Second Language Acquisition consisting of four parts, Acquisition-Learning theory; Input Hypothesis; Natural Order hypothesis; and the Affective Filter hypothesis. Stemming from the 1970s, Krashen (1985) formulated his proposal for second language acquisition on his work with English-language learners in the United States. For this literature review and thesis, the Acquisition-Learning theory and Input Hypothesis is discussed.

Krashen (1985) defined the Acquisition-Learning theory as a two-system approach to language learning. He suggested that there are two systems of second language performance which are independent, the acquired and learned the system. The acquired system may also be named 'acquisition' whereby the process of second language acquisition is comparable to the first language process; a product of a subconscious process. This system is claimed to require natural communication and meaningful interaction to be successful. In contrast, the learned system may also be described as 'learning' whereby formal instruction is required and includes a conscious process.

An example of this may be knowledge of grammar rules. Krashen considers 'acquisition' as more important than 'learning'. Krashen postulated that the most necessary part of second language learning was comprehensible input (i.e. the learner's exposure to a second language in a form that enables them to acquire that language such as oral listening or reading tasks). As a result, the Input Hypothesis (Krashen, 1985) attempted to explain how a language learner 'acquires' a language, not 'learning' it. In sum, he considered that a language learner progresses in natural order when receiving language input which one step ahead of their current linguistic competency is. The notion of input was imperative as he claimed that comprehensible input was adequate for successful second language acquisition. He furthered suggested how teaching should include the +1-linguistic competence in teaching methods and dismissed explicit grammar teaching techniques.

2.2.1 Acquiring Grammar Knowledge in the Second Language

Learning and teaching of grammar in language learning and teaching has been controversial for a long time. Historically, language teaching meant that grammar was taught to develop learner's linguistic competencies. Therefore, grammar played a considerable role in language education and school education. Moving forwards, grammar teaching was overshadowed by the initial introduction of communicative language teaching (Widdowson, 1978), focusing on communicative fluency rather than linguistic accuracy. However, in recent years the importance of grammar has returned, and evidence exists that grammar teaching helps to facilitate the learning and acquisition of a language (see Ferris, 2016). The notion of this shift is interesting in Asian countries (e.g. China, Hong Kong, and Japan) and the research highlights this.

Wu (2007) claims that grammar-translation and direct grammar teaching were common approaches in Hong Kong, and grammar teaching was extremely traditional. This traditional method included a presentation-practice-presentation approach where the grammatical structure is provided to students, students practice and finally, produce the target

structure in their spoken and written discourse. This method has been heavily condemned and criticised for its practicality and evidence, demonstrating that this method does not always lead to learning. Turning to second language theories and evidence, it is often thought that grammar is best taught under communicative methods which are like how the first language is acquired.

2.2.2 Studies on the Acquisition of Gender Pronouns

To gain a better insight into a potential difficulty in English (as a second language), and an example of a grammatical form that can be used in input enhancement; the acquisition of gender pronouns along with evidence and findings from existing empirical studies will be explored in related to second language learners. Pronouns have been found to be challenging to acquire by second language learners (Reifegerste & Felser, 2017; Slabakova, White & Guzzo, 2017). Slabakova, White and Guzzo (2017) suggest that second language learners have a problem with pronoun reference, and they suggest that the reason is due to the computational complexity of the grammatical structure. Further to this claim, is the notion that the interpretation of pronouns incurs more processing cost (Reifegerste & Felser, 2017). Slabakova, White and Guzzo (2017) suggest that pronouns may be present difficulties in the second language as they do in the native language. The reasons they suggest this is due to the distinction between pronouns (him and her) acting differently to reflexives such as himself, herself. New research by Kim and colleagues (2015) used psycholinguistic techniques (i.e. eye-tracking) and found that the processing of pronouns differs from the processing of anaphors, at least for Korean speakers of second language English. This may also be true for Chinese speakers of second language English.

Further, Liang and colleagues (2018) note that behavioural research has found that native speakers of Chinese are not sensitive to gender information through words. The authors suggest that native Chinese speakers may have this condensed sensitivity due to semantic gender information in personal pronouns available in their first language, (e.g. oral Chinese). More specifically, the reason being that in spoken Chinese, speakers use the word /ta/ to voice both female and male singular third-person pronouns. Therefore, not distinguishing between she/he/herself and he/him/himself. Thus, Chinese speakers do not need to stimulate their semantic gender information when utilising pronouns (Liang et al., 2018). This may play a role in the reasons why Chinese speakers of English as their second language often omit gender pronouns in written or spoken production.

Additional to these findings is the nature of each language regarding dropping structures in a sentence. The English language is a non-pro-drop language where the

language and sentences are highly restricted by syntax and grammar. Conversely, Chinese Mandarin is a pro-drop language where pronouns can frequently be omitted, including personal pronouns. Therefore, demonstrating the difference between English and Chinese Mandarin. These reasons may help in understanding the nature of Chinese learners when learning English as a second language and sources of their difficulty. Therefore, it is apparent that additional research studies can concentrate on the acquisition of a second language and whether it is a similar process to the first language learning process. The next section reviews Second Language Acquisition as a field analysing its origins, and critical theories which are relevant to this research study.

2.3 Noticing

The Noticing Hypothesis was proposed in the 1990s (Schmidt, 1990; 1995). According to Schmidt (1995), people learning any aspect of a second language such as words, sounds, grammar, and rules) need first to notice aspects in the material that surrounds them (e.g. texts and audio). Noticing can be described as the 'brain registering new material' and being aware of a new item but that there is no real understanding of how this item works (Schmidt, 1990). A simplistic example may be a child second language learner of English who reads an English short text with all the English passive grammar structures underlined. The child in this instance would become aware and 'notice' the English passive but not yet know the full grammatical rules which surround this grammatical structure.

Schmidt (2001) suggests that second language learners learn about the concepts they attend to, and vice versa, do not learn the concepts which are not explicitly attended to. Therefore, learners who do not grasp certain parts of their second language may not be paying attention to the forms needed. Schmidt (2001) proposed the "noticing hypothesis" (Schmidt, 1990, 1995, 2001) and used the term "intake" to refer to the part of the presented material (input) that is noticed by the learner. Therefore, theoretically, two distinctions need to be made about input enhancement.

First, intake focuses on "what is registered in the learner's mind" (Nassaji & Fotos, 2010, p. 37). In contrast, the input is "sampl[ing] the target language that learners are exposed to" (p. 37). These two concepts are not directly associated, and the learner may not always take in the language form, which has been given to them in the input (i.e. a reading text). The input provides the means of providing the learners with an external piece of information, (e.g. text or a written task which thus gives the learners a taste of the target language). Therefore, proposals of input enhancement were first put forward by Smith (1991, 1993).

Furthermore, "noticing" (Nassaji & Fotos, 2010; Schmidt, 1993) coined the future for IE where grammatical "target forms" can be enhanced into more engaging visual forms. Therefore, the use of engaging (and noticeable) visual forms leads learners to notice and hence learn the target forms. That is, selective enhancement of key grammatical elements will make them more noticeable and thus more likely to form part of the intake. For example, in line with theoretical explanations, for the material that is presented to become intake and thus lead to acquisition, L2 learners must first notice the target form (Lee & Huang, 2008).

Many scholars contribute to this broader discussion of the relationship between intake and input, and a fundamental tenet is that input does not always become intake (Nassaji & Fotos, 2010; Schmidt, 1993). For this reason, the noticing hypothesis (Schmidt, 1993) suggests that attention towards input is necessary for second language acquisition. Therefore, input enhancement techniques that draw attention to target language may be facilitating for second language acquisition and learning.

Throughout the second language acquisition paradigm, there are a variety of existing definitions of noticing. These are discussed in more detail below to allow the understanding of noticing to be more apparent when input enhancement studies are discussed further in the thesis. Schmidt's (1993) definition of noticing is one which is widely recognised and heavily relied on throughout noticing and input enhancement studies. Schmidt (1993) sees noticing as a parallel to conscious awareness by being a task a learner engages with without genuinely being aware of doing. Conscious awareness in his terms is defined by awareness, intention, and knowledge.

Sharwood-Smith (1981) suggested that noticing was essential to second language learning based on prior findings and second language theories. However, Schmidt (1993) differed in his approach and theory of noticing that it remained to be either a conscious or unconscious process. On the other hand, Tomlin, and Villa (1994) engaged with attention in a different sense. They saw distinct components of attention, these being: alertness (the learner being developmentally ready for the stimuli); orientation (the actual direction of attentional resources towards different types of stimuli); and detection (the process whereby a or specific bit of information is selected). The basis of these views was reached both on theoretical and empirical evidence in cognitive neuroscience.

These differing definitions of noticing were all proposed in second language acquisition over ten years ago. In some empirical research (Ellis, 1994, 1997; Lee et al., 1997; Skehan, 1996), noticing has in ways agreed with the definition set by Schmidt (1993). Most studies claim to be investigating the role of noticing in second language acquisition as proposed by Schmidt (1990, 1993 1995, 2001). Operationalising and measuring awareness in

second language acquisition has been a vexed issue because of the methodological difficulties in investigating such complex cognitive processes while learners process second language input. In previous studies (see Polio, 2005; Sharwood Smith & Trenkic, 2001; Wong, 2005), noticing has been measured based on offline/retrospective procedures (i.e. data collected after exposure to the second language data) (such as Doughty, 1991; Leeman et al., 1995; Overstreet, 1998; Shook, 1994; White, 1998; Wong, 2003); and/or online/introspective procedures (i.e. data collected while learners are interacting with the second language data, such as Alanen, 1995; Jourdenais et al., 1995; Leow, 1997, 2001). Offline measures have been widely criticised for the low internal validity of the data, as they may not reflect truly what learners became aware of while exposed to the input (see Leow, 1997, 2001; Robinson, 1995a; Shanks & St. John, 1994). Online procedures have been operationalised using think-aloud protocols, which are also limited regarding the information they can provide.

Furthermore, analysing think-aloud protocols is considered a very delicate and sensitive procedure with questionable outcomes regarding validity and reliability (see Bowles, 2008; Bowles and Leow, 2005; Ericsson & Simon, 1993; Godfroid, Housen & Boers, 2010; Leow & Morgan-Short, 2004; Sachs & Polio, 2007; Sanz et al., 2009). For a further review see §3.5.1).

Regarding the cognitive psychology literature, theories and research can be applied to aid the explanation of noticing. Most of these theories are attention-based (Ryan et al., 2018). Tomlin and Villa (1994) propose that attention is divided into three separate but related components: alertness, orientation, and detection. The distinction between conscious and non-conscious in noticing and attention is reviewed below. Alertness is the initial stage of attention and refers to the general readiness of a learner to receive input or stimuli. Orientation represents the learner directing their attention to certain incoming stimuli and away from other input. Detection, which Tomlin, and Villa (1994) consider the most significant component of attention for second language acquisition, serves as the cognitive registration of sensory stimuli. Unlike Schmidt's conceptual framework, Tomlin, and Villa (1994) do not see conscious noticing as necessary for detection to take place. Tomlin and Villa based a large part of their model on Posner and his research team's characterisation of attention (Posner, 1994; Posner & Peterson, 1990).

Another model which embraces cognitive processing and introduces neuroscience is research from Posner and Dehaene (2000) and Rothbart and Posner (2001). Their models propose that there are three separate networks of attention which are operative in processing incoming stimuli (the orienting network, the alerting network, and the executive control network). Posner and Dehaene (2000) imply from their analysis of their neuro-data that both

genetics and the environment are two mediating factors upon an individual's attentional capacity and development of attention as a property of the brain. This suggestion helps build new information on individual variation in learner attention but also gives us ideas as to how environmental changes impact the process. Manipulation of the environment may bring about changes to an individual's attention, but the effects are not always maintained in all research studies.

Furthermore, an update on the attention research from Posner comes from an article almost 20 years after their original article in 1990, whereby Petersen and Posner (2012) update their original article due to the significant advances in the cognitive science framework. To summarise, some of the advances made are to self-regulation, network efficiency and brain training. The authors comment that it is exciting to experience the extension of their work on attention, but that questions do remain unanswered.

It is also relevant to discuss the merits of attention and capacity theories about a second language learner. Combs (2004) suggest that task complexity plays a vital role in determining how much of the second language learner's attentional resources are expended at any given moment. Controlled processes are generally viewed as being less demanding than automatic processes (see De Keyser, 2001) in their effects on the capacity of attention. Likewise, complex tasks in the L2 are seen to create attention demands that can affect the accuracy, fluency, or complexity of learner speech (Robinson, 2001). Because learners have a finite pool of attentional resources, capacity limits can be exceeded during specific complex tasks. Tasks which require reasoning and reference to many elements are more attention-demanding than tasks which require a single activity and draw upon prior knowledge (Robinson, 2001). Skehan (1998) argues that as learners' attentional capacity limits are reached, learners may begin to prioritise processing meaning over processing form. Thus, Skehan (1998) predicts that learners may begin to employ a strategy of paying attention to content words at the expense of grammatical morphology, which adversely affects student performance.

Further ambiguities of the noticing concept come from researchers who do not see the role of conscious awareness playing any part in language acquisition. Krashen (1979, 1981, 1985) suggested that second language acquisition is different from typical aspects of learning and therefore relies on theories from cognitive psychology to confirm linguist's arguments. Krashen's Monitor Model (1981) made a clear distinction between learning and acquisition. The acquisition is defined as the subconscious part of language development which is like the process of the learning the first language. Learning, on the other hand, is the conscious knowledge and learning of grammar. Krashen discusses how there is no connection between

acquisition and learning with acquisition occurring only when learners are exposed to comprehensible input. Therefore, in Krashen's model, if learners do have access to the optimal amount of appropriate and substantial input, the acquisition should happen naturally. Within this model, learning is the only used as a way of helping learners edit their speech when they have time to think about the grammar rules that they need to apply. Formal instruction, in Krashen's view, is unnecessary for acquisition. However, second language learning is a process depending on the learner's style and strategies. Empirical research has demonstrated that instruction in conscious grammar rule-learning can support the attainment of successful communicative competence in a second language (Doughty, 1991; Long, 1983, 1988).

Other relevant cognitive theories include Paradis' (1998) distinction between implicit and explicit knowledge which supports the view that learning can occur without awareness. It is stated that implicit linguistic competence is automatically and explicitly learned grammatical knowledge may only be utilised to check and is not as part of an automatic production process. When a learner develops linguistic competence, it refers to the use of the language and the automatic processes. The learner's competence is not the attention paid or awareness to different parts of the language. Supporting these views is evidence drawn from neurolinguistics, which details the different brain regions responsible for the use of implicit linguistic competence and conscious grammatical knowledge of which learners are aware of.

As reviewed, characteristics of noticing, attention, and awareness in second language are contentious (Godfroid, Boers, & Housen, 2013; Leow, 1997; Loewen & Inceoglu, 2000; 2001; Robinson, 1995, 2003; Schmidt, 1990, 2001; Simard & Wong, 2001; Tomlin & Villa, 1994; Wong, 2001). The original Noticing Hypothesis coined by Schmidt's (1990) suggested that language learners must consciously notice forms in the input for acquisition to take place. However, arguments exist where noticing conflate two other constructs, attention, and awareness. Attention has been described as detection plus rehearsal in working memory by Robinson (1995, 2003). In language learning, this implies that attention is continuous, and learners can use this to pay attention to stimuli (Godfroid et al., 2013). On the other hand, awareness, has been described as conscious recognition that has been attended to. This construct determines that people either are or are not aware of the stimuli. In summary, noticing must play a role in second language learning but that the noticing might be unconscious making it a challenge to measure with conventional reports from learners, post-hoc or while studying. Previous literature has considered that noticing is not directly testable and has never been aligned to theories of language, and more so, second language (Truscott, 1998). Truscott (1998) and others (Hejin, 2005; Truscott & Smith, 2011) imply that the

cognitive foundations noticing are related to, are weak. Therefore, one may argue that it is worth considering Truscott's where the noticing hypothesis should be reformulated and include obtaining metalinguistic knowledge but not the competence of the language.

2.4 Input in Second Language Acquisition

Input has been heavily discussed in the second language acquisition field and the foreign language field whereby successful second language suggests the importance of the quality of the input made available to the learners (Ellis & Collins, 2009; Gass, 1997; Lightbrown, 1992). One of the main discussion points of language input is the amount and type of language input necessary for successful second language acquisition (Gass, 1997). Input has long been noted of its importance in the field of second language acquisition. A fundamental question which shaped many early theories in the field was how second language learners process input when listening or reading.

2.4.1 Input Processing

Input processing is a term within second language acquisition and learning proposed by VanPatten (1993, 2004, 2007). The proposed model was put forward and based upon Krashen's original input hypothesis in 1982. VanPatten (1993) described learners who miss grammatical markers in the input (text or audio) and that using this model, learners would need to process the input before the form for meaning and comprehension purposes. The theory attempted to explain how second language learners process input, how they make form-meaning connections and how they map syntactic structures onto the utterance.

Processing Instruction was an alleged solution to the problem. VanPatten (2004, 2007) argued that learners should be taught how to process input to better acquire the underlying grammar. Therefore, the method 'processing instruction' was originated, and it required instructors to push learners to recognise the grammar in each input (VanPatten, 2004). The necessary components to processing instruction are that learners are provided with an explanation of the grammar; they are alerted to any problems they may encounter with the input (e.g. differences between the first and second language); learners engage in activities and task to further improve their understanding of the meaning of the grammar structure.

An example taken from Sheen (2007) is that of a word-order grammatical problem from second language learners. For instance, in a classroom, a teacher may have introduced 'have' in a causative manner (i.e. 'The teachers **have** the students do the task). The grammatical explanation would be provided to the learners. Then the teacher would then

engage in processing instruction whereby they would provide examples in which the learners have to understand the grammatical structure to capture the meaning of the sentence. The examples may be written or in audio format. As a result, processing instruction requires the teacher to select material for the learners to read or listen and therefore recognise the grammatical structures. This is not an easy task; there would need to be frequent and practised processing instruction.

In theory and practice, it is crucial to differentiate the terms of input processing and processing instruction. Input processing is VanPatten's theoretical model and assumes some understanding of what is happening within the brain when the second language learners receive input. A processing instruction is a teacher-related task where learners must engage in noticing the grammar of the given input. Instruction here is predicated on the teacher's explanation and understanding the underlying grammar within the input, which will be practised. Both the explanation and practice occur outside of normal communicative activities and the technique to make the input more comprehensible is more of a 'focus on formS' than a 'focus on form' one (see Sheen, 2007).

2.4.2 Implicit and Explicit Techniques in Second Language Acquisition

One current and outstanding issue in second language acquisition and mainly, second language grammar learning is the debate that centres on the effectiveness of conscious grammar rule learning or unconscious processes which see grammar as meaningful (Nassaji, 2017). In other words, the role of explicit and implicit learning through conscious information of unconscious processes (Reber, 1989, 1993).

To define these terms considering second language learning: implicit learning is without awareness and can be defined as second language learning which occurs when learners use meaningful-input, explicit learning with awareness and can be defined as second language learning that involves explicit teaching (such as explicit teaching with grammatical rules). For grammar, explicit and implicit second language instruction can be seen quite distinctively. Nassaji (2017) sets out quite clearly the difference where explicit instruction is providing language learners with clear grammatical rules including how the form works grammatically, on the other hand, implicit instruction is absent of strategies and does not make language learners aware of what they are learning.

In an exploration of the distinctions between implicit and explicit knowledge, some researchers do advocate noticing in second language learning. Researchers who support the role of awareness or noticing mainly come from the field of cognitive psychology (Reber, 1989; Shanks, 2005). It may be argued that language learning is not necessarily different

from other types of learning and a psychological perspective, noticing works as the medium between input and memory system. Some authors advocate (Schmidt, 1990; Ellis, 1999; Swain, 1985, 1995; Long; 1981, 1983, 1985) that there is no acquisition without awareness or noticing. Truscott (1998) points out a weak version of noticing by suggesting that noticing is only necessary for the acquisition of metalinguistic knowledge. Metalinguistic knowledge is the "awareness developed when learning a language, that the rules of that language (grammatical, phonological, and pragmatic) are an arbitrary linguistic code independent of meaning" (Roehr & Gánem-Gutiérrez, 2009).

Implicit learning was first introduced by Reber (1967) to help describe a process where his participants in experiments would acquire knowledge about a problematic and rule-based stimulus. The exciting notion was that participants did not intend to learn about this stimulus and not necessarily aware that they had acquired any knowledge. Alternatively, explicit learning refers to learning situations where the participants are provided with instructions to look for patterns and rules (Rebuschat, 2013). Therefore, in these explicit conditions, learning is intentional and often leads to conscious knowledge (Rebuschat, 2013). From this distinction between implicit and explicit learning, second language acquisition has been interested in these types of learning (Ellis, 1994). Prompted by Krashen's (1981, 1985) proposals of second language acquisition, an ongoing debate in second language acquisition exists between implicit and explicit (Ellis, 2007). Research studies into this area have demonstrated that explicit methods in experimental conditions can help improve the development of implicit second language knowledge. There are existing studies into implicit learning and Hamrick, and Rebuschat (2012) concentrated on implicit learning and statistical learning which found that statistical learning which is incidental is more likely to result in implicit knowledge. Some participants who used explicit strategies also acquired unconscious knowledge. These findings show that both implicit and explicit learning can occur in parallel with one another. In conclusion, this study shows the usefulness of awareness measures when researching statistical learning.

Interestingly, Rebuschat (2013) focused on implicit and explicit learning in terms of the measures which are often used in second language acquisition research (e.g. verbal reports, direct and indirect tests, and subjective measures). In existing empirical studies, these measures have attempted to measure the conscious and unconscious knowledge acquired. Rebuschat (2013) interestingly commented that there was little knowledge known on implicit second language learning with a lack of empirical studies in this area. He suggested that individual differences must be accounted for implicit and explicit second language learning, as it is entirely relevant for classroom methods and techniques. The issue of prior knowledge

was mentioned in terms of native language influences and first and second languages affecting implicit knowledge in a third language. The author also commented on the issue of input modality (i.e. auditory versus visual) where there were no current studies on this at the point of his publication in 2013. One key finding from this paper is the lack of empirical research in implicit learning in second language acquisition.

Moreover, it is claimed by Williams (2009) that implicit and explicit do not differ widely, but there are only methodological differences. Williams (2009) assumes that the term incidental learning refers to experimental conditions in which learners are not informed of what they are learning. This can also be applied outside laboratory contexts; learners can learn language structures without having an intention to learn them. In Williams' definition, explicit learning involves the intention to learn. These terms have been researched quite heavily in the literature, and some are reviewed below.

Rebuschat and Williams (2011) explored the implicit and explicit knowledge in second language acquisition in a study focused on learning an artificial language under incidental circumstances (i.e. under implicit conditions in which the learners are unaware of what has been learned). Using two experiments to investigate whether second language acquisition can occur in implicit knowledge, they used native speakers of English and a semi-artificial language made up of German and English words to investigate the learning the second language syntax. Furthermore, the role of attention, awareness and conscious awareness is associated with these different types of learning environments. Ellis (2011) argues that language knowledge gained through exposure cannot be described or explained. For example, learners are not able to rationalise the fundamental structures involved with acquiring a language. Therefore, Ellis (2011) stated these types of knowledge as implicit. Implicit learning is noted as being independent of attentional resources. Consequently, DeKeyser (1995) also previously claimed that this type of learning does not involve learners being aware of what is being learnt. An explanation of implicit learning was defined as "the process by which knowledge about the rule-governed complexities of the stimulus environment is acquired independently of conscious attempts to do so" (p. 219).

In opposition, explicit learning involves learning the rules and vocabulary of the target chosen language. The action of this learning is suggested as conscious (Ellis, 2011). Interestingly, Rebuschat and Williams (2012) mention that explicit learning requires learners to look for patterns. Thus, as pointed out by Ellis (2009), explicit learning makes heavy demands on working memory due to the memorisation of patterns. The knowledge gained through this process is considered explicit knowledge and learners are aware of what they

know (Williams, 2009). In other words, they can explain the underlying structures of what they have learnt.

As stated earlier, second and foreign language has been suggested as possibly taking place without instruction (Doughty & Williams, 1998), there is still research to be undertaken to find out what the most effective form of instruction is. Research has suggested that in both explicit and implicit instruction, attention is available for the learners, but the awareness is different (Carr & Curran, 1994; Tomlin & Villa, 1994). Previous studies demonstrate that grammatical rules are learned best explicitly (Green & Hecht, 1992). As Swain (1998) revealed, using grammatical rules, and the names of meta-linguistic terms can attract learner's attention to the new grammatical target forms. DeKeyser (1998) previously mentioned that the argument between explicit and implication instruction is unresolved. Therefore, this thesis does not attempt to show if explicit or implicit is better or more effective, the aim is to focus on the compounded effect of using explicit rules with or without input enhancement. The implication of this finding is to share and help highlight how instructions can increase learners' noticing' or attention and awareness to a target grammatical form in the classroom with explicit rules.

2.4.3 Focus on Form and Form-Meaning Connections

This section will concentrate on the linguistic term focus on form. Focus on form is one of three methods of grammar teaching, and it differentiates itself from other methods regarding the way the target structure is presented and attended. Language instructors usually implement a task-based or content-based syllabus which briefly guides learner's attention to the target language constructions as they arise in activities. These types of activities tend to concentrate on meaning or communication (Long, 1991). Focus on form instruction can be manipulated on a "FonF continuum" (Doughty & Williams, 1998) which ranges from the most explicit metalinguistic feedback, explicit explanation of the rule (i.e. explicit focus on form) to the least implicit focus on form feedback (i.e. implicit feedback). The manipulated focus on form techniques is more implicit when the salience of the target structure is enhanced, for example, typographically (see Jourdenais et al., 1995). Regardless of the orientation (implicit or explicit), focus on form works because language learners must comprehend the written or spoken merits before attentional resources (focal or peripheral) can be directed to the target linguistic structures (VanPatten, 2004).

One of focus on form's fundamentals is to encourage intermittent attention to the formal aspects of the target linguistic construction in a meaning-led learning condition. The more the learners' attention is drawn to the target linguistic form, the attended part, the part

the attention has homed in on, will have enhanced chances of reverting into successful acquisition (Alanen, 1995; Jourdenais et al., 1995; Leow, 2001; Izumi, 2002). In applying Doughty and Williams (1998) criteria for the focus on form, intervention suggests that learners must engage with meaning before they pay attention to the linguistic code. In this, target forms need to have specific attention made to them for the completion of a task. The analysis of a learner needs to trigger instructional treatment (proactively or retrospectively), and the learner's focal attention is drawn to the form briefly and overtly. For example, attention needs to be a "balance" between unobtrusive and salient.

Alternatively, focus on form is a synthetic approach to language learning and is often referred to as a gradual accumulative approach to learning. In comparison, the focus on meaning is an incidental learning process whereby attention and awareness are not apparent in the learning process. This process is like first language acquisition. It should be noted that focus on form, proposed by Long (1981, 1996) relates to the "interaction hypothesis" and is quite communicative. The Interaction Hypothesis is defined as a theory in second language acquisition, claiming that language development is promoted by face to face interaction and communication methods. Students are required to notice new target forms but also be exposed to meaning (Jourdenais et al., 1995).

Form-meaning connections are the initial encoding and subsequent retention of meaning assigned to an unfamiliar word (Rott & Williams, 2003). Han, Park and Combs (2008) suggest that research has mostly overlooked form-meaning connections. They propose that future research should concentrate on form-meaning connections within the acquisition. There are two viewpoints of form-meaning connections: (1) explicit instruction may be superior over implicit instruction due to the drawing attention abilities and creating longer-lasting changes in learner behaviour, or (2) form-meaning connections is where the form is connected under a multitude of meanings in a range of contexts; here implicit instruction will be more effective. Thus, if this distinction is not made, then the comparison between implicit and explicit instruction is not clear, and the risk of using input enhancement findings is invalid and misleading.

2.4.4 Saliency

Saliency is linked to 'Input in Second Language Acquisition' (see 2.4) as it can be achieved in the input by manipulating the text or audio for possible learning benefits for the language learner and understood from two perspectives; psychological and second language acquisition. Ellis (as cited in Gass, Spinner & Behney, 2016) emphasises that saliency in psychological research related to a stimulus standing out from the rest. If an item is salient, it

is more likely to be noticed and attended to which in turn enter cognitive processing and subsequent learning (Ryan et al., 2018). Furthermore, Ryan and colleagues (2018) express that one-way researchers have focused on attentional processing in the second language is making stimulus more salient. Regarding second language learning, the stimulus could be a vocabulary item or grammar form, which is underlined in each 1000-word text provided to students in an English class. The underlined salient items may be more likely to be attended to by students, understood, and then learned.

Furthermore, salience is often modulated by modality (Cintron-Valentin & Ellis, 2016; Gass, Spinner & Behney, 2018). Spoken and written language is different regarding processing. For example, writing can leave a more permanent visual material and speaking being more short-lived (Cintron-Valentin & Ellis, 2016). An example research study which exemplifies this difference is VanPatten (1990). This study demonstrated that second language learners of Spanish found it difficult attending to both the meaning and form of aural input (i.e. a spoken text). Participants were required to process spoken Spanish passages for meaning while also engaging in monitoring the input for chosen target forms (lexical context words such as 'inflation' and grammatical items such as the definite article 'la'). Findings revealed that monitoring grammatical items led to a negative impact on comprehension; however, attending to lexical items had no impact on comprehension. These results highlight that different modalities are processed differently and that when learners are attending to various features, there is harm to comprehension in some instances.

Furthermore, Wong (2001) replicated the original VanPatten study (1990) with the addition of a written modality condition. Findings showed that comprehension was inferior in the aural input condition when compared to the written input condition. This is further evidence that written language is more easily processed and that it can make grammatical forms more salient and thus, processed.

One way of making linguistic stimuli salient is through the widely employed 'input enhancement' method, which originates from noticing theories and 'consciousness-raising'. The next section comprehensibly discusses this method, including background information and rationale to ascertain its origin, application, and through previous empirical studies; a commentary is offered on the findings of these methods. From the literature review so far in this chapter, the following points are central to my research:

- Grammatical forms which are of difficulty to Chinese learners of English are articles, gender pronouns,
- The role of salience playing a part in the learning of those difficult forms and how much attention learners pay to salient parts of the input (text or audio)

2.5 Input Enhancement

Input enhancement will now be discussed, and the above concepts (e.g. implicit and explicit learning, focus on form and salience) will be taken into consideration when discussing this instructed second language acquisition method. The above linguistic concepts work together with input enhancement to ensure it is a practical and useful form of manipulation.

Sharwood-Smith (1981) first proposed consciousness-raising, which ultimately led to the development of input enhancement. It is a method by which educators, instructors and researchers can direct language learner's attention to chosen information in the input (Ryan et al., 2018). One example of measuring noticing is a foreign language learning teaching method called Input enhancement. Input enhancement manipulates target language input to increase the salience of certain target forms in meaning-oriented activities. From the literature and prior research studies, it is evident that there is a multitude of input enhancement methods (see Figure 2.1). Cho and Reinders (2015) introduce the concept of having more liberal forms of input enhancement, such as visual enhancement and technological enhancement. Technological enhancement is using technology to draw attention to the target object. In a 2006 study by Gascoigne, participants were subject to some second language input and transcribing the input via a computer or by pressing additional keys. Results of this study showed keyboard transcription as having a positive effect on the learner's recall of the target items. Furthermore, aural input enhancement involves the manipulation of listening materials, increasing the volume of target grammar forms, or including a short pause just before or after the target items (Cho & Reinders, 2015).

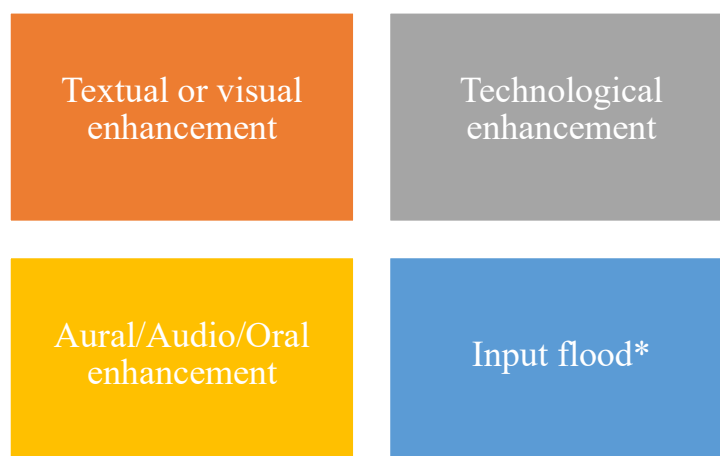


Figure 2.1. Types of Input Enhancement. Input flood is also suggested as being a form of input enhancement (Cho & Reinders, 2015; Gascoigne, 2006; Kim, 2006; Han et al., 2008; VanPatten, Williams & Rott, 2004; Ellis, 2002; Sharwood Smith, 1991).

One example is the use of textual enhancement whereby the textual target features would be boldfaced for a grammatical structure (e.g. all examples of the present tense in a written text provided to the student). While the focus is on the meaning of the text, the second language learner's attention is also likely to be drawn to the most salient features in the text, i.e. the textually enhanced (TE) target forms. Theoretically, "noticing" benefits acquisition, and although the target form (i.e. present tense) is noticed; this noticing will be in a context such as a meaning-based text given to the students. Prior research (Alanen, 1995; Doughty, 1991; Izumi, 2002; Jourdenais, Ota, Stauffer, Boyson & Doughty, 1995; Lee, 2007; Overstreet, 1998, 2002; Park, 2011; Shook, 1994; Wong, 2003;) related to input enhancement and more specifically, textual enhancement and its effectiveness, has shown three main implications: whilst it can be beneficial to students (Lee, 2007; Alanen, 1995; Jourdenais et al., 1995; Shook, 1994; Doughty, 1991), it has also been found to show no effect (Kim, 2006; Wong, 2003; Izumi, 2002; Overstreet, 2002, 1998) or even hinder students' language learning on comprehension (Lee, 2007; Overstreet, 1998). As mentioned previously, the underpinning theory for input enhancement is Schmidt's (1990, 1995) Noticing Hypothesis and despite remaining controversial, linguists' have accumulated evidence over previous years to explore how salient input can contribute to the acquisition of second language grammar and vocabulary (for example, Alanen, 1995; Lee, 2002; Shook, 1994; White, 1998; Wong, 2001).

Sharwood Smith (1991, 1993) claimed that using this method allows linguistic stimuli to become more perceptually salient and thus noticed (Gass, 1988; Schmidt, 1990). Using a "focus on form" (FonF) approach (Kim, 2006; Lee, 2007; Nassaji & Fotos, 2010) textual enhancement, a form of input enhancement which only focuses on the textual elements aims to provide "learners with correct models of the language" (Nassaji & Fotos, 2010, p. 38), for example, highlighted structures such as present perfect in each text using underline, boldfacing and so forth, in each sentence which depicts to the learners an example of how the grammar form may be utilised. Figure 2.1 illustrates this by using a bold font on gender pronouns. These example model sentences may then, provide sufficient knowledge of the target form where students can then use the form more correctly. Input enhancement originated from the ideas of Schmidt and input, not equalling intake (Ryan et al., 2018). There are a variety of different forms of input enhancement and for the nature of this literature review; textual input enhancement and audio/aural input enhancement will be discussed in this chapter.

2.5.1 Textual Input Enhancement

Visual textual enhancement (visually enhancing a grammatical form within a set text) is an implicit form of drawing the learner's attention to form in the written input (Doughty & Williams, 1998). Textual input enhancement has typically been employed with grammar items but vocabulary items more recently. For this thesis, textual input enhancement with grammar learning is discussed only (see Figure 2.2 for an example).

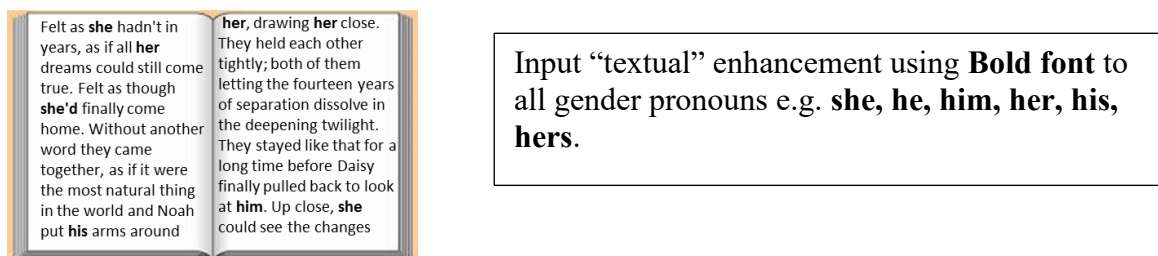


Figure 2.2. An Example of Input Enhancement – Textual Enhancement

This method has been employed to make the grammatical form more salient. It is useful because second language learners may otherwise lack sensitivity to some grammatical forms (Smith, 1991). As a result, highlighting such forms and promoting noticing may be thought to: (1) enhance input, (2) make the target form more salient, and (3) ultimately increase the opportunity for input to become intake and thus part of the long-term memory.

Nassaji and Fotos (2010) summarise how grammar can be focused through textual enhancement. Using a "focus on form" approach (FonF) (Nassaji & Fotos, 2010; Lee, 2007; Kim, 2006), (and although empirical research has been mixed), TE aims to provide "learners with correct models of the language" (Nassaji & Fotos, 2010, p. 38). These models may then, provide sufficient knowledge of the target form where students can then use the form more correctly. Moreover, this "positive" evidence differs from IE, which illustrates the incorrect forms in the input (i.e. "negative" evidence) (Nassaji & Fotos, 2010; Nassaji, 2017). Therefore, utilising input salience is useful because second language learners may lack sensitivity to some grammatical forms (Smith, 1991). Thus, highlighting such forms and promoting noticing may be thought to: (1) enhance input, (2) make the target form more salient, and (3) ultimately increase the opportunity for input to become part of the long-term memory.

Therefore, through an external "physical manipulation" (e.g. manipulation to materials by an outside agent, i.e. the teacher) (Han, Park & Combs, 2008), grammatical forms are made more salient by highlighting aspects of the input, either typographically or orally for example by increasing the volume of specific target grammatical structures and

utilised in written or oral texts (Nassaji & Fotos, 2010). Written textual enhancement texts utilise an authentic text, and grammatical forms are highlighted using the selected type of modification (i.e. bolding, italicising, underling, and different fonts) (see Figure 2.3) (Lee, 2007). Minimum target structures should be highlighted to avoid displacing the meaning process for the learners. When people read a text, the highlighted material is made distinctive and so receives more attention, possibly drawing attention away from the meaning of the text. If several grammatical forms are highlighted, the reader may lose the thread of the meaning in the text, so it is crucial for the focus of the textual enhancement to be on very limited specific aspects of the language (Wong, 2005).

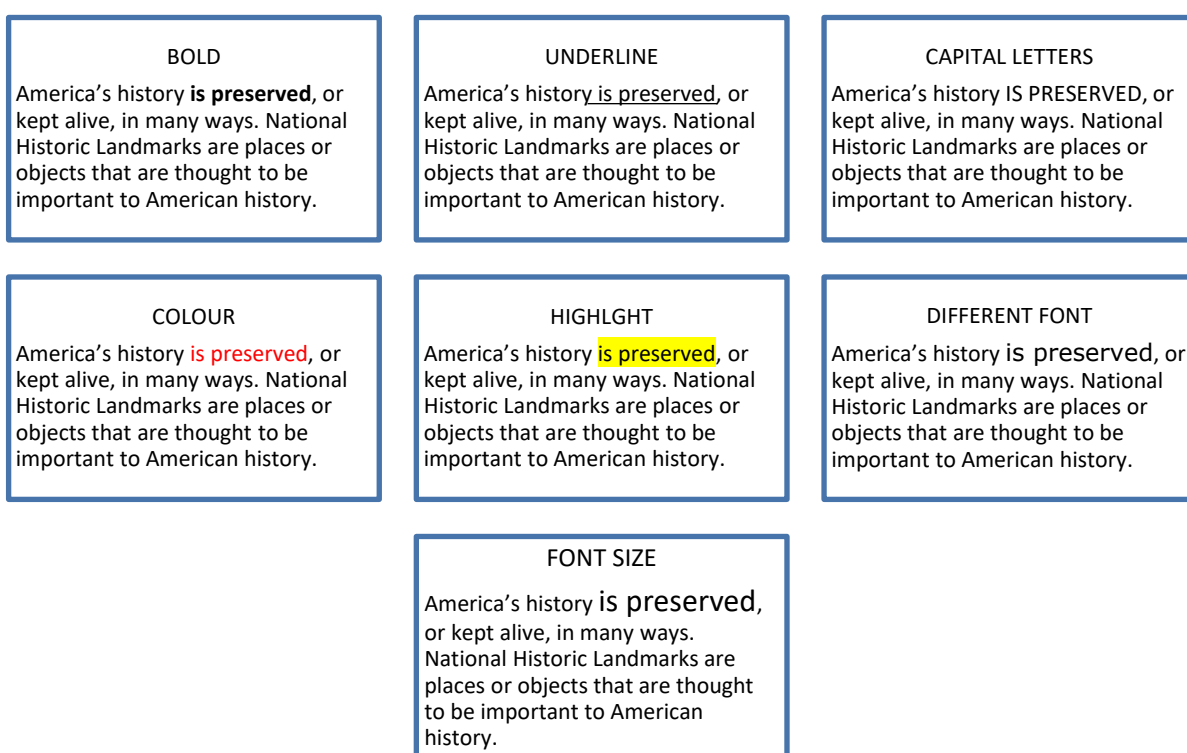


Figure 2.3. Different textual input enhancement examples making the English' passive form' salient using textual enhancement (bold, underline, capital letters, colour, highlight, different font, and increased font size)

2.5.2 Audio Input Enhancement

Aside from visual input enhancement (textual) is audio enhancement which is not as researched or published on. A different definition set by Gascoigne (2006) stated that the oral equivalent of textual enhancement could be in fact, stressed using the voice, tone, stress and intonation. There are unreported studies in this area and compared with the number of studies on textual and written input enhancement; it is surprising as this form of input enhancement

may well occur in the classroom much more frequently and could be disguised as corrective feedback or a recast.

Furthermore, Cho and Reinders (2015) put forward a case of whether audio enhancement is effective on second language acquisition. Their study focused on an under-developed form of input enhancement, aural enhancement. Their study included 72 Korean students who were engaging in an Academic English class. Students were randomly assigned to one of three classes (pause group, reduced speed group and a control group) and the research was experimentally based with the target form being enhanced; English passive. A grammatical judgment task (GJT) was administered as a pre-test and participants were then given an audio version of a reading text. The pause and reduced speed group were given artificially manipulated files, and the control group was given an original and unfiltered file. Participants listened to the story as part of their homework and were given one week to listen to the 90-minute recording fully. One week later, participants were given the GJT post-test and a noticing type task to establish if they had noticed. Participants who did not fully listen to the audiobook were excluded from the data. Their results found that learner's knowledge of the target form improved from pre-test to post-test by simply listening to the audiobook regardless of aural input enhancement. Results indicated no effect for aural enhancement on learner's knowledge. Therefore, these results highlight the discrepancy between learning and knowledge.

To further understand input enhancement, it is necessary to acknowledge the previous research and their recommendations (see Combs, 2004; Han, Park and Combs, 2008). For example, more studies need to investigate issues of timing, length of study (i.e. longitudinal studies and multiple treatments, (see Han, Park and Combs, 2008). These factors would help indicate how this technique activates learner's cognitive processes in the memory stores. With working memory being limited in capacity, this capacity may impose constraints on attentional processes. As research in this area develops, the learning processes of these structures will become clearer and give a better understanding of second language learner's differences in how attention and memory may affect second language learning.

In summary, the input enhancement technique is created to help learners notice a feature by providing the learners with typographical prompts such as bolding or underlining words as a means of drawing attention to the grammatical forms. This technique is used to make features in written input more salient with the scope to help learners notice these forms and create form-meaning connections (for a full explanation see §2.4.3). In addition, there is now an increase in oral and audio input enhancement which can be provided by using special stress, intonations, and gestures in spoken input.

Ellis (1993, 1994) splits input enhancement into three sections: (1) interpretation, which involves the grammar comprehension of the new form, noticing, cognitive comparing between learners' use of forms and correct use of forms; (2) integration that is achieved when completion of those three above phases, leads to knowledge being integrated into the implicit system - by enriching the subconscious intake (VanPatten 1996), (3) production, automatic use of the new target forms (Lee & Benati, 2007). Overall, input enhancement is useful for language development; however, input becoming intake can never be guaranteed. However, there is support for input enhancement being a type of focus on form as opposed to focus on forms (where the attention is drawn to isolated forms with no association to meaning). Overall, input enhancement can be deemed internal or external (Nassaji & Fotos, 2010; Smith, 1991). Internal is distinguished as referring primarily to techniques used in the deliberate teaching of a language and external input enhancement as the employment of ordinary events or situations (Smith, 1991). Furthermore, Sharwood Smith (1993) proposed two types of input enhancement: positive and negative. Positive input enhancement highlights salient correct forms within the input (Combs, 2004; Simard, 2018; Smith, 1993). For example, visual enhancement of a written piece of text where the chosen target forms are bolded, underlined, capitalised, or italicised. Negative input enhancement highlights incorrect forms (Combs, 2004; Simard, 2018; Smith, 1993). An example of this would be error marks which would draw learners' attention to the mistakes in a written piece of text. Combs (2004) assert that the greater the salience of form, the stronger the chances are that the second language learner will select it. Input enhancement is just one way in which input salience is increased. Therefore, some second language acquisition research has begun to propose different saliency techniques to enhance the input of linguistic forms in classroom settings. These methods can be accomplished by using strict explicit rule explanation to more implicit visual input enhancement.

2.5.3 Empirical Studies on Input Enhancement

There are several empirical studies on input enhancement which may focus on different areas of language, such as grammar or vocabulary. Some empirical studies have previously demonstrated the effectiveness of input enhancement (in whichever form: textual, auditory or both). Table 2.1 provides a summary of some of the key research on input enhancement concentrating on textual enhancement and grammar learning. Some researchers have suggested that prior knowledge of the second language form is necessary for textual enhancement to be optimally effective, for example, Jourdenais and colleagues (1995) studied learners who were formally taught the target form (e.g. imperfect verb) six weeks

prior to the study. Their results showed that textual enhancement of the imperfect verb in their text had a positive effect on the noticing of the second language form.

An influential empirical study by Lee (2007) investigated whether textually enhancing grammatical elements into meaning-focused reading classes' lead to beneficial effects on acquisition for: (1) the passive form, and (2) meaning comprehension. Participants in Lee's study had previously been taught the grammatical element through rule presentations by teachers. However, pre-test results demonstrate that learners failed to internalise the target form. Therefore, their prior knowledge of the target form (e.g. the passive voice) was underdeveloped. Moreover, results found that textual enhancement aided the learning of the forms but had an undesirable effect on meaning comprehension. Overall, this study highlights the pitfalls of using textual enhancement and some unfavourable effects. More research is needed in textual enhancement and under which conditions made it more effective for the learners. A focus on methodological design, measures (i.e. how to measure acquisition and intake of the target form) and the procedure of completing a textual enhancement study (i.e. the form of enhancement, length of study condition) are the future direction studies should be heading.

First, there have been some reviews in the form of second language instruction type and its effectiveness, and more closely related are the reviews on input enhancement and their effectiveness on learning a specific form. Norris and Ortega (2000) employed systematic guidelines to research and meta-analysis to consider research findings of second language instruction and their effectiveness. They included studies from 1980 to 1998. Overall, their results found that explicit types of instruction were far more effective than Focus on Form and Focus on Forms interventions. Their further findings suggested that the effectiveness and usefulness of L2 instruction are in fact, long-standing and that measures of outcome significantly affect the weighting of observed instructional effectiveness in the individual studies.

Plonsky and Oswald (2015) comment on several questionable items in SLA research studies. Random assignment in SLA studies, whereby it is not common in classroom-based studies (Plonsky, 2013). Use of delayed post-test is mixed in SLA research; studies reviewed in Table 2.1 do not always include a delayed post-test thus, authors cannot be sure of how long-term the effect of input enhancement is. Findings from Plonsky (2013) found 29% use of delayed post-tests in the lab and 81% in the classroom (Plonsky & Gass, 2011). Some studies fail to report their descriptive statistics (Leeman et al., 2005), making subsequent syntheses of the research very difficult.

Table 2.1.

A Review of Key Studies Demonstrating Visual Enhancement with Grammar

(Adapted from Han, Park & Combs, 2008; LaBrozzie, 2016; Lee, 2007)

Study	Enhancement (mostly textual)	Target Form	Participants	Control group?	Main Findings
Alanen (1995)	Italics	Finnish locative suffixes	36 adult learners L1 English L2 Finnish	Unenhanced group read the text No true control groups	TE had facilitating effect on learners' recall and use of the targets
Bowles (2003)	Target verb underlined, bolded morpheme	Spanish imperatives	15	?	No effect on intake and participants did not report noticing No effect on comprehension
Cho (2010)	Underline, bolded	English Present Perfect	87 high school students	Unenhanced group read the text No true control group	TE affected noticing and receptive acquisition of the English present perfect
De Santis (2008)	Increased font size and colour red to target form; increased font size and bolded target form	English Bound morphemes on present indicative verbs	15 adult speakers L1 Haitian L2 English	Unenhanced group read the text No true control group	Increased noticing of the form, no effect on orally produced forms
Doughty (1991)	Underline	English Relative Clauses	20 adult intermediate learners	?	Positive effect on the acquisition of the target form
Fang (2016)	Bolded and increased font size	English anaphors	60 EFL Taiwanese 17- year olds L1 Taiwanese L2 English	Unenhanced group read the text No true control group	Positive effect of TE, increased anaphor performance No effect on comprehension
Fukuya and Clarke (2001)	Highlighted in yellow	English Mitigation in requests	34 university students L2 English	Unenhanced watched the input No true control group	No effect
Indrarathne, Ratajczak Kormos (2018)	Bolded	English Causative had construction	19-21-year olds, studied L2 for 10 years L1 mixed L2 English	20 in the control group True control group – just performed	TE found to help participants maintain their attention after an initial exposure and to lead them to

				pre and post-tests	establish some preliminary form–meaning representations
Izumi (2002)	Bold, shadow, changed font and increase font size; underlined	English relative clauses	61 adult learners Diverse L1 background L2 English	True control group Control group only completed the pre-test, post-tests	Failed to show gains in learning, positive effect on noticing
Jahan & Kormos (2015)	?	Modal auxiliaries ('be going to' and 'will') and their use for expressing future plans and intentions	97 Bangladeshi learners in a university setting L1 Bengali L2 English	True control group Control group only completed the pre-test, post-tests	No effect on the form-mapping of target forms Enhanced & unenhanced gained more detailed, partial understanding in terms of noticing the target forms
Jourdenais et al., (1995)	Underlined and changed font for each form – shadow or bold	Spanish preterit and imperfect verbs	10 adult learners L1 English L2 Spanish	Unenhanced group read the text No true control group	TE promotes noticing of L2 form and has effect on output
Jourdenais (1998)	?	Spanish preterit, imperfect	116 adult learners with different proficiencies L1 English L2 Spanish	True control group Control group only completed the pre-test, post-tests	No effect on acquisition
Kim (2006)	Bolded target form	English vocabulary	297 adult Korean learners L1 Korean L2 English	True control group Control group only completed the pre-test, post-tests	TE alone did not aid form and meaning recognition of the words
LaBrozzi (2016)	One type of TE in each group: underline, bolded, italics, increased font size, capital letters, different font	Spanish present and preterit tense	109 learners L1 English L2 Spanish	Unenhanced group read the text No true control group	TE positively affected second language form recognition More effective with increased font size condition
Lee (2007)	Increased font, different font, bolded of target form	English passive voice	259 Korean learners L1 Korean L2 English	Unenhanced group read the text No true control group	Positive effect on learning, Negative effect on comprehension

Leow (1997)	Bolded and underlined entire verb form	English Imperative verb forms	84 Spanish adults L1 Spanish L2 English	Unenhanced group read the text No true control group	TE had no effect
Leow (2001)	Underlined verb forms; formal imperative bold	Spanish formal imperative	1 st year university students L1 English L2 Spanish	Unenhanced group read the text No true control group	No effect on noticing No effect on comprehension
Leow et al. (2003)	Underlined verb; bold tense morpheme; increased font size	Spanish present perfect	72 college level learners	Unenhanced group read the text No true control group	No effects on intake or noticing No effect on comprehension
Loewen and Inceogru (2016)	Highlight	Spanish preterit and imperfect past tense)	30 college level students L1 American English L2 Spanish	Unenhanced group Read the text No true control group	Learners aware of highlighted grammatical forms in text. No difference in the amount of attention between the enhanced and unenhanced groups Both groups improved in their knowledge of the L2 forms; no differential improvement between the two groups
Meguro (2017)	Combination of bolding and a larger font (14 point)	English Tag questions	69 Japanese learners L1 Japanese L2 English	Unenhanced group read the text No true control group	TE group 3 performed better No effect on comprehension
Overstreet (1998)	Increased font size, bold and underline; increased font size; underlined and shadowed	Spanish preterit/ Imperfect	50 adult learners L1 English L2 Spanish	Unenhanced group read the text No true control group	No positive effect for either production of recognition tasks Negative effect found on comprehension of the texts
Overstreet (2002)	Bolded, underlined and capitalized	Spanish present progressive/ imperfect subjunctive	109 adult learners L1 English L2 Spanish	?	No effects on intake but higher awareness of items with high

					communicative value
Park (2004)	Bolded, underlined, increased font size of target form	Back-shifting	?	?	No effect on noticing
Park (2011)		A selection of Korean words	30 English learners 30 Korean learners		Zero knowledge condition group showed similar noticing patterns Under some knowledge condition group – notice more input item and process them at a deeper level
Robinson (1997)	?	English novel verbs (dative alternation)	60	?	Limited effects
Simard (2009)	Different TE methods per group	English plural markers	Grade 8 French learners L1 English L2 English	?	Effects of TE differed depending on the format used
Shook (1994)	Bolded and capitals	Spanish present perfect/relative pronouns	125 adult learners L1 English L2 Spanish	Unenhanced group read the text No true control group	Subjects whose attention was drawn to grammatical items gained more linguistic information
White (1996)	?	Possessive determiners	86 children	Unenhanced group read the text No true control group	TE increases the frequency of linguistic feature use but no effect on accuracy of use
White (1998)	Bolded, underlined and italics	English third-person singular pronouns and possessive determiners	Primary school children L1 Francophone L2 English	Unenhanced group read the text No true control group	Positive effect on learning All three groups improved in ability to use the target forms
Winke (2013)	Input flood	English passive construction	L2 English	Unenhanced group read the text No true control group	No effect

Wong (2003)	Increased font, bolded, italics and underlined structure; underlined; enlarged, bolded and italics	French past participle agreement in relative clauses	81 adult learners L1 English L2 French	Unenhanced group read the text No true control group	TE not effective as a form of input enhancement on acquisition of the past participle in relative clauses No effect on comprehension
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Note. N/A Refers to the study not detailing information in the study, L2 refers to second language, EFL refers to English foreign language, TE refers to textual enhancement, and VIE refers to visual input enhancement (terms are used interchangeably)? refers to information not provided in the published or available study.

2.5.4 Conclusions Drawn from Empirical Studies on Input Enhancement

From the 31 studies centred on input enhancement (textual, audio and input floor) presented in Table 2.1, it can be concluded that there are mixed results with input enhancement. Of the studies, 15 out of the 31 presented here found enhancement to have a form of positive effect on noticing (however the study categorised this), learning or acquisition. These findings ring true of previous findings in the literature where the results are inconclusive, and there is not yet a real consensus on how effective input enhancement is among second language learners. Further research is needed to investigate why the results are inconclusive and what is really happening in the learner's cognition when under an input enhancement study condition. Interestingly, Han, Park and Combs (2008) comment on this in their meta-analysis. Their review implies that future research needs to take the path of understanding which cognitive processes are being worked when input enhancement is evident, and which leads to acquisition. The more imperative factor to consider is the role of attention in input enhancement studies.

As suggested by Combs (2005), task complexity plays an important role in determining how much of the second language learner's attentional resources are expended at any given moment. Controlled processes are generally viewed as being less demanding than automatic processes (see De Keyser, 2001) in their effects on capacity of attention. Likewise, complex tasks in the second language are seen to create attention demands that can affect the accuracy, fluency, or complexity of learner speech (Robinson, 2001). Because learners have a fixed pool of attentional resources, capacity limits can be exceeded during specific complex tasks. Tasks more demanding are ones which do require reasoning and reference to many elements. These types of task demand more attention and usually draw on prior knowledge (Robinson, 2001). One of the findings from table 2.1 and in the previous empirical studies is the negative effect that input enhancement can have on comprehension. For example, Overstreet found a negative effect on the subject's comprehension of the texts in the classic textual enhancement (through the means of increased font, bold, underline and shadow) among 50 adult learners. This finding could be explained through the possibility that the learner's attention was at capacity and while there was no positive effect found for the learner's production of recognition tasks, the comprehension was affected as reading the second language input already used the resources available to the learner. Furthermore, Skehan (1998) debates that as learners' attention capacity is reached, learners may prioritise processing for meaning over processing for form. Thus, Skehan predicts that learners may begin to employ a strategy of paying attention to content words at the expense of

grammatical morphology, which adversely affects student performance. These findings could be tied into the results of input enhancement with enhanced grammatical forms whereby learners are being distracted by the textual enhancement, and some of their processing may be comprised when they are being asked to do too many tasks (e.g. read, pay attention to meaning, and pay attention to the highlighted, salient grammar forms).

Further to this, the role of working memory and cognitive load (see Sweller, 1988) should be assessed. In Robinson's (1995, 2001a, 2001b, 2003) account of attention and memory, the processing of information from the working memory to the long-term memory involves two types of rehearsal: elaborative rehearsal and maintenance rehearsal. In one of the longer-term studies of Input Enhancement (Doughty, 1991), the effects of elaborative rehearsal may have led to her participants' greater success on the post-treatment written tasks. Because the researcher employed a variety of tasks in addition to input enhancement, it is difficult to ascertain just what long-term memory effects Input Enhancement alone had upon the participants. Nonetheless, one could argue that the very presence of multiple forms of input could trigger the cognitively higher-level elaborative rehearsal process. As elaborative rehearsal involves the activation of the learner's previous knowledge or schemata, it appears that a study that employs a variety of more explicit, semantic processing tasks (such as reading for meaning) in addition to Input Enhancement could promote better long-term memory of targeted forms.

Some of the other input enhancement studies (Leow 2001; Jourdenais et al., 1995; Robinson, 1997; White, 1998) (see Table 2.1), which attempted to introduce a targeted form, may have had less positive effects due to the learners' lack of a store of previous knowledge into which the new information could be encoded. White's (1998) study emphasised the fact that even after repeated, long-term exposure to multiple Input Enhancement treatments, her participants still did not know precisely why the targeted forms were being highlighted. This indicates that exposure to new forms via Input Enhancement alone might only activate the maintenance rehearsal process, during which the newly encoded input is stored in the long-term memory as an unanalysed chunk. As much second language learning involves chunking new information into the long-term memory, perhaps future studies of this kind could attempt to utilise a variety of treatments (both explicit and implicit), to allow for greater moments of learner analysis. In isolation, Input Enhancement may not promote conceptually driven learning processes. However, well-timed treatments, which promote a combination of data-driven learning in conjunction with subsequent conceptually driven learning, could yield more robust outcomes.

Some studies have reported a positive effect of input enhancement in language learning, while few (Leow, 1997, 2001; Overstreet, 1998) reported no effects of input enhancement. However, conclusions could become robust, generalisable and reliable if delayed post-tests were also included in the test design of most the studies. Furthermore, although positive and/or negative effects of IE reported in studies, there is no theoretical explanation describing the cognitive processes involved for the type of enhancement applied and the implications of the effect of enhancement on these processes. Moreover, there are no explanations regarding why and how one aspect of textual enhancement is more effective than another type, how much, what type and for which target form input enhancement exposure is more effective. These are some of the questions that remain unanswered (see also Sharwood Smith & Trenkic, 2001). Williams and Evans (1998, p. 139) argue that it has not been clear exactly what it means to draw a learner's attention to form or how this is to be accomplished. From a pedagogical perspective typographic, textual input enhancement has failed to provide a consensus both at a theoretical and practical level regarding which features of the linguistic forms should be enhanced, i.e. the ending of the verb, or the whole verb, or the verb in combination with the subject, when using typographic, textual input enhancement for teaching, for example, the third person singular –s; and how to enhance them better in order for the target form to become salient for the learner. For perhaps a better insight about cognitive processes involved, such as noticing, could be provided with the use of eye-tracking, which can enhance the validity and reliability of studies (see also Godfroid, Housen & Boers, 2010; Sanz et al., 2009). However, this is sometimes beyond the research design of some empirical studies.

The reader is reminded that apart from White (1998), all remaining and reviewed studies in the previous section have adopted a pre-, immediate post-test design. Post-test designs may be defined as a test given to learners after the completion of some sort of treatment condition or instructional programme. The post-test is used alongside a pre-test which enables a measure of achievement before and after the treatment or instruction. Within input enhancement research, it is usual to see a pre-test, post-test design and the post-test may be immediately after the treatment and, or delayed, sometime after the treatment to envisage if any change or learning is prolonged. There is a lack of delayed post-tests in their field of research and thus, difficult to see any long-term effects of the teaching method. More research studies are needed, whereby they have pre-immediate-delayed post-tests. In addition, most of the reviewed input enhancement studies are short in nature.

Although input enhancement has been presented as a promising teaching intervention in foreign language teaching and learning, it has failed to inform stakeholders. However, there remains ambiguity of noticing in second language acquisition. For the most part, support originates from cognitive psychology where awareness or noticing is deemed to be imperative in second language acquisition and learning.

2.6 Learning and Teaching - Related to Input Enhancement

This section will explore the issues related to Input Enhancement and implications which arise from the prior research and future research directions. These issues need to be considered before setting out to investigate input enhancement with the chosen population group. Issues considered are pedagogical implications and individual differences.

2.6.1 Pedagogical Implications of Input Enhancement

The inclusion of input enhancement within the classroom is, of course, intended to produce beneficial effects for students and language learners. Zhang (2012) examined the concept of noticing with an actual English foreign language classroom to show that it did indeed lead to those benefits. Despite some criticism from Zhang (2012) of the noticing phenomena due to extraneous variables (direct attention available, language level, speed of the presentation), input enhancement is claimed to possess teaching implications in a Chinese classroom. Zhang (2012) discusses the nature of noticing techniques as being second nature to a language teacher in pursuing effective methods to promote input into intake. The author further confers that instructors should be provided with good resources such as textbooks and additional materials where input enhancing methods can be multiplied.

While there has been previous research in input enhancement methods and testing their effectiveness, it is useful to apply the teaching method to a real-life authentic classroom. One method which is easily used and adaptable within teaching is to construct conditions for noticing in instructional materials by highlighting linguistic features; that is, to investigate the effect of noticing through visually enhancing using bold-font, underlining or larger font (called input enhancement) (Smith, 1993). Learners who are exposed to these modified input materials are assumed to have noticed the target points. For example, Doughty (1991) found that learners who were given materials with relative clauses outperformed another group receiving no highlighting when tested on their comprehension of the texts and their knowledge of relative clauses.

Furthermore, Alanen (1992) investigated the effect of different conditions on noticing, namely: explicit teaching, input enhancement and control condition (no condition). However, the result in Alanen's study showed that there was no significant difference between the enhanced input condition group and the control group. Therefore, Fotos (1993) postulated that both task and formal instruction were equally effective in promoting noticing. Relating these two forms of instruction back to a language classroom, formal instruction is adopted by many language instructors. With reference to China, it is reported that their English language teaching methods are centred around a formal instruction method, and arguably appears to work (i.e. relating to their overall education results and abilities of their students).

The second method asks learners to report what they had noticed during task completion retrospectively. Retrospective reporting of the learning during task can be measured using think-aloud protocols. Think aloud protocols are defined as data being gathered when participants report the content of their immediate awareness during a reading session (Davis & Bistodeau, 1993). Researchers have attempted to assess the extent to which learners have noticed highlighted input by examining retrospective think aloud. Think aloud is the process of data collected while learners are interacting with the second language data. A study aiming at investigating effects of input enhancements of preterit and imperfect verb forms in Spanish found that 14 L2 adults receiving enhanced input made more reference to these forms during think aloud on a subsequent production task than on learners who had not received input enhancement (Jourdenais et al., 1995). Therefore, suggesting that input enhancement does have the capacity to be in short-term memory.

The third method is to infer noticing from observable interactions such as negotiation of meaning during task completion. Many studies have investigated noticing in oral discourse by observing learner's conversational adjustments (Larsen-Freeman & Long, 1991), request for modified input (Ellis, 1995), and language-related episodes (Swain, 1998). Researchers believe that conversational adjustments signal miscommunication which draws learners' attention to the language during otherwise meaning-focused activity (for example, Gass & Madden, 1985). However, noticing is rarely observed directly, thus making it difficult to generalise findings. Input enhancement, for example, is an "external approach to noticing" (Schmidt, 1993).

Consequently, think aloud protocols have been conducted in many instances where learners have received the input (Bowles, 2010). However, these reports and retrospective interviews are not without criticism. Participants are usually resistant to verbalising a problem

and think aloud protocols are difficult to identify changes in behaviour due to learning. The protocol works based on the subject verbalising their actions. Participants need to have some prior training in the think aloud practice before the final trial. In contrast, researching noticing through conversational changes has been more desirable. Swain (1998) implies that it is essential in empirical studies to test what learners do, not just what the research assumes instructions and task demands lead learners to focus on.

Therefore, from Zhang's (2012) research, there is yet to be a shared view on noticing in the classroom and moreover, noticing in second language acquisition. This is mainly due to the unobservable methodological nature of noticing. In addition, noticing levels can be affected by many other variables (e.g. motivation to learn the second language and attentional resources available). However, there have been several pedagogical implications, especially for China.

Implications in China, for example, imply that second language learning usually takes place in the classroom. Within these classrooms, the teacher is the central figure. The students learning the second language are strongly influenced by teaching practice and methods. Therefore, teachers can promote effective instructional methods to make input become intake. This promotion may be through input enhancement techniques (which this research project is largely concerned with), input flood, and explicit teaching (Wong, 2005). Using a communicative teaching method which aims to help raise students' fluency, teachers are increasingly concerned with making sure students understand the forms. For example, within China, one main concern is the comparisons of exam performance levels across institutions and where an advantage of helping to raise students' habits of observation and noticing of forms would be beneficial. Alongside the factors which may influence noticing (see Schmidt, 1990; Skehan, 1998 who suggest perceptual salience, instruction, and frequency to name a few) teachers should try every effort for attention to be raised to these methods but also the incorporation of good textbooks can help. Textbook authors, editors should provide the teachers with good materials. The combined effort of both factors would essentially lead to better learner and results in the second language learning. In summary, the usefulness and practicality of input enhancement and raising awareness to noticing is applicable to the second language classroom in a culture that thrives on learning English as an additional language.

2.6.2 Other Issues Noted and Research in This Field

Textual enhancement and comprehension are related and may be detrimental to each other. Han, Park and Combs (2008) claim that some existing studies have attempted to create a meaning-oriented environment. Studies which do this have their participants answer comprehension questions before the study treatment condition (Alanen, 1995), provide vocabulary assistance to their participants (Williams, 1999), written recall summaries (Izumi, 2002) and somewhere rigorous design makes enhancement not so evident, so the participants are not distracted from reading (White, 1998). More rigorous designs include comprehension in the post-test where participants take a comprehension test (Leow et al. 2003). Han, Park and Combs (2008) argue for the need for pre-test post-test of comprehension measures as a dependent variable. Moreover, there is also the issue of what type of comprehension is trying to be measured by researchers if at all they include a comprehension task. Local comprehension is suggested as a factor rather than global comprehension. Testing for local comprehension would mean only the part of the text read is being incorporated.

More importantly and much more rigorously involved in all input enhancement studies is the issue of which target grammatical form should be chosen. In much of the instructed second language acquisition research, evidence shows that not all grammatical forms are the same in terms of the effectiveness of instructional activities. The type of form can change the effect of an intervention through mutual interaction. This mutual interaction maybe with other variables: the demands of a task or test, learner proficiency, prior knowledge of the form, familiarity, and the available resources in terms of pragmatic information. Therefore, the forms which may benefit from input enhancement is not entirely evident. Some have suggested the need for enhancing a meaning bearing form (as in Leow et al., and Shook's research) whilst others suggest there is no need to enhance a meaning bearing form (Wong, 2003; Shook, 1999).

Issues of prior knowledge of the enhanced form seem to interact with the impact of input enhancement (Han, Park & Combs, 2008, pp. 608-609). Previous TE studies employ participants who possess some PK of target forms (e.g. Kim, 2006; Wong, 2003; Izumi, 2002; Overstreet, 2002, 1998; Jourdenais et al., 1995), participants who lack PK of target forms (Alanen, 1995; Shook, 1994) or participants with varying levels of PK (Park, 2011) (see Table 2.1). The previous studies vary in the participant's prior knowledge of target forms. Consequently, three main findings are offered for the relationship between TE and PK of the target forms by the authors: (1) TE alone is more effective for learners with some PK of the form (2) TE may induce

noticing but not understanding and, (3) compound enhancement (e.g. TE alongside other strategies such as corrective feedback) are much more effective for noticing and deeper processing (Han, Park & Combs, 2008, p. 609).

Input flood is a method of input processing by which a text is littered with as many examples of the target form as possible. However, there is a difference between input flood and input enhancement. The difference is that input flood takes the form and will feature it more heavily than a normal text. The form in this sense is not made typographically more salient, and it only includes the form in excess.

As a result, the overuse of textual enhancement can have a detrimental effect on learners making the optimal use of the implicit learning method (Kim, 2010). For example, methodological design plays a huge role in overuse. Researchers need to understand the implications that overuse can have. In one text where target forms are enhanced, these forms need to not go over a set amount, i.e. from the last published meta-analysis on visual input enhancement (Lee & Huang, 2008), the average number of words that treatment length was (of the 16 studies, only 15 studies reported) 1,062 words. As a result, some points from the above issues mentioned relevant to this thesis are:

- Methodological design including participants, prior knowledge, treatment length, number of exposures to study condition, and the discrepancy between input flood and input enhancement must be considered in the design of the input enhancement technique.

2.7 Interim Summary

In this chapter, I have found that the field of second language acquisition the mixed effectiveness of using the instructed second language method, input enhancement, with second language learners. Through the review of previous studies, it is evident that there needs to be further investigation into how effective this method is and the reasons for the variability in effectiveness for language learners. A meta-analysis in visual input enhancement and/or audio input enhancement could assess the magnitude of the method for grammar learning using effect size and synthesising the different methodological differences between study. There is also the need for more research into input enhancement but from different modalities such as visual and audio, and the role of explicit grammatical rules in combination with input enhancement and in isolation. It could be strongly argued that there is a lack of research on audio (input)

enhancement and no conclusions about whether this type of instructed second language acquisition method can be useful to second language learners and in the language classroom. While reviewing the existing studies on input enhancement (mostly visual or textual), the non-consensus of how effective it is maybe down to the variation between learner's cognitive processes. For example, there may be a benefit or neglect of cognitive processes while the learner uses the input enhancement method. This variation can be explained and demonstrated through several cognitive psychology points which will now be reviewed in Chapter three, and the contribution of my research will be explored and included.

Chapter 3: Literature Review - Cognitive Approaches to Second Language

3.1 Introduction

As identified in the previous chapter and literature review on second language learning and more importantly, input enhancement, there is a relationship with cognitive processes. Input enhancement relies on the principles that increasing salience of target forms (grammar or vocabulary items) promotes attentional processing which is considered necessary for second language learning. However, a less researched and less known area is the idea of deeper processing (e.g. cognitive effort and the engagement with prior knowledge) which plays a role in learning the second language but also in the effectiveness of input enhancement. This chapter reviews relevant literature from the cognitive psychology strand of this thesis describing some of the cognitive psychology framework adopted. This research lies in the fields of Psychology (primarily Cognitive Psychology) and Linguistics disciplines as it addresses cognitive underpinnings of learning and improving the second language. In short, the issue of cognitive processes within second language learning needs to be explored further, and the critical issues have been explored in the following literature review.

Given what was reviewed in §2 in relation to second language learning methods and input enhancement, this chapter tries to engage and apply some cognitive psychology perspectives to learning (e.g. perception, change blindness, multi-media learning, cognitive load) to the underlying process of how input enhancement might work. In sum, with my understanding of cognitive psychology and language learning, I have noticed the inadequate explanation of cognitive processes within the input-processing method named *Input Enhancement*. Moving forward, the next section will review important and related areas of cognitive psychology (perception and change blindness) which can help to understand the cognitive processes involved in learning a second language.

3.2 Exploring Cognitive Factors in Second Language Learning

Cognitive factors can mediate and hinder second language learning. These include mental processes such as attention, perception, language usage and memory (DeKeyser, 2007; Neisser,

2014). Each of these factors will be introduced in the below sections and reviewed in relation to second language learning.

3.2.1 Attention

With specific reference to attention for this review and in second language learning, many scholars cannot find a clear central definition (e.g. Schmidt, 1990; VanPatten, 1996). Notable contributions to attention and second language acquisition are from Indrarathne (2016) and Indrarathne and Kormos (2016). They note that the conceptualisation of attention in the second language acquisition field is unclear. A vague understanding of attention and all its associated terms (e.g. awareness and consciousness) is a shortcoming, especially in input processing literature and research.

Indrarathne, Ratajczak and Kormos (2018) have extended their research into cognitive processes and input utilising Eye-tracking methods. Their study focuses on the changes in second language processes of grammatical forms in implicit and explicit conditions. Using 77-second language learners of English and input of a reading text with seven examples of the grammatical construct in two conditions (input flood or input enhancement), their results found a significant effect between the two variables; total fixation rate and the instruction. A key finding was that in the textually enhanced conditions, learners attentional processing decreased.

Empirical findings from Indrarathne (2016) focus on elements of cognitive processing in input processing. This research study used input flood and input enhancement among second language learners of English in Sri Lanka and found that a high working memory capacity allowed learners to direct more attention to the target forms (Indrarathne, 2016). Indrarathne's thesis was a positive move in the direction of understanding cognitive processes with input processing methods and pinpoints that more research is needed with aural input enhancement; to assess the different types of input enhancement and what success they have with the learners.

Previously, in the Second Language Acquisition field a cognitive model of second language acquisition was introduced by Ellis (2006). He suggested that the field had been studied from a cognitive psychological viewpoint for over three decades and demonstrated that the two areas shared similar knowledge, understanding and methods. Ellis referred to the idea of the Associative-Cognitive CREED which can be defined as Construction-based, Rational, Exemplar-driven, Emergent, and Dialectic. The underlying argument is that learning a language is like the way we learn in everyday life. Second language acquisition is therefore suggested as

being ruled by the general principles of learning which are associative (e.g. learning from a behaviourist perspective) and cognitive (e.g. learning from a conscious, deductive, and explicit perspective). Attention is an important concept to define in second language acquisition and very necessary for understanding certain forms of instructed second language acquisition such as input enhancement (Schmidt, 2001). Input enhancement theory is driven by attention claims whereby salience (the highlighting of the input to draw the learner's attention to the form) and learning

3.2.2 Perception

Prior research exists in perception which can be applied to the field of second language. Brewer's (1984) work in the 1970's provided early examples of the perception idea where 'if we do not expect to see something; we often do not see it'. This older theory could relate to the instructed second language acquisition method of input enhancement. Input enhancement is the notion of enhancing parts of the input for learners to increase their 'intake' and learning of the enhanced part. In layman's terms, it is enhancing typographically or audibly a chosen language part (grammar or vocabulary items). If a teacher using input related methods whereby, they are adding or changing to the original input (e.g. text or an audio file), learners may not notice any difference to the input if they have not been guided or expected it to happen.

3.2.2.1 Change Blindness

Further to perception is the theory of Change Blindness which is relevant to second language and further argues that very little of our input is intake. Change blindness is a phenomenon which lies in the perception field. This theory shows how narrow our range of attention is and the effects it may have on our attention (McConkie & Currie, 1996; Simons & Levin, 2007). Studies have shown that large changes can be made to a picture without learners even noticing them. Change blindness has been investigated for several years where the initial experiment carried out by McConkie and Currie (1996) prompted such interest. Their participants looked at high-resolution, visual scenes in colour on a computer with eye movements measured. The computer enabled modification to the scene where the observed looked. An example may be where the observer looked from the door of a house to the window, say, the window (or some other element of the scene such as the sky, or the car parked in front of the house) changed in some way: it could disappear, be replaced by a different element, change colour, change position.

Findings show that when eye movement occurred, large changes to the scene on the computer could be made without participants noticing them. Parts of the image that took up a fifth of the area would not be seen by observers. Scholars have attempted to explain this phenomenon by reference to the brain mechanisms which are used in combination with successive eye fixations to help form an integrated view of the visual world. More specifically, each eye move makes retinal images shift. A brain mechanism may help each shift to generate a constant view of the world. However, this mechanism might be imperfect and consider differences in visual content across the shift which explains why saccade changes sometimes go unnoticed.

Further empirical work by Resink, O'Regan and Clare (1987) highlighted alternative findings. Their experiments found that change blindness is not related to eye movements per se. In their work, Resink et al. (1987) utilised a flicker technique which was used between consecutive images. For example, the first picture (A) is shown for, 250 milliseconds, followed by a modified picture (B). In between A and B, a brief blank screen would be shown. This would cause a flicker, lasting about 80 milliseconds, that is, a duration like that of an eye movement. The cycle A-bl-B-bl-... was then repeated. Observers were told that something was changing in the picture every time the flicker occurred, and they were asked to search for it.

The phenomenon of change blindness has inspired strong claims about visual attention, visual memory, and awareness. For example, some researchers have argued that change blindness implies that internal visual representations are completely absent (O'Regan & Noe, 2001), and others have suggested that it implies that our representations of visual scenes are sparse or incomplete (Rensink et al., 1997; Simons & Levin, 1997). These conclusions are intriguing because they run counter to traditional models of perception, in which a complete representation or internal model of a scene is constructed from multiple views of it. Instead, these conclusions rely on the idea that there is no need to form internal representations in normal scene perception because the world can serve as a "memory store." However, recent thinking about the possible causes of change blindness shows that change blindness does not constrain the extent of completeness of our visual representations; change blindness could still occur even if our representations were rendered with infinite precision. Successful change detection requires both a representation of the scene before the change and a comparison of that representation with the scene after the change and change blindness could occur because of a failure of this comparison process rather than (or in addition to) a failure to represent the pre-change scene.

Consequently, although representations are needed to detect a change, the failure to detect change does not imply the absence of a representation.

As stated by Simons and Ambinder (2005), the findings and discussion around change blindness must not be taken out of context and conclusions should not be exaggerated. Regardless of whether mindsight and implicit change detection exist, care must be taken not to overstate the conclusions drawn from change-blindness research. A failure of conscious change detection need not imply the absence of visual representations, and it might not reflect the absence of all forms of change detection. So, what can we conclude from change blindness? Although change blindness does not imply the absence of representations, it does imply that whatever representations are maintained do not contribute to conscious change perception. Such failures could result from limitations on the capacity of attention: Even if we have sufficient representations to potentially detect a change, the change will go unnoticed if we do not attend to the changing object. Or the failures could imply limitations on the comparison mechanism used for change detection: Unless we explicitly compare the changed information before and after the change, it will go unnoticed regardless of how much information we represent. The contribution of these different mechanisms to both change detection and change blindness remains an open and important area of exploration. Regardless of which mechanisms contribute to change blindness, the phenomenon itself is still theoretically significant—our conscious awareness of our visual environment is sparse even if our representations of it might not be

More importantly is what can be inferred from the Change Blindness theory in terms of second language acquisition. The phenomena as first discussed many years ago, but there has been a surge in empirical work since the 1990s (Simons & Ambinder, 2005). Therefore, change blindness theory allows understanding as to why very little of our input is actual intake. This theory can be applied to second language learning and can help to interpret the effectiveness of some of the input processing methods currently used in teaching such as input enhancement.

3.2.3 Concept Acquisition Theory

A further theory that lies in cognitive psychology, and one that may be used to help explain the effectiveness of input enhancement is concept acquisition. This is where the target forms may be like concepts. A rule-based approach to concepts is Bruner, Goodnow, and Austin's (1956) hypothesis-testing approach. Their approach differed from the behaviourist approaches where concept learning involved the passive acquisition of an association to a stimulus (the object that

was going to be recognised) and the response (verbal response or labelling). Bruner et al. (1956) argued that concept learning involve forming active hypotheses and testing. In one of their experiments, participants were shown flash cards varying in shape, colour, number, and borders (Bruner et al., 1956). The task was to discover rules for categorising the flashcards by selecting cards to be tested and by receiving feedback from the experimenter indicating whether the selected card fit the categorising rule or not. The researchers documented different strategies for selecting cards, and a considerable body of subsequent work showed large differences in how easily acquired are different categorisation rules (e.g. Bourne, 1970). For example, a conjunctive rule such as "white and square" is more easily learned than a conditional rule such as "if white then square," which is, in turn, more easily learned than a bi-conditional rule such as "white if and only if square."

Parallel developments on artificial categories were explored in Katz and Fodor's (1963) semantic marker theory of compositional semantics within linguistics. In this theory, a word's semantic representation consists of a list of atomic semantic markers such as +Male, +Adult, +Physical, and -Married for the word "Bachelor." These markers serve as the components of a rule that specifies when a word is appropriately used. Each of the semantic markers for a word is assumed to be necessary for something to belong to the word category, and the markers are assumed to be jointly sufficient to make the categorisation.

Concept acquisition theory states that any interference with retrieval would hurt the rate of concept acquisition (Bourne, 1979; Bourne et al., 1956). Therefore, in an input enhancement study, subjects in enhanced study conditions typically have the enhanced text multiple times, and then post-tests are performed. If concept acquisition is applied here, the memory may be significantly involved. Bourne et al., (1976) further suggested that in a concept-acquisition study, the subject requires some details about the feature values of their stimuli, making positive and negative instances of the concept. When subjects classify these new instances, they use their memory to determine values in the past, and ones that have appeared consistently. Therefore, this relates to input enhancement studies and how often the instance or enhanced grammatical form appears in each text. Bourne et al.,'s (1976) frequency theory highlight that the frequency of various stimuli and that their values attributed to them by the subject are unique when compared to the irrelevant ones that are just based on differential frequency. As Bourne et al. (1976) further suggested subjects can uncover the relevant values by keeping track of their frequency in positive and negative instances. In application to input enhancement, learners may

monitor the enhanced forms and sort them into categories, (e.g. if articles are all enhanced, the subject may keep values associated to “a,” “an” and “the”). Therefore, memory is proposed as the underlying component of the gaining of concepts, and similarly may be the key component in input enhancement.

One suggestion is that languages spoken by an individual may influence the types of concepts that one is capable of learning. The Linguistic Relativity Hypothesis by Whorf (1956) was in fact based on differences between English and Native American languages in their terminologies of ideas such as time, motion, and colour. For example, Whorf proposed that learners of the Hopi language have no concept of time due to the fact this language demonstrated no mechanism for talking about time. However, Whorf’s linguistic analyses have since been discredited (see Pinker, 1994), but his theory remains controversial. In application to the concept acquisition theory and input enhancement, it would be necessary to consider whether the grammatical form was chosen to be manipulated and enhanced in the text and the role of giving explicit rules on that grammatical form may be one that is relatively known by the chosen population. For example, within the Chinese Mandarin language, there is an absence of articles (e.g. a, an, the). If this form was to be enhanced, the participants in the studies might we'll have more difficulty in categorising these forms into categories for which they wish to retain and learn.

3.2.4 Memory

Although the primary aim of this research is to understand the impact of cognitive processes on input enhancement techniques, the study requires an understanding of working memory and its associated impact on second language learners. Working memory is closely related to attentional processing and consciousness which have been explored above. For example, if a student attends to input or stimulus with conscious awareness, the stimuli has potential to enter the student’s working memory (Koch & Tsuchiya, 2006; Lamme, 2003). Because of this, the research of working memory in second language acquisition and input processing methods can yield new insights into how second language learners attend to and process input while learning an additional language. Moreover, working memory capacity is also associated and related to the development of second language implicit and explicit knowledge (Serafini & Sanz, 2015). Therefore, in the below sections models of working memory have been reviewed regarding

working memory in second language learning to being on the variables in the effectiveness of input enhancement.

Working memory can be defined as the 'ability of store and manipulate incoming stimuli (Baddeley, 2007 as cited by Shaofeng, 2017). Briefly, memory stores may be considered. The notion of how learners (first and second language) process and store information is necessary to this study. When information is presented to learners, it is usually processed and stored as part of the memory; the system for storing and retrieving information (Baddeley, 1997). Atkinson and Shiffrin (1968) suggest that memory has three separate stores: a sensory memory (SM) store storing limited sensory information for brief periods; a STM store storing information for a longer period of time (15-30 seconds) than the sensory store but limited in its capacity (7 +/- 2 items); and a LTM store with a large capacity, holding information for long periods. This model of memory remained influential and was the background for Baddeley's WM model (1968) which more fully developed the middle part of the system, addressing processes as well as stores. Baddeley and Hitch's (1974) original model comprised of a tripartite system including the central executive (responsible for the control of WM), the phonological loop (responsible for holding and manipulating speech information), and the visuo-sketchpad (responsible for holding and manipulating visual images).

One existing model of working memory is Baddeley's multi-componential model of working memory. Baddeley and Hitch's (1974) model of working memory included the following components. Central executive system, an episodic buffer, visuospatial sketchpad, and the phonological loop (Baddeley, 2000). This system operates mainly from the central executive component whereby it coordinates the visuospatial sketchpad and the phonological loop. Second language learning researchers have tended to focus on measuring the capacity of the phonological loop (Baddeley, 2012) and the central executive system (Hummel, 2009; Safar & Kormos, 2008; Wen, 2012). Measuring these two systems have included span tasks to assess working memory capacity and simple span task to gauge short-term phonological memory.

Further to this model, Robinson (1995, 2003) offered a different view whereby the processing of information to the LTM from WM involves encoding which is dependent on other factors are known as rehearsal. Robinson offers two types: maintenance rehearsal and elaborative rehearsal. Maintenance rehearsal uses the phonological loop to convert information from the short-term memory (STM). Here, oral input such as X is turned into the phonological form. This notion of encoding leads to LTM encoding in an unanalysed way. For example, the

unanalysed chunks of language can be broken down by automatized, inductive learning processes. This process requires less cognitive resources than the elaborative rehearsal process.

However, the three-component model of WM was not without criticism. Baddeley (2000) himself commented on the limitations of this concept of WM and has since enhanced the model with a new component of WM: the episodic buffer (controlled by the central executive system and responsible for storing information into a multi-dimensional code). It is suggested as being the temporary interface between the slave systems (i.e. central executive, phonological loop, and visual sketchpad) where it forms an important part of LT episodic language. In Baddeley's (2003) overview of WM and language, WM is seen as underpinning the capacity for thinking. Therefore, this implicates language processing with WM.

There are also the cognitive models of language, processing, and memory (more commonly known as emergentist models (O'Grady, 2008) who suggest that learner's inductive systems are responsible for the knowledge of words and their uses. This learning is mediated through the frequency of the input, salience and how easy it was to process those words and uses. This type of belief of language learning and processing suggests that working and long-term memory are fundamental to language learning, both first and second language (Miyake & Friedman, 1998). Furthermore, grammar learning is seen to be impacted by phonological short-term memory (Shaofeng, 2017 as cited in Loewen & Sato, 2017). A study by Engel de Abreu and Gathercole (2012) found working memory correlated with second language grammar learning.

Models of memory are useful in explaining how information can be stored and retrieved and some theories have attempted to explain how the incoming information is processed before it is stored. Early research conducted by Thompson and Paivio (1994) began to look at theoretical implications for audio-visual processing. They proposed the dual code theory which suggested that auditory and visual components of audio-visual objects are functionally independent in memory; visual information is processed in the visual working memory whereas auditory information is processed in the auditory working memory. With regards to Baddeley's model of working memory (1986), the visual information would be processed in the visuospatial sketchpad, and the auditory information would be processed in the phonological loop. The principle of this theory states that more information is learned because more information can be stored due to the independent stores. If all the information were presented in one format, then there would be more of a struggle to access this information from one store however when they

are presented in two formats then the information can be accessed from two stores. Thompson and Paivio (1994) found that when items were presented auditory, visually or audiovisually participants who had been presented with pictures and sounds had a higher recall than those who had been presented information in just one format, lending support to the dual code theory.

Mayer (2003) and Mayer and Moreno (1998) have conducted many experiments concerning audio-visual materials, using the term 'multimedia learning' to refer to combining pictures with words to aid learning. They propose that by creating a well-designed multimedia presentation, students can learn more deeply and foster a meaningful understanding, with examples including presentations of how a pump works (Mayer, 2003) as well as the formation of lightning (Mayer & Moreno, 1998). Mayer strongly believed that uni-modal presentations such as someone talking you through the process were not sufficient to convey these types of instructions and incorporating images with words would create more efficient learning.

From the empirical evidence that Mayer and his colleagues had gathered, they were able to formulate the cognitive theory of multimedia learning to describe how people learn from words and pictures (Mayer, 2005). Within this theory, Mayer proposed three underlying assumptions. The first was like the dual code theory of Thompson and Paivio (1994) stating that humans have separate information processing channels for visually and presented auditory information. When information is presented to the eyes in the form of pictures and illustrations, this is then processed in the visual channel, but when information is presented to the ears in the form of sounds, then this is processed in the auditory channel. During processing, it is important to consider the presentation mode of the information and the sensory mode. For the presentation mode, the focus is on whether the stimulus is verbal (e.g. spoken or printed words) or non-verbal (e.g. pictures) and whether they will be processed in either the verbal or pictorial channel. For the sensory mode, the focus is on whether the stimulus is initially processed through the eyes or the ears and subsequently processed in the visual or auditory channel.

The second assumption states that humans' memory store has a limited capacity; the amount of information that can be processed in each store is limited at any one time. This is consistent with Sweller's cognitive load theory (1988) which proposes that the more information a person must learn in a short amount of time the more difficult it is to process the information in the working memory subsequently inhibiting learning. The final assumption of Mayer's theory states that humans engage in active learning when they attend to relevant information in each store. Mayer provides a detailed framework regarding the processing of incoming information,

how audio and visual materials are processed and stored in separate channels. The cognitive theory of multimedia learning, therefore, provides support as to why audio-visual materials are useful in teaching and learning.

3.3 Working Memory and Second Language

Prior literature and research implicate WM in language (see Baddeley, 2000, 2003; Gathercole & Baddeley, 2003). Theoretically, connectionist views to second language acquisition and working memory state the process of learning language arise from linguistic sequences or chunks. In this instance, WM plays an “instrumental role” (Wen, 2012, p. 7) where it is necessary to help vocabulary and morphosyntax. About WM and L2 comprehension, similar patterns have been observed. Harrington and Sawyer (1992) found that foreign language (FL) readers with higher WM spans performed better on both the reading and grammar, vocabulary sections of the Test of English as a Foreign Language (TOEFL) proficiency exam. Also, Hulstijn and Bossers (1992) tested the influences of both L2-nonspecific and L2-specific factors on foreign language reading comprehension. Results found that at early stages of L2 learning, reading comprehension is dependent on L2-specific knowledge, such as vocabulary and grammar rules, whereas, at later stages, L2 reading involves more L2-nonspecific factors, such as WM and L1 reading proficiency. Thus, at higher levels of L2 proficiency, WM becomes increasingly important for FL reading comprehension. The link between WM and areas of L2 learning implicates the notion of input processing where many grammatical forms may be a source of difficulty. Educators may then use an input processing technique such as TE to promote salience, noticing of these forms and thus, learner’s acquisition of the form improves. WM is likely to play an imperative role in mediating the success of such input processing techniques.

Drawing upon the findings of studies on the language learning difficulties faced by Dyslexic learners, who are generally characterised by smaller WM capacity (Jeffries & Everatt, 2004), Ellis (1996) and Ellis and Sinclair (1996) argue that WM plays an important role in the processes of acquiring L2 grammatical knowledge and skills. This role has been investigated in many studies which, however, have applied very different measures to assess the functioning of WM. This makes the comparison of the findings and drawing conclusions based on them difficult.

Ellis and Sinclair’s (1996) study was the first to provide indirect evidence for the

Role of WM about grammar learning as it demonstrated that articulatory rehearsal in WM facilitates the acquisition of explicit grammatical knowledge. Williams and Lovatt (2003) compared L2 learners' ability to remember determiner noun combinations in Italian with their scores in an immediate serial recall test. Their results indicated a moderately strong relationship between success in the grammar learning task. Furthermore, Martin and Ellis (2012) also reported a moderately strong correlation between a non-word repetition test and the participants' ability to produce artificial foreign language forms that they were taught and to generalise those forms to new utterances. In Santamaria and Sunderman's (2015) study, participants with a high reading span were also found to score highly in both immediate and delayed post-tests targeting the knowledge of French direct objects. Apart from these, Ahmadian (2015) observed a significant relationship between a listening span test and L2 self-repair behaviour among adult L1 Farsi learners and O'Brien et al. (2006) report a significant relationship between a non-word span test and L2 Spanish grammatical competence measured in a narrative task. In contrast, Grey, Williams and Rebuschat (2015) did not detect a significant relationship between two non-word repetition tasks that measured WM capacity and the results of an acceptability judgment and a picture matching task on verb-final word order and case marking of a semi-artificial language that the participants in their study were exposed to. A series of studies was conducted by Juffs (2005, 2006) which aimed to uncover the association between L2 sentence processing and WM capacity, as measured by a reading span task. He also found no significant relationship between WM capacity and reading speed.

3.4 Multi-sensory and Modality Research

In recent years, there has been a move towards seeing if input enhancement across other modalities (i.e. visual, textual, audio or a combination of all) influences learners and whether they can benefit from such a technique. This is in line with much of the literature, studies and materials arising from second language learning research studies which are attempting to link how second language materials should be presented in the classroom for the optimum outcome for learners.

Multisensory refers to the use of two or more sense modalities simultaneously (Hecht, Reiner & Karni, 2009; Káta, Juhász & Adorjányi, 2008) therefore, in multisensory teaching lessons would be taught using audio, visual and tactile methods alongside each other to receive and express information. Multisensory learning has been shown to be effective when teaching

children with special educational needs dyslexia and learning difficulties (Hayes, Tiipana, Nicol, Sams & Kraus, 2003; Kast, Meyer, Vögeli, Gross & Jänke, 2007; Luchow & Shepherd, 1981).

Numerous studies have shown that when an extra stimulus is presented alongside the original stimulus, for example, if a graph is presented alongside text describing data, students perform better on tests (Griffin & Robinson, 2005; Robinson, Robinson & Katayama, 1999) perhaps because they are attending to the same piece of information twice. Adjunct displays are features which appear outside of the text such as diagrams, graphs or maps and it is argued that students will perform better when tested on the knowledge of a text if it is also referenced in a display (Robinson, Robinson & Katayama, 1999). This finding can be further broken down suggesting that when different sensory modalities are presented alongside one another, this could also lead to a higher performance in tests.

Audio-visual instructions are the most common instructional method when looking at bimodal formats of presentation (Mastroberardino, Santeangelo, Botta, Marucci & Belardinelli, 2008; Mayer & Moreno, 1998). Kieffer (1965) suggests that audio-visual materials are used in teaching as they stimulate a high level of interest in the students, provide a depth and variety of learning and create and develop different thought patterns; however, he does mention that they must be used by a teacher who is creative and analytical in their teaching. This recommendation by Kieffer acknowledges the fact that it might be easy to create audio-visual materials however they must be taught effectively to engage students.

A capable platform for delivering material in a multi-sensory form is through Desktop Presentations such as PowerPoint. Within classrooms today, a shift has occurred where there is more use of Desktop Presentation Programs (DPP) such as PowerPoint which ultimately provides the benefit of combining visual appeal such as colours, images, and animations with spoken audio of the information (Daniels, 1999). Such programs have attempted to engage students by providing them with stimulating materials to maintain their interest as well as providing teachers with an easy and efficient way to teach a lesson. Although advances in technology have been largely responsible for schools opting for more multimedia-based learning, visual paper materials are still being used using posters, displays and worksheets alongside audio input from teachers.

As described previously in Chapter 2.3.2, the multi-sensory paradigm links well to noticing in a way that adds to the argument of using two or more senses can help achieve better learning. If input enhancement were to be used alongside an audio input, and utilise audio

enhancement, the learner may have greater chances to be aware of the enhanced and more salient input. Through higher awareness and attention denoted to the enhanced forms, their later intake and acquisition may improve. Research in this field is relatively new (Barnados, 2006; Cho & Reinders, 2010; Perez, Peters & Desmet, 2017; Reinders & Cho, 2010; Seyedtajaddini, 2014; Wong, 2001) but adds to the arguments that multi-sensory and multi-modal learning and noticing would be beneficial to learners but needs to be tested under controlled experimental conditions.

Furthermore, modality can be used in input enhancement to further extend the previous studies and add the value of different presentation models (e.g. audio, visual, or computerised). Some strategies have been explored (Higbee & Clawson, 1990; Neath & Suprenant, 2003) where the presentation modality of information is ideal. Despite learners having preferred styles of learning, whether with visual aids, talking and listening or engaging in practical activities, it is vital that the learning material be presented in a way that can consider these differences and the information can be communicated effectively.

It is important to note learner's preferred styles to learning which will generate better effects and achieve greater learning. Pashler et al., (2008) claimed that researchers who do not consider learner's optimum style will not be as effective. This is called the "learning style hypothesis." One study which highlights this claim is Korenman and Peynircioglu (2007) who tested presentation modality and learning style preference on individual's ability to learn and remember melodies. Participants were given 32 items with half of the items presented in an auditory format and half presented in a visual format and asked to recall the melodies they had been presented with. The research reported that presentation modality did not play a significant role in their ability to remember the melodies however the learning style preference did. Those who were described as visual learners (based on self-report questionnaire findings) learned the visually presented items faster and well while those who were auditory learners learned the auditory presented items faster than the visually presented items.

Korenman and Peynircioglu's (2007) study demonstrates that tailoring learning materials to learner style are beneficial and greater achievement is shown. However, there are some disadvantages to this approach. While being very learner centred, it may not be entirely possible in a larger classroom or school, for example, China where the state schools feature 50 pupil classrooms. Learning preferred styles, however, does hold value in that it gives an insight into how different presentation modalities do have different outcomes on learning. Therefore,

research has tended to concentrate on sensory styles of learning such as audio and visual and the differences between them.

More importantly, one programme which advances input enhancement is VIEW (Visual Input Enhancement of the Web) (Meurers, 2010). This is a computer-assisted programme by which language learning is targeted. The computer-assisted learning programme system provides the opportunity to use an automatic workbook which allows the learner to be drawn to and become aware of English grammar forms. This programme attempts to bridge the link between language learning and the presentation of materials. The system is used online so therefore can be accessed anywhere in the world with internet access. It can be accessed using a plug-in service on the web so easy access. Theoretical paradigms which VIEW uses are Natural Language Processing (NLP) technology to generate the exercises identify the material (Meurers, 2010). Such activities are informed by pedagogical instruction and include colouring of the target form, have the learner find the targeted form, and then controlled practice activities such as multiple choices, fill in the blank and editing tasks. This programme is an example of how input enhancement has been filtered into language learning materials and resources.

In summary, modality can serve as a means of enhancing students learning (Mayer, 2009). Modalities using technology, allow learners to quickly access a wide range of texts, potentially offering them the input necessary to learn vocabulary in a genuine context (Chapelle, 2007; Blake, 2009). Also, text-based tasks have the potential to help improve learners' vocabulary acquisition (Thanh & Huan, 2012), and while there has been some study of the benefits of input enhancement in technology-mediated contexts, more research is still needed (Yanguas, 2009). Moreover, furthermore, audio-visual materials based on Thompson and Paivio's dual coding theory and Mayer's cognitive theory of multimedia learning explain how when information in an audio and visual format is presented, the audio information is processed separately to the visual information and consequently stored independently. This enables the individual to retrieve information from both stores which result in a greater recall. If they were not stored independently, then this will increase the cognitive load. Cognitive load will now be defined and applied explicitly to second language learning and the notion of input enhancement.

3.5 Cognitive Load

Cognitive load will now be reviewed in application to second language learning as it is a feature of a cognitive conceptions of the process of second language acquisition that warrants more

consideration. Cognitive load theory can be defined as the total amount of mental effort used in the working memory (Sweller, 1998). The theory suggests how the cognitive construct is organised, what happens to cognitive processes when learning and how learning instructional materials should be designed and ordered (Moreno & Park, 2010). Similarly, it was heavily argued by Sweller (1998) that instructional design can be used to reduce cognitive load in learners. Typically, a psychology term, it can be usefully applied to second language learning and methods employed to increase learners' acquisition.

Cognitive load theory has been a critical theory in psychological literature and application based on the idea that there needs to be a careful balance between learning materials and human cognition. The theory works on the basis that working memory can become limited and therefore inhibited when there are difficulties with the learning materials which could be due to inadequate design (Sweller, 2003; Lin, Liu & Paas, 2017). In the early years of cognitive load theory, researchers concentrated on the development of best practice guidelines for designing materials to help eliminate extraneous cognitive load which may lead to a decreased learning ability (Mayer & Moreno, 2003; Moreno, 2010; Paas et al., 2004 Sweller, 2005; Sweller et al., 1998).

Plass (2003) considered the idea of multiple representations in second language learning and whether they help or hinder learning. In his study, 152 English students learning German were required to read a 762-word German story presented by a multimedia computer program. Participants received no annotations, verbal annotations, visual annotations, or both for 35 keywords in the story. Plass' findings show that the recall of word translations was lower for low-verbal and low-spatial ability students when compared high-verbal and high-spatial ability students, respectively, when they received visual annotations for vocabulary words, but did not differ when they received verbal annotations. Text comprehension was worst for all learners when they received visual annotations. These results are consistent with the generative theory of multimedia learning and with cognitive load theory which assume that multimedia learning processes are executed under the constraints of limited working memory.

Some of the findings presented by Sweller (2017) concentrate on the instructional implications of adult second language learning. He suggests that learning a second language requires consideration of cognitive architecture and how learning works. He reiterates the notion that instructors should be susceptible that adult learners must first process the category of information in a limited-capacity, limited-duration working memory before transferring that

information to an unlimited capacity, unlimited-duration long-term memory. One of the rules which are emphasised is the notion that instruction and learning material needs to be structured in a way that reduces working memory load. For example, language teachers should always explicitly present the grammar and vocabulary of the second language rather than expecting learners to induce the information themselves (see Kirschner et al., 2006).

3.6 Measuring Cognitive Processes in Second Language Research

This section will focus on the methods used in research to measure cognitive processes. Two techniques will be reviewed, think-aloud protocols and eye-tracking methods.

3.6.1. Think-aloud Protocols

Think-aloud protocols is a strategy used by experimental participants to provide an insight into their mental processes, thoughts and strategies involved when performed an assigned task (Ericsson & Simon, 1980, 1993). These reports are recorded and later used for analysis by the researcher. They have been used in research on language, comprehension, writing and problem-solving (Jordano & Touron, 2018). It is assumed that the data gathered from a think-aloud or participants verbalisation of their thought processes may help to identify the metacognition process used when performing the task in question and enables access into the participants working memory (Ericsson, 2003).

The think-aloud protocols process can create large amounts of information that may provide insight into behaviour and thought processes; however, they are not without limitation. Some of the more commonly reported criticisms are that the protocols can be difficult to administer (Jordano & Touron, 2018). This difficulty is typically because the participants are not usually familiar with verbalising their thoughts while completing a task. It may be suggested as quite an un-natural task. Given this point, researchers must provide full instructions to the participants for verbalising thoughts at throughout the process are often prompted. Once this process has been completed, the scoring of the data must be completed by a trained researcher who knows how to score think-aloud protocols. In addition to this is the situation of having a large sample which would require extensive time to transcribe, score and code.

Some research evidence shows that combining think aloud protocols with another method may provide more useful (Catrysse et al., 2018). It is advised that the think-aloud protocol in conjunction with the eye-tracker can gain additional information for processing

behaviour (Catrysse et al., 2016; van Gog & Jarodzka, 2013). Eye-tracking is now discussed in the next section.

3.6.2 Eye-tracking

Eye-tracking is a resource often used by researchers in the Cognitive Psychology and Linguistics field. It is, therefore, necessary to review the function, reasons for eye-tracking during research, and how relevant it is to second language learning and processing. This section will explore the technique, how it is utilised in cognitive psychology and the second language field, the merits and limitations and some empirical evidence of the use of an eye-tracking and what it has uncovered.

Eye-tracking is a non-invasive means of indication of brain function and cognition (Eckstein et al., 2017). By analysing a person's gaze while performing a task, we have an insight into attentional focus and cognitive strategies. Psychology has been historically interested in analysing the inner mind and looking at how muscles in the eye contract (Smith, 2012). Eckstein et al., (2017) mentions that cognitive psychologists used this type of research for the past two centuries but in the last 20 years eye-tracking has been overtaken by brain imaging research. However, due to improvements and finer analysis tools in eye-tracking, it is regaining popularity. One area that features eye-tracking technology is in psychological reading research which uses a suite of techniques in which participants eye movements are measured (Smith, 2012). These movements provide researchers with an understanding of where a person is looking at any given time and the sequence of shifting from one location to another (Poole & Ball, 2006). Eye movements during reading such as gaze duration, saccade length, occurrence of regressions, and search time, can be used to infer moment-by-moment cognitive processing of a text by the reader (Just & Carpenter, 1980) without significantly altering the normal characteristics of either the task or the presentation of the stimuli (Dussias, 2010). Therefore, providing an insight into cognitive processing while reading.

Turning to a different yet associated field is Applied Linguistics where eye-tracking is quite novel. There has been a vast amount of research completed in the second language field where eye-tracking has been positively utilised. Some examples are included in the following sections. Révész and Gurzynski-Weiss (2016) conducted a study on teacher's perspectives of task difficulty. Their study employed both eye-tracking and think-aloud protocols. The research involved 16 English as a second language (ESL) teachers to judge the linguistic ability required

to carry out four pedagogic tasks and consider how they would manipulate the tasks to suit all abilities of proficiency, low and high. While teachers were judging the tasks, their eyes were tracked, and teachers ‘thought aloud.’ Results revealed that teachers were concerned with linguistics factors affecting the task difficulty. Furthermore, the eye-tracking data was united with the think-aloud protocol findings.

More important is the use of eye-tracking methods in input enhancement research. Aside from think aloud verbal reports which require learners to vocalise their thoughts while performing a task, eye-tracking has become popular in second language acquisition (Loewen & Inceoglu, 2016). In terms of second language acquisition, eye-tracking provides a “mind-eye link in which it is argued that the object that holds the eyes gaze is being cognitively attended to (Godfroid et al., 2013). In terms of input enhancement, eye-tracking enables researchers to investigate whether learners focus or fixate on the enhanced forms in the text more so than other conditions.

An example of research in this area is Godfroid et al., (2013) who studied second language learner’s fixation duration in a visual text focusing on pseudo words. The findings show that the learners in fact spent more time looking at pseudo words and therefore the authors contributed this finding to an increased attention with the pseudo words. A further finding was the learners increased reading time which was associated to better post-test vocabulary recall test scores. Again, this demonstrates positive effects of increased attention on second language learning. A further study is from Winke (2013) who replicates an insightful study from Lee (2007) (for a review see 2.X). Winke (2013) assessed the passive construction in English enhanced flooded texts and unenhanced texts and eye-movement data. Findings revealed that the enhanced flooded group did not gain increased form-correction scores after the enhancement. More interesting is the eye-movement data recorded during the reading and exposure process demonstrating longer gaze durations during enhancement and increased re-reading periods of time. This finding implicates the learners noticing of the passive forms and therefore, the enhancement in Winke’s study only promoted noticing. Without the measurement of eye movement in this study, there would be no additional information about noticing.

Recently studied by Indrarathne, Ratajczak and Kormos (2018) are the changes in second language learners processing ability of written input in implicit and explicit conditions. Using eye-tracker, and total fixation duration measured; findings reveal that in session one, groups receiving explicit instruction to pay attention to the grammatical item in the written text

displayed higher values when compared to groups receiving implicit instruction. Indrarathne, Ratajczak and Kormos (2018) state that their findings are similar to those of Godfroid and Uggem (2013), Winke (2013) and Issa, Morgan-Short, Villegas and Raney (2018) where enhanced only groups fixated on the target items significantly longer than unenhanced groups in session 2 and 3. This finding as indicated by Indrarathne, Ratajczak and Kormos (2018) suggests that effects produced by visual enhancement may not be detected in the first sessions and can take longer for the participant/learner to realise items are enhanced. However, more research is required in this sense and more so, eye-tracking will not be able to fully tell the story.

By reviewing input enhancement studies in relation to eye-tracking, there are some recommendations for future research. When studying the effects of textual enhancement, it is important to examine the patterns of change in eye-tracking measures across exemplars and sessions and not only to consider averaged values during the whole experiment. However, this might not always be possible given that eye-tracking is usually a one-one process between the researcher and participants and would be extremely time-consuming to measure during each session which could be over three times.

The real purpose of measuring eye movements is to understand an individual's processing ability (see Figure 3.1 for an overview of how eye-tracking works). The correlation between eye movements and processing allows researchers to interpret perceptual and cognitive processes. It is reported that the two most widely used measures of eye movements are eye fixations and saccades (Dussais, 2010; Smith, 2012). Eye fixations may be defined as when eyes are somewhat stationary and reflect when information is being encoded. Eye fixations allow learners to read and the extract important and useful information about the text (Dussias, 2010). Saccades may be defined as the movement of the eyes between fixations. During saccades, there is a lack of encoding and therefore, useless in interpreting a target's complexity or salience.

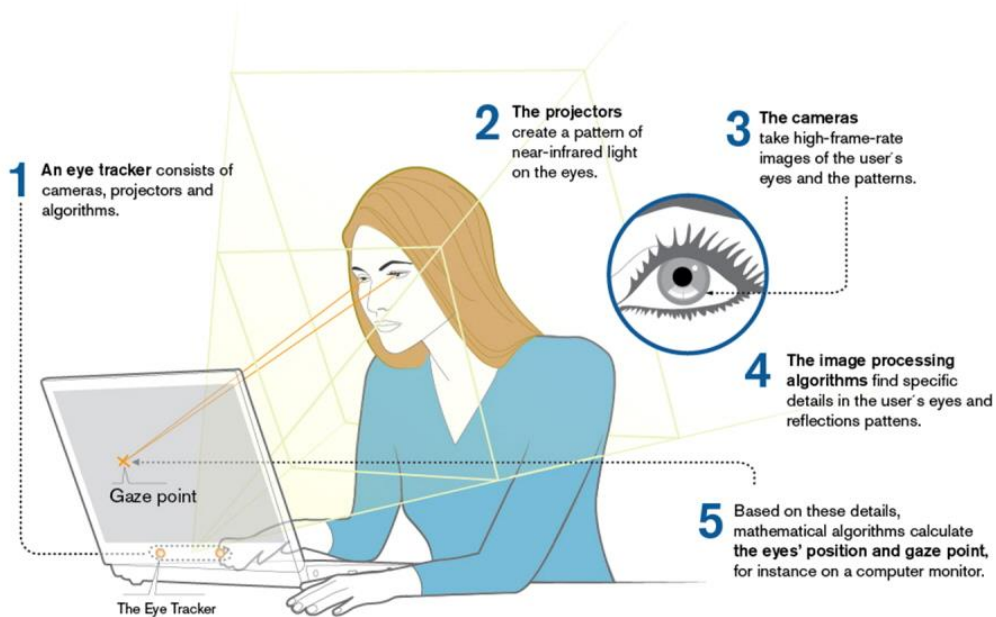


Figure 3.1. How an Eye-tracker works (Image provided by Tobii, 2018)

In general, eye fixations during (L1) reading in English last approximately 200–250 milliseconds (Rayner, 2009), though it is considerable within- and between-reader variability. For example, a fixation may range from just under 100ms to more than 500ms. This variability in fixation duration is believed to vary as a function of the relative cognitive difficulty in comprehending a text (Rayner, 1998). However, L1 readers do not fixate on every word in a text, but rather they fixate on about two-thirds of the total words (Just & Carpenter, 1980).

Context is extremely important in interpreting the meaning of fixations, which cannot be completed in a vacuum. For example, when browsing a Web page (an encoding task), higher fixation frequency on a specific area can mean greater interest in the target, such as when one views a picture in an advertisement. Higher frequency can also be a sign that the target is complex in some way and more difficult to encode (Jacob & Karn, 2003; Just & Carpenter, 1976). Poole, Ball, and Phillips (2004) suggest that more fixations on an area indicate that it is more noticeable, or more important, to the viewer than other areas (reported in Poole & Ball, 2006). However, in search tasks, a higher number of single fixations, or clusters of fixations, are often an indicator of greater uncertainty in recognising a target item (Jacob & Karn, 2003). The duration of fixation is also linked to the processing-time applied to the object being fixated with a longer fixation duration indicating either difficulty in extracting information, or that the object

is more engaging in some way (Just & Carpenter, 1976). The so-called eye-mind assumption holds that the reader's eyes remain fixated on a word if the word is being processed. Up to now, eye-movement records in L2 research have been used to investigate two major areas: (a) the way in which L2 speakers recognize words when they are spoken in each language; and (b) the question of whether monolingual and L2 speakers process various syntactic sub-processes similarly during sentence comprehension tasks (see Dussias, 2010, for an overview). Only a handful of published studies have so far employed eye-tracking to explicitly examine L2 noticing (Godfroid, Housen, & Boers, 2010, Kuhn, 2012; O'Rourke, 2008, in press; Smith, 2010; Smith & Renaud, in press). Each of these studies suggests that eye-tracking is suitable to use as an instrument for measuring the noticing of written text. An additional advantage of using eye-tracking to measure some inference of attention is that it does not interfere with the learner's process of reading while performing the task.

While the most part of this chapter has focused on the cognitive factors involved in second language learning and thus, possibly help explain the variability in the effectiveness of input enhancement methods – individual differences can play a huge role in second language learning.

3.7 Conclusions Drawn from the Literature Reviews

This section will briefly tie together the key points of the included literature review with a view to informing the reader how the thesis will be put together and what is included.

Noticing and acquisition is a topical issue and involves the issue of the methodological design of most of the textual enhancement studies. Han, Park and Combs (2008) especially comment on the issue of test bias in input enhancement studies. There is an issue of measuring and assessing the efficacy of input enhancement. Most input enhancement studies equate the effectiveness of input enhancement with its ability to generate acquisition. Alternatively, some studies have used more than one task to try and target this issue. Research such as that by Alanen (1995) and Izumi (2002) use input enhancement to prime what learners then notice. Noticed targets then translate into the acquisition. The most important aspect to keep in mind when using input enhancement is the role of cognition. Input enhancement is set to spark cognitive processes, and these are initiated by noticing. Further to this is the notion of the expectations of input enhancement. Input enhancement cannot be expected to produce results in a short amount

of time. A short amount of treatment of an enhanced study condition should not be expected to produce immediate effects.

Wong (2005) discusses this and suggests that instant learning is not always expected from a short session of treatment. This suggestion works in line with cognitive processing in that a short amount of treatment cannot result in deep processing. Furthermore, noticing is not always a guaranteed deposit on the acquisition. One study which helps this argument is Izumi (2002) where externally induced noticing was not correlated with more learning. Thus, posing the argument that noticing may not lead to acquisition. In Williams (1999) argument that learning registered by learners may not be encoded into the long-term memory (such a short study condition and often input enhancement studies do not have a repeated study condition, so only see the enhanced forms once). Therefore, this poses the need for a deeper insight into memory, working memory and long-term memory regarding input enhancement studies. The underlying assumptions of input enhancement and more notably noticing are often excluded from mentioning memory altogether.

I would argue that memory, and attention is an intrinsic part of noticing and needs further thorough investigation. As Han, Park and Combs (2008) stress, enhanced target forms may lead to learners noticing the structure, but further processing is needed for learners to truly acquire such a form. The authors close their recommendations for future input enhancement studies by suggesting the researcher cannot truly know how the learner will control the effectiveness of input enhancement. This effectiveness is largely due to the learner. Efficacy of input enhancement works in part of the other six suggestions described below. All contribute to a better understanding and detail of how input enhancement is working in empirical studies. Last, an important factor mentioned is that input enhancement studies should move away from acquisition tests and focus more on measuring the effect at the level of noticing. An alternative may be a measure of concentration or attention to measuring out the effect of noticing or measuring via the use of Eye-tracking. Some recent studies have adopted this technique and provide interesting results (Indrarathne, 2016; Indrarathne & Kormos, 2016; Indrarathne, Ratajczak and Kormos, 2018).

Another conclusion drawn from the literature is the possible relationship between input enhancement and the cognitive processes incurred during the process by the learners. In exploring the effects of input enhancement upon the learner's cognitive processing system, as proposed by Smith (1993), the original rationale behind input enhancement includes the

possibility of increasing saliency of a selected form to promote the reconstruction of a learner's developing language system (i.e. the first language, second language and other individual differences contributing to establish an "interlanguage", the learner's independent language). Therefore, about the learner's developing language system – selective attention and how WM processes it alongside other memory stores (e.g. short-term memory and long-term memory) should be examined alongside IE. Also, Schmidt (1990, 1995, 2001) argues that conscious attention to input is necessary for learning to take place. Conscious noticing of grammatical target forms helps lead to learning a second language. Referring to links between cognitive psychology and psycholinguistics, it is possible to examine the role of cognitive processes in attention and memory as they appear in second language acquisition research (Combs, 2004).

As per Smith (1993), input enhancement in principle directs a learner's attention to a specific target form, thus increasing saliency and helping to reconstruct the learner's developing interlanguage system to allow second language acquisition to occur. In doing so, selective attention is promoted but also working/short and long-term memory. Despite input enhancement and cognitive processing research being at under-researched stages, this study aims to investigate whether cognitive processes have any relationship with input enhancement techniques such as textual enhancement and audio enhancement. Memory and attention are interlinked (Cowan, 1995; Rensink, 2002) and these processes give rise to differential effectiveness of IE across learners. Furthermore, capacity constraints which mediate levels of attention available for processing need to be considered (Smith, 1993) about IE. As research increases in this area, we will obtain a clearer understanding of how attention and memory affect second language learning.

The "Noticing Hypothesis" (Schmidt, 1993) suggests attention towards input is necessary for Second Language Acquisition, and consequently, input enhancement techniques may be facilitating for Second Language Acquisition. By reviewing existing studies in WM and noticing, there is generally a relationship in that all else being equal, people with higher working memory capacity tend to notice more (e.g. Ando et al., 1992; Mackey et al., 2002). Skehan (1998) proposes that individual differences (ID) in working memory may constrain noticing, which in turn would influence second language learning (Robinson, 1995).

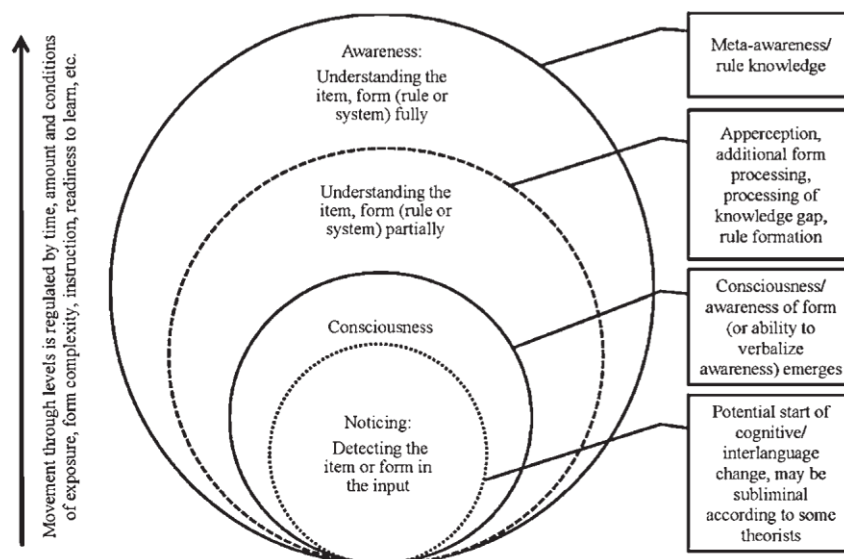


Figure 3.2. Second language learning processes and distinct levels of attention (as shown in Winke, 2013).

It has been argued that attention is necessary for second language learning (Tomlin & Villa, 1994). In contrast, awareness appears to not be necessary for second language learning. Again, like working memory and the analysis in second language acquisition; a more refined analysis is needed. Moreover, the research project will add original knowledge to a reputable area of second language acquisition and learn to pull together the questions which remain unanswered on working memory, attention, and awareness and noticing within in second language learning.

Ellis (1994) pointed out that Schmidt’s original work on noticing tied into findings from cognitive psychology which were then applied to second language acquisition theories. Ellis even goes as far as stating that “Schmidt is one of the few linguists who have adopted the conceptual and experimental rigours of experimental psychology in answering questions concerning the role of consciousness in L2 acquisition” (1994, p. 10). Therefore, it is necessary to review the cognitive psychological literature of consciousness which Schmidt referred to.

In summary, prior knowledge needs factoring into research studies that assess the effectiveness of input enhancement. In Izumi’s (2002) study, contradictory findings are demonstrated. For example, this study uses participants with an “emerging knowledge” of relative clauses (p. 549). The design disregards participants who fail to demonstrate signs of knowledge to the target form using a cut-off point (e.g. 80%) on the pre-test. Despite controlling

for prior knowledge of the target form, the study found no significant gains to learners noticing through textual enhancement. The results suggest that despite possessing a foundation for using English relative clauses, this foundation knowledge did not aid subsequent learning after textual enhancement. Prior knowledge of a target form is one variable which adds to the effectiveness of textual enhancement. About the current investigation, prior knowledge of the enhanced form is central to the idea behind the target form, the English article system. Although the effects of prior knowledge on learning with textual enhancement are mixed, the present research will draw upon prior knowledge, addressing target forms that are already familiar to the learners.

A related issue to the puzzling pattern of textual enhancement results is made more complex where the technique is used as one of several variables that are manipulated to see the effect on learning. For example, textual enhancement as the only independent variable (IV), textual enhancement as a technique of focus on form (e.g. Doughty, 1991), and textual enhancement and explicit rule instruction (e.g. Alanen, 1995). Therefore, as outlined above, generalisations made from previous findings regarding the effectiveness of textual enhancement are mixed and contradictory (see Table 2.1). Furthermore, Lee and Huang (2008) recommend future directions for textual enhancement research suggesting participants in studies must be developmentally ready for the target forms which will be textually enhanced. Failing to choose appropriate target forms for the learner's status may result in benefits of textual enhancement becoming less apparent. In relation to this is the relationship with learner's cognitive processes when engaged in an input enhancement task (visual/textual or auditory). Research is currently taking place on this but requires more effort from the field.

There is a multitude of a cognitive process which can be triggered by input enhancement. The idea is to investigate what effects input enhancement had had or perhaps has not had on the second language learners processing of input. Central to this thinking is the idea of where input enhancement may or may not trigger certain cognitive processes such as attention, cognitive resources, and memory. Similar to Combs (2005) rationale behind his paper on the association between input enhancement and cognition, the impact of input enhancement upon attention, memory and potential learning will be appraised.

In conclusion, although input enhancement studies have shown some valuable insights into the impact of textual enhancement on learner's grammatical developments and acquisition, there is no generalisability with the results, and we cannot be confident that textual enhancement is always effective. One approach to including new and varying forms of input enhancement that

manipulate target forms in a text is multi-media learning. Furthermore, it is important that when considering cognitive efforts and processing in an instructional method, the online measures of learning (i.e. processing) are measured. One way to measure this is by using an eye-tracker. The next section will discuss eye-tracking research, usability, concerns, and implications.

3.8 Anticipated Contribution of my Research

The review of input enhancement (see Chapter Two) and cognitive factors (see Chapter Three) points to a multitude of issues which still need to be investigated. For example, varying modalities of input enhancement, and what role cognitive processes play when using different types of input enhancement. This thesis attempts to fill some of these gaps in the body of existing research. Below are issues which need further investigation in this field. Each will be explained in terms of addressing them in this research and which strategies will be employed to add to the field of second language acquisition and cognitive processing.

- Existing studies on input enhancement (both visual, textual, and auditory) present mixed findings. Therefore, it is worth adding to this body of literature by ensuring that the experiments take note of previous issues raised such as prior knowledge, a true control group and the inclusion of a delayed post-test. Prior knowledge where the participants possess adequate prior knowledge of the target form as findings demonstrate that textual enhancement is more effective for learners with previous knowledge. A true control group should feature in input enhancement studies so there is a baseline measurement. Often, control groups in this type of research are unenhanced texts where the participants have still received some intervention or study condition (i.e. a text with no enhancement). Previous input enhancement studies have included only immediate post-tests and thus do not collect any information regarding longer-term effects or learning. The delayed post-test will feature in both experiments as it provides a different point of measurement and attempts to ascertain some form of long-term learning (albeit short scale).
- Often, input enhancement research focuses on the immediate and short-term benefits and includes immediate post-tests. This type of design only focuses on the short-term impact of input enhancement and not the long-term value in this teaching method or instructed second language acquisition method. For this reason, all experiments in this research will include delayed post-tests in the research design. The delayed post-test will achieve insight and findings on the longer-term value and effectiveness of this method. Use of the delayed post-

test and more of a longitudinal design add to the body of evidence of the effectiveness of input enhancement in the long-term for the learner.

- The use of audio input enhancement is still relatively new, and there is a lack of research studies in this area. As a result, one of the studies investigating input enhancement will focus on the different modality of the method.
- Previous input enhancement studies have used academic study environments, and thus focus on using a distinct academic pool of participants rather than the public. The research completed will focus on two separate study environments using two sets of students: high school students in a state boarding school in China in an English foreign language setting; and university students in a pre-degree programme in the UK in an academic setting. These settings have been chosen to show diversity to the setting and background of the input enhancement study. However, research studies would be separate to their normal teaching schedules and would not be included in their timetabled studies.
- The last published meta-analysis in visual input enhancement and grammar learning was in 2008, and there have been multiple studies in input enhancement conducted since. Therefore, the field requires an updated meta-analysis in this area which accounts for the latter studies (published and unpublished, i.e. grey literature) to adequately assess the magnitude of this technique.
- Modality research and application to input enhancement - Therefore, it is imperative to assess input enhancement in different modalities (i.e. spoken and written language). Experiment 2 of this thesis focuses on this aspect of salience, in this case, textual enhancement through using boldface, to understand the impact of modality and whether is differential affects the salience of forms and subsequent input processing.

3.9 Overall Summary

In this chapter, I have considered some of the cognitive processes involved in second language acquisition. As discussed in this literature review, there are some theoretical considerations and studies conducted which are associated with cognitive processing in input enhancement. As pointed out in this chapter, cognitive psychology is related to second language learning, and the three areas (e.g. attention, consciousness, and awareness) are different.

Based on the information provided in Chapter two and three, the research recognises that within the areas of cognitive processing in noticing and through input enhancement; there has

been a lack of research into what cognitive processes are triggered by input enhancement. As Combs (2005) suggested over a decade ago, research on input enhancement and cognitive processing is still at a very early stage, and this remains in recent times. There is an extreme lack of follow up studies based on what Combs (2005) suggested. Nevertheless, it may be observed that input enhancement does engage the learners' focal attention processes and it does lead to subsequent processing of varying degrees of depth (Indrarathne, Ratajczak & Kormos, 2018). To better understand input enhancement, future research should consider some of the issues highlighted here, for example, the effect of input enhancement in conjunction with other concurrent tasks needs to be studied more fully to better understand issues of timing and capacity. Likewise, longitudinal studies that employ multiple treatments could better gauge how input enhancement activates the learners' cognitive processes, especially in the long-term memory. Memory structures are capacity-limited and impose constraints on attentional processes. However, it is still unclear as to what learning processes these structures and constraints give rise to. Hopefully, as research data accumulate in the field, there will be a clearer understanding of how individual variation in attention, memory, and rehearsal affects second language learning.

As the literature review pointed out previously, the empirical work which has been completed has explored both implicit and explicit techniques on language learning outcomes. The focus on form approach to second language learning is the more useful and aids learners within their form-meaning connections. Furthermore, previous literature (de la Fuente, 2012) does indicate that enhanced focus on form approaches lead to a promotion of attention towards the target structures in the input. While there is a body of research on implicit and explicit learning methods regarding language learning; there is no consensus as to how successful these methods are at directing the learner's attention to the target linguistic forms (usually vocabulary items or grammar structures).

Overall, the main theoretical gap in this thesis is related to the attentional processing of second language learning input identified is the vagueness of terminology used in second language acquisition literature and research. There appears to be a need to know how different input (implicit and explicit) techniques work, but there is no real attempt to understand the concepts, attention, and awareness. Thus, there has been data collection methods which do not employ the correct standards of operationalisation and possibly do not measure what they intend to. This investigation focuses primarily on input enhancement yet looks at different methods,

textual and audio input enhancement. The review in this chapter and Chapter 2 two direct researcher's interests to the investigation of input enhancement (both textual and aural), which can potentially be a useful method of language instruction by focusing on the optimum conditions that occur in learners depending on their cognitive processes and individual differences. In the exploration of this study, pilot studies and two experiments are devised that focus on four important aspects: (1) the method of input enhancement (textual and aural) and how effective it is, (2) the role of explicit rules and input enhancement, and (3) the impact of multi-modal and multimedia learning in relation to input enhancement techniques. Through two experiments, these focal aspects will be assessed: Experiment 1 is the first of two experiments attempting to investigate the effectiveness of visual input enhancement and explicit rules which gives further exploration for Experiment 2. Experiment 2 is the differing of modalities in input enhancement with textual and aural conditions.

Chapter 4: Meta-analysis of Visual Input Enhancement Grammar Learning Studies from 1981-2016

4.1 Introduction

Existing studies include input enhancement in a multitude of ways, for example: as the key variable of research interest and measurement (Jourdenais, 1998; Leow, 2001), or as a technique of focus on form (Doughty, 2001; Robinson, 1997). Research studies also exist with ‘moderating variables’ (Lee & Huang, 2008: 308) like explicit instructions to focus on the form of target items (Alanen, 1995; Kubota, 2000). One observation is that there is a vast range of existing literature on input enhancement. Prior findings on visual input enhancement have been described as “elusive” (Lee & Huang, 2008: 308) as the outcomes are inconsistent for reasons that are still to be determined and call for further reviews including new textual enhancement literature. Based on previous studies, narrative reviews (see §2.5.4) and as outlined in Chapter 2, there is a strong conclusion that the findings of input enhancement, and more so visual input enhancement are inconsistent where some factors may co-vary.

From the 31 studies centred on input enhancement (textual, audio and input floor) presented in Table 2.1 (see Chapter 2, see §2.5.4), it can be concluded that there are mixed results with input enhancement. Of these studies, 15 found enhancement to have a form of positive effect on noticing (however the study categorised this in their review), learning or acquisition. These findings ring true of previous findings in the larger input enhancement literature where the results are inconclusive in textual input enhancement for grammar or vocabulary. Thus, there is still no real consensus on how effective input enhancement is among second language learners. Further research is needed to investigate why the results are inconclusive and what is really happening in the learner's cognition when they experience an input enhancement study condition.

As reviewed in §2.5.4 where conclusions of previous input enhancement studies were drawn – there is definite need for further analyses into understanding the variability in outcome of these studies. In §2.5.4, variability in the outcomes is noted from 31 studies reviewed. 15 of the 31 reviewed studies are found to have a positive impact on learning and noticing. The fact that only half of the studies found positive effects on the second language learners could be attributable to differences in design such as the use of participants, length of text, prior

knowledge of the target form, use of tests and a control group. It is important to identify the degree to which such variability is attributable to design features. Williams and Evans (1998, p. 139) argue that it has not been clear exactly what it means to draw a learner's attention to form or how this is to be accomplished. Combined with new literature in the last decade on textual enhancement, this further rationalises why a new and broader time frame (e.g. 1981 to 2016) of studies in a quantitative review would update findings in this area and focus on items like moderating variables, learner characteristics.

One key thread which has been pulled from reviewing previous empirical studies (see §2.5.3-2.5.4) is that the previous studies provide inconclusive evidence of how effective input enhancement is to a student's learning and that different studies found different outcomes which may be a fault of the study's design. From a pedagogical perspective typographic, textual input enhancement has failed to provide a consensus both at a theoretical and practical level regarding which features of the linguistic forms should be enhanced, i.e. the ending of the verb, or the whole verb, or the verb in combination with the subject, when using typographic, textual input enhancement for teaching, for example, the third person singular –s; and how to enhance them better in order for the target form to become salient for the learner. For perhaps a better insight about cognitive processes involved, such as noticing, could be provided with the use of eye-tracking, which can enhance the validity and reliability of studies (see also Godfroid, Housen & Boers, 2010; Sanz et al., 2009). However, this is sometimes beyond the research design of some empirical studies.

Overall, earlier chapters/sections in this thesis (see §2.5.3-2.5.4) show that findings in the existing textual input enhancement literature are inconsistent and would benefit from meta-analysis treatment. More importantly, there is quite a clear uncertainty as to which factors are more influential in determining the success of visual input enhancement. To conclude from findings in the narrative review §2.5.3-2.5.4, there is a large range of difference in terms of learner characteristics, research design and reported statistics in visual input enhancement studies. Coupled with the findings from Chapter 2 where only one meta-analysis exists in this domain (Lee & Huang, 2008), there is a need for a more recent review to uncover some of these differences in methodology, and assess the magnitude of the size of effect for visual input enhancement for grammar learning in a second language setting.

This chapter provides a synthesis and qualitative review based on qualifying studies over the past 35 years with visual input enhancement and grammar learning as the topic to identify

those factors that may be responsible for superficial inconsistent outcomes. The next section reviews the meta-analysis method, existing reviews on this topic, related meta-analytical reviews on second language instruction and a rationale for the current study. The research questions will then be covered along with a full methodology (literature search strategy, inclusion/exclusion criteria, coding procedure) followed by analysis and results. An interim discussion with a summary and future research will then be offered.

4.2 Previous Meta-Analysis Literature

4.2.1 Meta-analysis (general)

An up-to-date review of the textual enhancement and grammar literature must use methods where the quality of the method is assessed, and the participants part of those studies is considered (e.g. learner characteristics). A review combining these aspects will enable the measurement of the effectiveness of this instructed second language acquisition technique. As suggested in the above reviews of previous literature, an updated review including all available textual enhancement and grammar learning studies from 1981 to 2016 and using meta-analysis methods is necessary.

Meta-analysis is an effective form of searching and quantifying the results and effectiveness of an intervention or study condition across several studies (Cumming & Calin-Sageman, 2017; Glass, 1976; Lipsey & Wilson, 2001). In summary, the principle of a meta-analytical review is to research and find all the available primary findings on a topic. From each primary study, data are extracted, typically descriptive statistics, to provide an estimate of the size of the effect of a given treatment or study condition. One effect size metric is chosen and used for each study. Meta-analysis has been popular in the fields of medicine and education, but it has also been used in cognitive psychology as a means of guiding the field in terms of the effective interventions and treatments. In terms of language, meta-analytic reviews exist on the topic of cognitive correlates of bilingualism (Adesope, Lavin, Thompson & Ungerledier, 2010), the relationship between working memory and language (Linch et al., 2014) and more importantly to this study, second language instruction effectiveness (Norris & Ortega, 2000). As a result, this demonstrates that meta-analysis has been a method of synthesis and checking of effectiveness in language learning.

As suggested by Plonsky and Oswald (2015) meta-analysis is a more critical quantitative tool which exercises objectivity and is more systematic in its approach. Meta-analysis allows the

searching strategy to identify grey literature (i.e. unpublished papers, dissertations). This ensures that the meta-analysis attempts to include all studies or all studies which satisfy a pre-determined quality threshold for inclusion. The studies are then evaluated for methodological quality and are coded for design features blind to the outcome of the method; then study outcomes are converted into a common effect size to control for effects of different analysis choices. These outcomes are typically weighted according to study power or quality. Therefore, a meaningful summary statistic which represents the whole database can be calculated, and then studies can be grouped to look for internal effects. There are different ways that a meta-analysis can be completed. One of the most common ways is guided by Glass (1976), who suggests calculating the effect size for each study, as this score is representative of the impact of the intervention on test scores. The effect size represents the impact of the intervention, visual input enhancement in the present study. Effect size for this meta-analysis, Cohen's d , is worked out by dividing the difference between the mean scores of the treatment group and the mean scores of the control group by the pooled standard deviation. If the effect size is consistent across all the different research studies, then the effect of this teaching method is considered as robust and reliable. Effect sizes are generally regarded as small (0.20), medium (0.50) and large (0.80) (Cohen, 1988).

Plonsky and Oswald (2010; 2015) highlight several benefits of performing meta-analysis research in the second language learning field. As is suggested, meta-analysis in the applied linguistics area can help to provide critical information on methods and instructions only if the analysis is well planned, uses sound statistical methods and is based on a thorough understanding of relevant theory. The meta-analysis can aid future research, practice, and policy (Plonsky & Oswald, 2010). Furthermore, meta-analysis has been recognised as being superior over other synthesis methods in the second language acquisition field (Li, 2010); it is argued to be instrumental in finding research gaps, flaws, and methodological differences and to generate some understanding of the effectiveness of different methods and interventions (Norris & Ortega, 2000).

4.2.1 Existing Textual Enhancement and Grammar Learning Meta-analyses/Narrative Reviews

There are existing textual enhancement and grammar learning meta-analysis reviews (e.g. published study from Lee & Huang, 2008 and an unpublished master's thesis from Alsadhan, 2011). Since these reviews took place, there have been many additional, influential input enhancement studies. These earlier meta-analyses (see Lee & Huang, 2008; Alsadhan, 2011)

help identify specific foci for this meta-analysis. Lee (2007) also provided a thorough narrative review on the previous published literature in visual input enhancement and grammar. This section will now review these studies and focus on their aims, selection criteria, findings, and conclusions.

4.2.1.1 Lee and Huang (2008) Meta-analysis

Lee and Huang's meta-analytic review (2008) is widely acknowledged as one of the primary meta-analytical reviews which has attempted to measure the effectiveness of visual input enhancement and grammar learning. The aim in this study was to collate previous studies between 1981 to 2008 to examine the visual input enhancement to investigate the effects for grammar learning only. The authors aimed to examine the overall effectiveness of visual input enhancement and other research questions around publication bias such as exploring the sources of publication as a moderating variable. Four research questions were explored centred on how visual input enhancement has been investigated up to the year of 2008, magnitude of the impact of the technique on grammar learning, meaning comprehension, and relative magnitude in published versus unpublished studies (i.e. observable differences between studies published in refereed journals and unpublished doctoral studies).

To conduct their meta-analysis, Lee and Huang synthesised 16 available and qualifying empirical studies in the field (with 20 study samples). By first conducting a synthesis of these studies, they then calculated and aggregated the effect sizes using Cohen's *d* values. Lee and Huang's (2008) starting point was Lee's (2007) narrative review of 13 visual input enhancement studies including 1 doctoral dissertation. More thorough searching was then conducted via 5 electronic databases, hand-picked journals which had already published studies on at least one visual input enhancement study, and some other additional journals. A total of 16 studies with 20 unique samples were used and only studies from published journals and doctoral dissertations were considered. Their selection and inclusion criteria of studies were: English written experimental/quasi-experimental designed studies featuring second or foreign language learners, published between 1981 to 2006 investigating visual input enhancement of grammar items only using written input texts, studies with post-test measures, single-sentence reading tasks, studies with control or comparison groups, studies from refereed journals, book chapters, or unpublished dissertation, and research that included enough descriptive statistics for effect sizes to be calculated. Their coding scheme focused on shared characteristics from the studies and

methodologies in (a) learner characteristics including: total number of participants; number of participants per each unique study sample; length of study of the target language and context of L2 study; previous knowledge of the participants on the targeted form; actual proficiency levels of participants using Thomas's (2006) proficiency assessment measures: (a) impressionistic judgment, (b) institutional status, (c) in-house assessment, and (d) standardized tests. And in (b) research design including: target language, targeted linguistic forms, reading materials, dependent variables and types of measures used, and any other independent variables examined apart from VIE, dependent variables (receptive or productive), measures used for gauging learners' degree of noticing, intensity of treatment, detailed amount of time for each step of the procedure in the experiments, interval between the pretest and the first treatment session, the interval between the last treatment session and the post-test, the duration of the treatments, the amount of time for all treatment sessions, and the actual reading time.

Overall, their results were taken from 12 published articles and 4 unpublished dissertations in line with their selection criteria. Their results were organised and presented by publication characteristics, learner characteristics, research design, treatment intensity and then the quantitative meta-analysis. Finding indicated that second language readers given visually enhanced input in the form of written texts only marginally outperformed those who were exposed to unenhanced texts with the same target forms flooded in them (effect size, $d = 0.22$). They found a small negative effect on comprehension, (effect size, $d = -0.26$).

They also found that except for one unpublished thesis, all studies included in their meta-analysis used comparison groups and not true, no-treatment control groups. The authors concluded the analysis by stating that there needed to be an improvement in research focusing on input enhancement regarding the more rigorous reporting of the methodology and to include all relevant statistical information. Further to this is the employment of delayed post-tests. Their study uncovered that only three studies (Jourdenais, 1998; Kubota, 2000; White, 1998) included a delayed post-test. This is of interest in input enhancement research as one would hope that the effects of the technique are long-lasting rather than temporary. Without the delayed measurement, the research provides very limited evidence in this area and therefore, textual input enhancement research studies lab or classroom are only focusing on very short time frames and short-term learning.

They commented loosely on the possibility of a file-drawer publication bias. The qualifying studies for Lee and Huang's (2008) meta-analysis show 16 studies were included and

their main measurement in terms of magnitude and effect were derived from the immediate and delayed post-tests, also measuring pre to post-test results for grammar learning. Meaning comprehension results and effects were also measured. Two observations from these findings are that only 5 of the 16 qualifying studies ran delayed post-test and comprehension measures were only included in 7 of the 17 studies.

Their conclusions were centred around the research area improving methodological practices by recommended that authors and research studies included more sophisticated reporting of statistical and treatment-related information. The studies included in the analysis compared the performance of textual enhancement groups with comparison or control groups. The results showed that the enhanced groups in the synthesized studies marginally outperformed the unenhanced groups (small effect, $d = 0.22$). Lee and Huang (2008) claimed that this small effect size is due to the textually enhanced groups being compared with other enhanced groups. For example, comparison groups rather than true control groups may be provided with another technique like input flood. This can conflate or suppress findings as the effect is then measuring like for like rather than against a true baseline. Take-home messages from Lee and Huang's (2008) review stated that second language acquisition research needs to report descriptive statistics, methods, and procedures much more meticulously if meta-analyses in this field are to extend and perform to their fullest potential. There is also call for more true control groups and the use of delayed post-tests. Therefore, this study may face similar difficulties with the earlier literature but following Lee and Huang's (2008) advice, there may be better luck with more recent studies.

4.2.1.2 Alsadhan (2011) Meta-analysis

Another example of a meta-analysis in textual input enhancement is an unpublished master's thesis by Alsadhan (2011). The aim of this analysis was to look at the effectiveness of two different instructional methods of second language instruction, textual enhancement and explicit rule presentation with grammar learning and acquisition. The goal of the review was to examine these two instructional treatment methods and investigate if they have positive effects on grammar 'noticing' and/or acquisition in an English foreign language setting.

Alsadhan (2011) synthesised 45 studies between 1980-2010 that addressed textual enhancement and explicit rules presentations. Several online databases (ERIC, Linguistics and Language Behaviour Abstracts, ProQuest and PsychINFO) and relevant journals were searched

upon with relevant key terms (e.g. input enhancement, focus, and form and textual enhancement). As with Lee and Huang (2008). The selection criteria here was published experimental and quasi/experimental studies between 1980 and 2010 measuring effects of textual input enhancement and explicit instruction on noticing and/or acquisition on second language grammar structures in a ESL/EFL setting. Interestingly, the selection criteria did not include studies that did not employ a pre and post-test design (for example, Alanen, 1995; Jourdenais et al., 1995; Overstreet, 2002). Studies were coded in line with Cooper's (2010) common categories such as setting, participant characteristics, research design and statistics information of each study. With a coding sheet of five categories, this was like that used in Lee and Huang (2008).

Once the searching and selection process was conducted, the meta-analysis was completed by computing effect sizes in the form of Cohen's d (Cohen, 1998) for each individual study report (totalling 13 textual enhancement studies) and the average effect size of all. The meta-analysis utilised a fixed method meta-analysis approach. The findings revealed a low effect size ($d = 0.30$) of the textual input enhancement treatment, and a high effect size ($d = 0.93$) of the explicit rule presentation treatment. The effect size calculations and results indicated that all the textual enhancement studies reported low-medium effect size values. The two studies with higher effect sizes were De Santis (2008 with $d = 2.15$) and Hayer (1997) with ($d = 1.43$). The effect sizes also represent the effect of textual enhancement treatment on the learner's acquisition of the chosen grammar form(s). Eight studies examined noticing but only reported their separate effects on acquisitions (Ha, 2005; Izumi, 2002; Leow, 2001; Leow et al., 2003; Jourdenais, 1998) with a low effect size ($d = 0.43$). Alsadhan (2011) also calculated the pre to post effect size. This measure is helpful as it helps to determine how much of the effect size is due to the treatment type. The results highlight that this calculation was not always possible, and it is reported that there was not always enough relevant descriptive data in the studies to calculate the difference. To sum up, this meta-analysis found that explicit rule presentation had a significant effect on the subjects' noticing/acquisition and was more effective than visual input enhancement. Some observations for the two reviewed meta-analyses are that learner characteristics were only explicitly considered in the Lee and Huang (2008) meta-analysis. Alsadhan (2011) appeared to be more interested in the magnitude of textual input enhancement or explicit rule presentation on noticing and/or acquisition on grammar items.

Overall, Alsadhan's (2011) meta-analysis contributed to the field, but the findings are tentative due to fact that not all studies included adequate information about their subjects or treatment. Furthermore, this meta-analysis only included published articles therefore not capturing unpublished articles which also include relevant findings to visual input enhancement.

4.2.1.3 Lee (2007) Systematic Review

Further to the existing meta-analyses, Lee (2007) conducted a complete systematic review of 13 visual input enhancement studies from published (11) studies and unpublished dissertations (2) within his study on textual enhancement and content familiarity on learners' attention to forms. The results indicated that there were significant differences between the enhancement and the baseline conditions, but that topic familiarity had a negligible effect. Lee's interpretation was that textual enhancement aided learning of the target forms but had an unfavourable effect on comprehension. Conversely, topic familiarity aided comprehension but was ineffective in terms of learning of the passive form. More importantly for this chapter are the findings from his short, comprehensive review in the journal article. His findings revealed that five of those reviewed studies found positive effects with textual enhancement on grammar (Alanen, 1995; Doughty, 1991; Jourdenais et al., 1995; Shook, 1994; White, 1998).

The other studies from his review (Izumi, 2002; Jourdenais, 1998; Leow, 1997, 2001; Leow et al., 2003; Overstreet, 1998, 2002; Wong, 2002) failed to demonstrate positive effects with textual enhancement on grammar. More interestingly is some of the differences in the studies regarding methodology. For example, out of these 13 reviewed studies there were small sample sizes of under 50 participants in total (Doughty, 2001; Alanen, 1995; Jourdenais et al., 1995; Leow, 2001) and large sample sizes ranging from 50 to 125 participants in total (Izumi, 2002; Jourdenais, 1998; Leow, 1997; Leow et al., 2003; Overstreet, 1998, 2002; Shook, 1994; White, 1998; Wong, 2003), treatment periods which ranged from less than one hour to ten working days (however it is not known how many hours this treatment was), different first language backgrounds and researching different second languages and finally different assessing measures from free recall, grammatical judgement tasks, oral tests, sentence combination tests, production tasks, recognition tasks think aloud protocols and comprehension measures to name a few. These variations in the studies make comparison without a meta-analysis and methodological synthesis difficult as there may be other factors compounded on the success of visual input enhancement. Lee and Huang (2008) furthered this by arguing that differences in

methodology ‘contributes to the indeterminacy of the results’ (Rassaei, 2015: 285). This is one of the reasons for the call for further meta-analyses in second language acquisition and more specifically second language instruction research.

4.2.3 Meta-analyses on Second Language Acquisition and Learning

Norris and Ortega (2000) focused on the effectiveness of second language instruction from 1980 to 1998 characterizing language second language acquisition techniques as either focus on form (implicit) or focus on forms (explicit). The effect size reported by Norris and Ortega (2000) for instructional effectiveness was 0.96, a very large effect size. Their findings also revealed that average effect size for explicit treatment ($d = 1.13$) was much higher than implicit treatment ($d = 0.54$). Therefore, explicit instruction (i.e. focus on form) was more effective than implicit instruction.

One of the findings from the Norris and Ortega (2000) review was that many of the studies which compared implicit and explicit instruction mainly used what Nassaji (2017: 209) pointed out as ‘explicit knowledge’ tests. These tests (approximately 90%) used non-communicative methods to measure the role of the instruction, and only 10% used items which were of communicative value. Further to this, the deciding factor of what was deemed as implicit was very narrow, and often only one type of instruction (Nassaji, 2017). It could be suggested that these results were extremely one-sided towards explicit instruction (Ellis, 2008; Nassaji, 2017). Nassaji (2017) highlights that researchers are now much more careful in their selection of methods. One of the examples provided is from Spada and Tomita (2010) meta-analysis were half of their measures used implicit methods in the tests. These implicit methods include free production tasks and use of spontaneous language. However, despite this shift in the categorisation of tests, their findings still revealed a larger effect for explicit instruction. Thus, demonstrating that it is more effective in empirical research.

Moreover, Ziegler, Meurers, Rebuschat, Ruiz, Moreno-Vega, Chinkina, Li and Grey (2017) refer to the findings of the last published meta-analysis in visual input enhancement (see Lee & Huang, 2008). Ziegler et al., (2017) highlights the notion that the meta-analysis was overall positive; however, their final results found that several limitations regarding their method. For example, two thirds of the studies included used less than three treatments with a total duration of two hours or less to the enhanced reading materials. Furthermore, their findings illustrated small total number of word types included in the enhancement and grammar tokens

(e.g. under 50), and most studies using one text (Ziegler et al., 2017). One key finding from the Lee and Huang (2008) analysis was the assessment measures whereby many studies used one test to assess learner's grammatical knowledge after the exposure to enhancement. It was further recommended in Han, Park and Combs (2008) article that assessment within language learning should be approached by using multiple measures. By using multiple measures, it may be easier to detect any learning. The prior meta-analysis demonstrated the need for longer and sufficient assessments stretching over a longer time span to better understanding the contribution that input enhancement has on second language learning development (Ziegler et al., 2017). As a result, this chapter aims to provide further insight into the body of input enhancement studies and to see whether empirical research in this domain took notice of the previous limitations of input enhancement research.

Another set of reviews central to this meta-analysis are by Plonsky and others (Plonsky, 2013; Plonsky & Gass, 2011) who have delved into research in second language acquisition as a means of detailing the way quantitative research is conducted and more importantly, reported. One finding relevant to any meta-analysis in second language acquisition is the lack of descriptive statistics which are reported in published studies. Plonsky (2013) found in his study that only 31% of 606 studies reviewed reported the mean without the standard deviation and this has been further found in other papers (Oswald & Plonsky, 2010; Russell & Spada, 2006; Wa-Mbaleka, 2006). This is of concern for this meta-analysis in visual input enhancement, and grammar learning as some of the studies may be missing basic descriptive statistics which are required for the synthesis of the data and effect size. The current meta-analysis will highlight where studies do not report this information and recommend that future studies do included their basic descriptive statistics.

4.2.4 Shortcomings from Previous Meta-analyses

In sum, the three studies reviewed above (Alsadhan, 2011; Lee, 2007; Lee & Huang, 2008) share similarities in their approach of providing details on visual input enhancement studies and possibly variables that affect the instructed second language technique. These variables loosely fall into the categories of: Learner characteristics, Research materials and Data and Statistics. The importance of examining the above variables is self-evident however rationale is provided for investigating these variables. Therefore, a planned meta-analysis of visual input enhancement and grammar learning studies was conducted. Although some of this

research has been reviewed previously (see Lee & Huang, 2008) these only represent studies up until 2008 and the field would benefit from the inclusion of more recent work

As reported in the Lee and Huang (2008) meta-analysis, the included studies often included intermediate learners and they recommended this for future visual input enhancement studies. This was explained by the authors in a sensible way as beginner learners would not have enough prior knowledge of the target form(s), and advanced learners would have had too much exposure and previous knowledge or learning with the target form(s). However, a limitation is that while learners in the reviewed studies were classified as ‘intermediate,’ there was not one single proficiency test used. The research studies all used different measures. As demonstrated in the above reviews (Alsadhan, 2011; Lee & Huang, 2008) of previous meta-analyses on textual input enhancement, the papers range from 1981 to 2011. There has since been a flurry of papers published and conducted which may help shed light on any moderating variables and help to compute an effect size to measure the magnitude of visual input enhancement for grammar learning. In sum, the current study is a response to previous meta-analyses and systematic reviews who called for further research to shed more light on the effects of visual input enhancement on second language grammar development.

4.3 The Current Meta-Analysis

In conjunction with the conclusions outlined above and the main findings from the literature review (see Chapter 2) that input enhancement (both textual and aural) are valued methods of teaching and focusing a second language learner’s attention to grammar forms, the previous meta-analyses and systematic reviews demonstrate inconsistencies in effectiveness and the way that studies are conducted. Therefore, a further exploration of factors which are influential in determining the success of this method is required.

This study will aim to provide a meta-analysis to account for the inconsistency in outcome and explore the learner characteristics (study context), research design and measures, treatment materials and then estimate the overall or combined effect. In this case, it would be the overall effect of visual input enhancement on grammar learning. The average effect size can then be calculated, and this is ultimately the statistic which would be desirable to the second language acquisition field as it would be interesting to see if it is like Lee and Huang’s value from over ten years ago. The objectives of this study are to: provide a larger period which accounts for the

papers completed after 2008 (see Alsdhan, 2011; Han, Park & Combs, 2008; Lee, 2007; Lee & Huang, 2008).

4.3.1 Aims of the Current Study

The present meta-analysis study included here is to expand the findings above by reviewing the published studies on visual input enhancement and grammatical learning, including a greater time range (between 1981 and 2016) and taking on board recommendations from previous meta-analyses in the second language field. The research questions and variables originate from §2.5.3 whereby the visual input enhancement study design is quite different in most studies. As a result, the independent variables examined in this study include *Learner characteristics* (first language, second language, total participants per study and per condition, length of study, previous knowledge of the target form and participant's proficiency level); *research design of the study* (target language: target forms; reading materials; independent variables; other measured variables; dependent variables – receptive and production; type of measures included; intensity of the treatment sessions – amount of exposure to the target forms; time between immediate and delayed); *research materials* (form processing measures; meaning processing measures; text type materials; text length; number of treatment sessions; duration of treatment; total amount of treatment time; total amount of reading time; total exposure; intervals between pre-test and first treatment; intervals between last treatment and post-test and delayed post-test). The importance of examining the above variables is self-evident however, rationale is provided for investigating these variables.

This chapter forms part of the means for a meta-analysis and would be the third known exhaustive quantitative synthesis of visual input enhancement for grammar studies since 2008 (Alsdhan, 2011; Lee & Huang, 2008). The study addressed the two below research questions:

1. How has visual input enhancement and grammar been investigated in the literature to date (1981- end of 2016)?*
2. What is the overall effectiveness of visual input enhancement for grammar learning?

*Research question 1 was investigated through a systematic synthesis of the literature on visual input enhancement and grammar learning. Research questions 2 was investigated through the quantitative meta-analysis.

4.4 Method

This analysis followed guidelines for conducting meta-analyses by Plonsky and Oswald (2012) and adheres to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff & Altman, 2009) guidelines due to their use in the psychology field and practical structure. Furthermore, Cumming and Calin-Sageman's (2017) and Oswald and Plonsky (2010) and Plonsky and Oswald's (2012) advice on searching databases was adhered to.

4.4.1 Identifying Literature and Search Strategy

The aim of the literature review was to identify and examine all visual input enhancement studies, published and unpublished since 1981 (the first time the concept of input enhancement was mentioned by Sharwood Smith). Recent narrative reviews (see Labrozzi, 2016; Lee, 2007; Lee & Huang, 2008) provided a starting point for identifying key words that were used in searching databases. The keywords developed at this stage were *input enhancement; visual input enhancement; textual enhancement; noticing; focus on form; unobtrusive implicit learning; enhance**; *typographical; textual; implicit; incidental; attention; notic**; *reading; grammar; linguistics*. In completing the searching, a wide and diverse set of techniques (Plonsky & Brown, 2015) were used. First, using a combination of keywords, seven electronic databases were searched for published journal articles, unpublished dissertations and working papers including Educational Resources Information Centre (ERIC); Psychnet; Open Access Theses and Dissertations (OATD); British Library; Ethos; Core; ProQuest Dissertations and Theses (see Table 4.1 for a full overview of searched databases). Grey (i.e. unpublished) literature was included in the search for primary studies through searching for conference proceedings and working papers on practitioner journals. A previous meta-analysis (Lee & Huang, 2008) showed a possible publication bias for example, $d = 0.55$, medium effect size for immediate post-test measures for grammar learning in *published papers* compared with $d = -0.01$, small effect size for the *unpublished dissertation studies*. The grey literature is required within a literature review to eliminate any potential misrepresentation of the true effects of input enhancement (Cumming, 2011). This misrepresentation occurs when only studies with strong results are published, leaving other research studies 'locked away.' This synthesis included published studies and unpublished studies; PhD dissertations and theses and in-house working papers. Unpublished papers were accessed through discussion with other PhD students in the field, use of practitioner/working paper journals and use of databases which hold submitted PhD/Doctoral

dissertations. During the literature search, the inclusion of all studies, regardless of methodological strength, does not affect the conclusions drawn from meta-analyses (Shapiro and Shapiro, 1980). As a result, the inclusion of unpublished studies; dissertations and working papers, helped reduced the impact of the file-drawer problem.

Second, electronic searches were completed with some widely cited journals in Second Language Acquisition and Applied Linguistics including, but not limited to: *Applied linguistics*, *Language learning*, *Applied language learning*, *Contemporary educational psychology*, *Studies in Second Language Learning*, *System*, *Modern Language Journal*. Third, online nonlibrary databases were examined (*Google Scholar*, *Research Gate*, *Academic.edu*), specific relevant websites (<http://ling.hawaii.edu/>); and a relevant Working Papers database (*TESOL and Applied Linguistics from Columbia University US*) were scanned for sources of primary research. Fourth, reference lists of input enhancement studies and meta-analyses in second language instruction were examined for sources of further relevant data. Previous reviews on the topic were cross referenced to check for any potential outliers which were not found through the database search in the initial search identification. For example, Lee (2007) and Labrozzi (2016) published narrative reviews of visual input enhancement research and Lee and Huang (2008) meta-analysed visual input enhancement for grammatical learning. Similar to Lee and Huang (2008), it was decided that if the same sample of participants appeared in more than one source, it would constitute study.

Finally, as recommended by Lipsey and Wilson (2001), professionals within the Second Language Acquisition field were contacted as potential sources of data. In addition, where studies and papers were missing information or data, authors were contacted for further information. Unpublished research was also sought out by emailing first authors of relevant studies requesting additional studies. Conference presentations were excluded from the this review due to lack of detail in their explanation of their methodology thus making it extremely difficult to extract information from the studies.

The search began from 1981 as this was the year the concept *consciousness-raising* was introduced to the second language learning literature by Sharwood-Smith (1981). Due to the time of the thesis being completed, the search period ended at the end of 2016. 2017 studies were not included in this meta-analysis. The last search was performed on 22nd December 2017. Suitable papers were identified based on screening the abstract. Although, a wide and deep search was

conducted, the synthesis findings within this study and nor will a meta-analysis provide a final answer to visual input enhancement studies and grammar learning.

Table 4.1

Searched databases, journal, and other methods

Index/Database	Description	Usage	Type of literature
Educational Resources Information Centre (ERIC)	ERIC provides access to literature related to education. It contains over one million records of journal articles, reports, practitioner reports, conference papers and book chapters.	Published studies	Published material
Psychnet	Database of abstracts in the field of psychology. Produced by American Psychological Association.	Published studies	Academic journal articles
Open Access Theses and Dissertations (OATD)	Database of open access theses and dissertations worldwide.	Unpublished dissertations	Unpublished dissertations from doctoral students
British Library Ethos	e-theses online (UK Higher Education awarded doctoral research theses)	Searched for full texts of UK awarded Unpublished dissertations	Unpublished dissertations from doctoral students
Core	Open access research papers	Published studies	Academic articles
Journals: Applied linguistics, Language learning, Applied language learning, Contemporary educational psychology, Studies in Second Language Learning, Modern Language Journal, System	Journals where visual input enhancement studies had been previously published.	Journal articles not picked up in database searches	Academic journal articles
Research Gate, Academia.edu	Open access papers from researchers worldwide	Open access articles which could not be accessed by a database	Journal articles and working papers
Google Scholar	Freely accessible search engine which includes some full texts of scholarly literature	Peer reviewed journal articles, working papers	Peer reviewed journal articles, working papers
Hand-search website: http://ling.hawaii.edu/	Ability to search 2017 papers on the relevant topics to ensure current and previous studies has been included	Working papers Articles missed from the above databases and search methods	Journal articles and working papers
Emailing authors	Asking for unpublished studies, studies from supervised students		Journal articles, working papers and unpublished dissertations

Working Papers database - TESOL and Applied Linguistics from Columbia University, United States (US)	Working research papers from institutions and providers (e.g. Teachers College, Columbia University (US). The journal published full-length articles dealing with language use, language acquisition, language teaching and language assessment)	Working papers
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4.4.2 Inclusion/Exclusion Criteria

Table 4.2 includes the full inclusion criteria for studies. Studies between 1981-2016 were included. 1981 was the first time the concept of input enhancement was mentioned (Sharwood Smith). Working papers were included as some provide detailed and empirical evidence for visual input enhancement. Visual input enhancement is more common than other forms (e.g. auditory). Studies up until the end of 2016 were included as this was the time restraint due to the thesis. All studies must have examined visual input enhancement and grammar learning. Thus, studies exploring vocabulary learning were excluded as this was not the focus of the thesis. Studies must focus on second language learners and how this method works in the context of learning a new language. The present study was concerned with the comparative nature of treatment group and control/comparison group, therefore only empirical studies were included. A true control group was participants who received no treatment and may be regarded as a baseline group. Comparison groups may be students who received an unenhanced version of the reading task. Manipulation of the treatment is the key to this criterion. The amount learned from the treatment, to test the effects of this instruction. Studies must examine the effects of visual input enhancement via a natural reading task such as a short text (usually up to 600 words) on the learning of grammar item. Target forms which were enhanced in studies must be grammatical items, not vocabulary items or items of speech. Pre-test/post-test measure design needed as the effects needed to be measured before and after treatment of the study condition.

The content of articles included in the analysis was screened according to a set of inclusion criteria (see Table 4.2) and then included full texts were coded based on a coding scheme (see Appendix B2). The search for articles (published and unpublished) included all those available in databases and email up to 31 December 2016. All studies included in the synthesis are identified with an asterisk (*) in the final References list. The PRISMA (2009) recommendations were followed (see Table 4.2): Initial selection (from various sources and dropping duplicates); Screening (based on abstracts and quick glance, eliminating any papers at a

quick glance) and Eligibility assessment based on examination of the full text. After screening, including, and excluding articles, coding and analysis was completed.

Table 4.2

Full Details of the Criteria for Inclusion in the Review

	Criteria	Notes
Initial selection	Studies were published or made available between 1981 and 2016	<i>1981 was the first time the concept of input enhancement was mentioned (Sharwood Smith). Visual input enhancement is more common than other forms (e.g. auditory). Studies up until the end of 2016 were included as this was the time restraint due to the thesis.</i>
Initial selection	Articles included were published in journals, articles published as book chapters, or unpublished studies; dissertations and working papers	<i>Working papers were included as they provide detailed and empirical evidence for visual input enhancement.</i>
Screening	All studies were either quasi-experimental or experimental studies	<i>The present study was concerned with the comparative nature of treatment group and control/comparison group, therefore only empirical and provides correlational studies were included. Manipulation of the treatment is the key to this criterion.</i>
Screening	Independent variable was the study condition and at least one condition included visual input enhancement within a text	<i>The study condition was the treatment (visual input enhancement).</i>
Eligibility	Dependent variable was the grammar acquisition	<i>The amount learned from the treatment, to test the effects of this instruction.</i>
Screening	Participants were second language learners. Studies which included first language learners were excluded	<i>The synthesis focused on second language learners and how this method works in the context of learning a new language.</i>
Eligibility	The learning activity included a natural reading task as a vehicle for input enhancement	<i>Studies must examine the effects of visual input enhancement via a natural reading task such as a short text (usually up to 600 words) on the learning of grammar item.</i>
Screening	The study needs to examine the effects of visual input enhancement – on grammatical ideas targeted by study design through reading task	<i>Target forms which were enhanced in studies must be grammatical items, not vocabulary items or items of speech.</i>
Screening	A post-test should be evident. Immediate/delayed (or both)	<i>Pre-test/post-test measure design needed as the effects needed to be measured before and after treatment of the study condition.</i>
	A control or comparison group was needed for the study to be included in this meta-analysis	<i>A true control group was participants who received no treatment and may be regarded as a baseline group. Comparison groups may be students who received an unenhanced version of the reading task.</i>

Screening	Studies included were ones written in English	<i>Studies needed to be accessible to the researcher in English. This decision was based on the notion to ensure replicability of the current meta-analysis.</i>
	Studies included reported adequate information for effect sizes to be calculated	<i>Where the necessary descriptive statistics were not included, the author was contacted. If these statistics were not given, the study was not included.</i>

4.4.3 Coding Procedure

Based on previous literature reviews I identified several variables likely to influence input enhancement findings (see Chapter 2 and §4.2.1). These variables have been organised into three categories: (1) learner characteristics, (2) research design, and (3) research/treatment materials. After researching and identifying the body of literature that met the inclusion criteria, there was a coding scheme (see Appendix B3). In addition, each study was coded as published or unpublished to examine publication bias. Throughout the searching stage of this meta-analysis, there was a concentrated effort to include unpublished studies such as dissertation studies from PhD students and unpublished work from published researchers. This inclusion allowed for comparisons between published and unpublished studies in the results section. Studies also had the author(s), published year and journal (if applicable) coded.

Learner characteristics coded included first language, second language, total participants per study and per condition, length of individual foreign/second language learning, previous knowledge of the target form and participant's proficiency level. *Research design of the study* included target language: target forms; reading materials; independent variables; other measured variables; dependent variables – receptive and production; type of measures included; intensity of the treatment sessions – amount of exposure to the target forms; time between immediate and delayed (if a delayed post-test was part of the design).

Research materials in each study included form processing measures; meaning processing measures; text type materials; text length; number of treatment sessions; duration of treatment; total amount of treatment time; total amount of reading time; total exposure; intervals between pre-test and first treatment; intervals between last treatment and post-test and delayed post-test.

Data and statistics coded were immediate post-test effect size; delayed post-test effect size; post-to delayed; pre-to immediate contrast; meaning comprehension. Statistical information recorded included statistical results reported in the studies (mean, standard deviations, *F* test

scores, p values, and confidence intervals). From this statistical information, effects are computed, and if already reported in the studies, coded too.

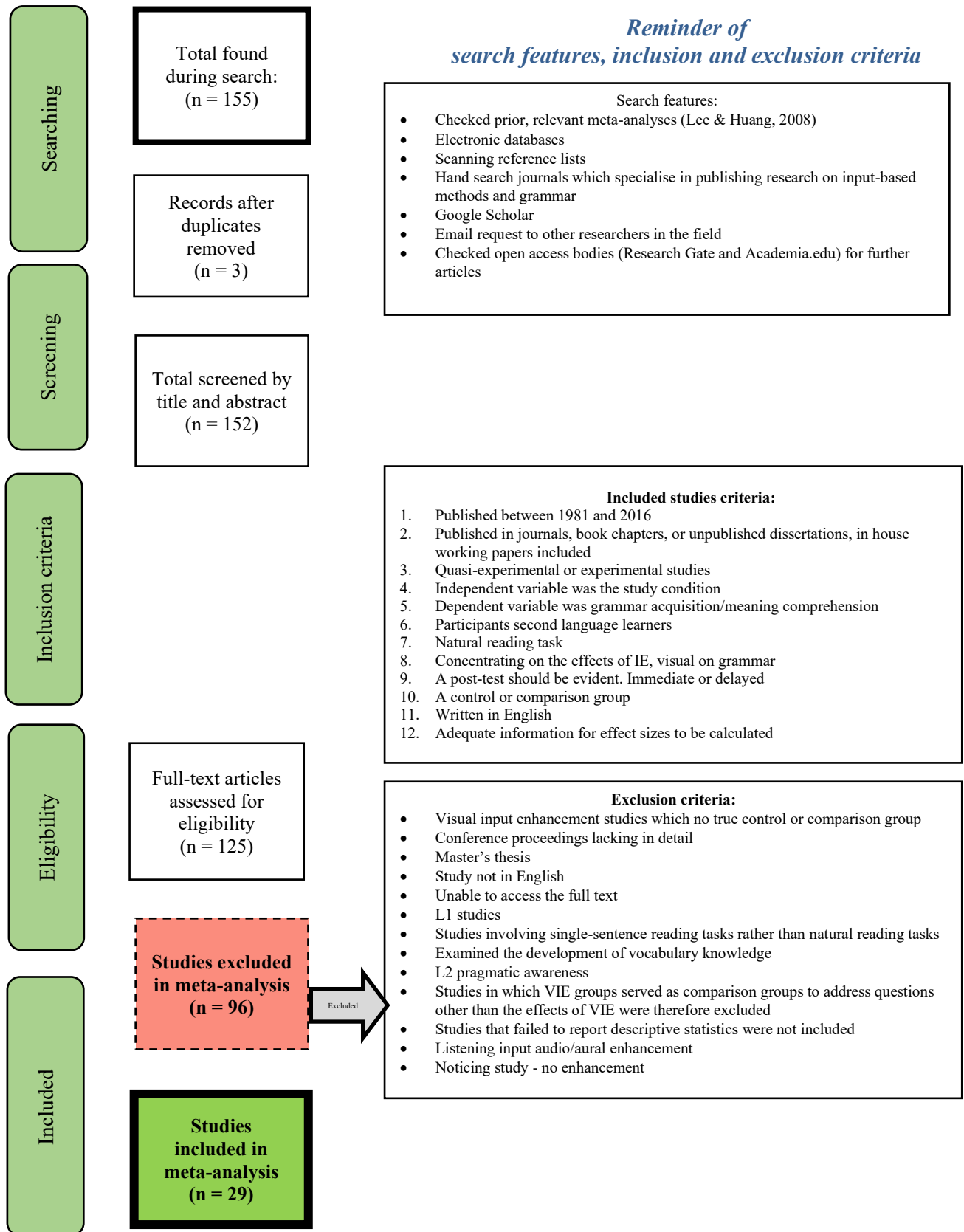


Figure 4.1. Diagram of the study identification process (taken from PRISMA, 2009)

4.5 Analysis and Calculating Effect Size

The analysis for this study will follow a methodological synthesis which reviews of the study type and source, learner characteristics, research design and treatment materials. The quantitative review will be conducted by computing effect sizes for each study included. From each study, descriptive statistics were searched for and collected so that effect size could be computed to provide a measure for effectiveness of the chosen technique. Given the popularity of Cohen's *d* being adopted in second language meta-research, and that one of the two meta-analyses on this topic used Cohen's *d*, the same effect size computation (Cohen's *d*) was facilitated. To calculate effect sizes for the 'effectiveness of the visual input enhancement treatment per study,' the dependent and independent variables were focused on. As described by Cohen (1988), effect size is "the degree to which the phenomenon is present in the population". Effect size has a multitude of metrics and helps to measure the strength of a relationship or effect between variables. For example, *d* index, *r*-index, and odds ratio. Using these measures depends on the topic and technique. One of the aims of this quantitative review is to measure the "overall effectiveness of visual input enhancement for grammar learning" (Research Question 3). To achieve this, the meta-analysis must measure the effect between the independent and dependent variable. In simple terms, this is the visual input enhancement on the form and meaning processing tasks taken at the immediate (and/or delayed post-test stage). The most suitable metric for this is the *d*-index.

Cohen's *d* is calculated using the following: Difference between the mean experimental group (e.g. the textually enhanced group) compared with the comparison group on the immediate post-test measures. For the independent samples T-test, Cohen's *d* is determined by calculating the mean difference between your two groups, and then dividing the result by the pooled standard deviation (Cohen's $d = (M2 - M1) / SD_{pooled}$). This measure is appropriate when the two groups being measured has similar standard deviations and are of a similar sample size. Because of the nature of the studies, the groups are similar in size and the pre-post test result is the same group and sample size. Ideally, as with the case in previous meta-analyses, there should be a true control group. Due to most of studies not having this in their methodological design, this was not possible. The comparison group was therefore used. There were also missing data in some of the studies (means and standard deviations), for example failure to report the difference between pre-immediate post-test, and scores on the tasks (dependent variables). Where data is missing, the effect size calculations include 'not reported,' and no effect size is reported.

4.6 Results

29 studies (19 published journal articles, 4 book chapters, 5 doctoral dissertations and 1 conference proceedings) from 1981-2016 were included in this synthesis and meta-analysis (see Table 4.3 for a full overview). These studies were examined in line with the coding categories (see §4.4.3), the results will now be presented by study identification (source type), learner characteristics/study context, research design and measures, treatment materials and then the data and statistics including the quantitative review and effect sizes.

4.6.1 Synthesis of Research - Descriptive Overview of the Data Sample

Study Identification/Publication Characteristics:

During the literature search and inclusion/exclusion activities, there was a vast amount of visual input enhancement studies ranging from 1991 to 2016, a 35-year period. A total of 29 studies was included. Over 155 studies related to visual or textual input enhancement were retrieved from the literature (as described in Figure 4.1). Based on the inclusion and exclusion criteria, 125 studies were reviewed in full to ensure they fit the inclusion criteria. There were many reasons why studies did not fit the criteria (see Appendix B4 for an excerpt). In total, as shown in Table 4.3, a total of 29 studies fit the inclusion criteria and were retrieved and included in this study. Figure 4.2 and 4.3 shows the studies included by year, totalling 10 studies in the years 1991 to 1999, 11 studies in the years of 2000 to 2009 and 9 studies in the years of 2010 to 2016. The included literature can be broken down into 19 journal articles, 4 book chapters, 5 doctoral dissertations and 1 conference proceeding (see Figure 4.4). In terms of published and unpublished literature, this is 23 published articles, and 6 unpublished articles (see Table 4.4).

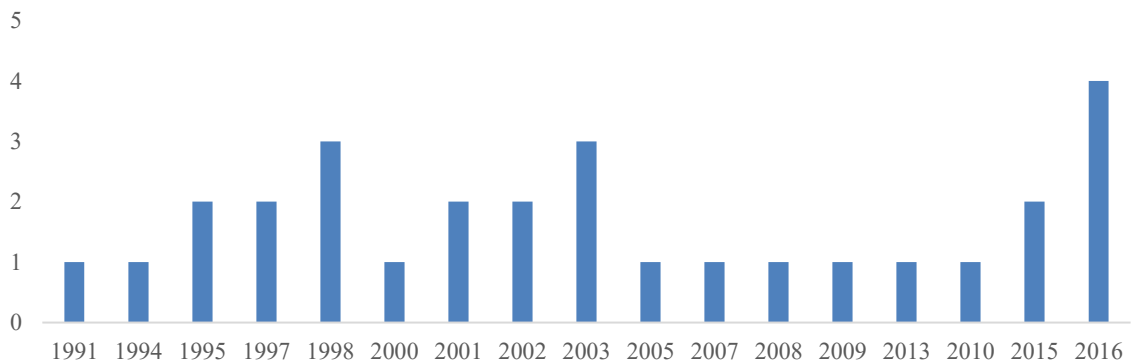


Figure 4.2. Included Studies during 1991–2016.

Table 4.3

Methodological Characteristics from Included Studies (N = 29).

	<u>Study and date</u>	<u>Paper type and source</u>	<u>Form of enhancement</u>	<u>Target form</u>	<u>Participants</u>	<u>No. of sessions, treat. duration</u> <u>Reading length, total exposure</u>	<u>Measure of assessment</u>	<u>Findings Form processing</u>	<u>Findings Meaning processing</u>	<u>Overall effect</u>
1	Alanen (1995)	Published book chapter In R. Schmidt (Ed.), Attention and Awareness in Second Language Learning (Technical Report #9) (pp. 259-302).	Italics	Finish locative suffix / consonant gradation	36 adult learners L1 English L2 Finnish	Unenhanced group read the text No true control group	Sentence completion GJT Rule statements	Some positive effects on acquisition, especially on locative suffixes	Not tested	Some positive effects on acquisition
2	Atkinson (2016)	Doctoral dissertation	Bold	English gender pronouns	311 high school students L1 Chinese Mandarin L2 English	4-week study 6 groups – with true control group Delayed 2-week post- test	GJT Productive use fill in the blank test Noticing and Comprehension	No effect on intake in enhanced groups. Explicit rules only group performed best in the immediate short-term	No impact on comprehension	No effects on intake/ acquisition
3	Bowles (2003)	Conference proceedings Theory, Practice and Acquisition	Target verb underlined, bolded morpheme	Spanish imperatives	15 L1 English L2 Spanish	?		No effect on intake and participants did not report noticing	No effect on comprehension	No effects on intake/ acquisition
4	Cho (2010)	Published journal article Innovation in Language Learning and Teaching	Underlined, bolded	English Present Perfect	87 high school students L1 Chinese L2 English	Unenhanced group read the text No true control groups		TE affected noticing and receptive acquisition of the English present perfect		Positive effects on acquisition/intake
5	De Santis (2008)	Published journal article Applied Language Learning	Increased font size and colour red to target form; increased font size and bolded target form	English Bound morphemes on present indicative verbs	15 adult speakers L1 Haitian L2 English	Unenhanced group read the text No true control groups		Increased noticing of the form, no effect on orally produced forms		Positive effects on acquisition/intake

6	Doughty (1991)	Published journal article Studies in Second Language Acquisition	?	English relative clauses	20 adult intermediate learners L1 mixture L2 English	?	Comprehension questions Free recall-task Grammaticality judgment task Sentence combination task Guided sentence completion task	Positive effect on acquisition	Not directly tested	Positive effects on acquisition/intake
7	Fang (2016)	Published journal article Journal of Research in Reading	Bolded and increased font size	English anaphors	60 EFL Taiwanese 17-year olds L1 Taiwanese L2 English	Unenhanced group read the text No true control groups		Positive effect of TE, increased anaphor performance	No effect on comprehension	Positive effects on acquisition/intake
8	Fukuya and Clarke (2001)	Published book chapter L. Bouton (Ed.), Pragmatics and language learning, Vol. 10 (pp. 111–130).	Highlighted in yellow	English Mitigation in requests	34 university students L1 mixed nationalities and first language (23 Japanese, 4 Chinese, 2 Koreans, 2 Taiwanese, 1 Iranian) L2 English	Unenhanced watched the input No true control groups		No effect		No effects on intake/acquisition
9	Ha (2005)	Doctoral dissertation	?	English determiners	64 Adults learners L1 Korean L2 English	?		Positive effect on acquisition	Not tested	Positive effects on acquisition/intake
10	Izumi (2002)	Doctoral dissertation	Bold, shadow, different fonts, and sizes	English relative clauses	61 adult learners Diverse L1 background L2 English	True control group Control group only completed the pre-test, post-tests	Recall task Sentence combination task Picture cued sentence completion task Interpretation task	Not directly tested	Positive effects on noticing (measured by the note taking and text reconstruction task) Failed to show gains in learning/acquisition	No effects on intake/acquisition

11	Jahan & Kormos (2015)	Published journal article International Journal of Applied Linguistics	Bold	English Modal auxiliaries ('be going to' and 'will') and their use for expressing future plans and intentions	97 Bangladeshi learners in a university setting L1 Bengali L2 English	True control group Control group only completed the pre-test, post-tests	No effect on the form-mapping of target forms Enhanced & unenhanced gained more detailed, partial understanding in terms of noticing the target forms	No effect on the form-mapping of target forms Enhanced & unenhanced gained more detailed, partial understanding in terms of noticing the target forms		No effects on intake/acquisition
12	Jourdenais (1998)	Doctoral dissertation	Underline, bold, shadow, different font	Spanish preterit, imperfect	116 adult learners with different proficiencies L1 English L2 Spanish	True control group Control group only completed the pre-test, post-tests	Comprehension questions MT Narrative essay	No effects	No effect on acquisition	No effects on intake/acquisition
13	Jourdenais et al. (1995)	Published book chapter In R. Schmidt (Ed.), Attention and awareness in foreign language learning (pp. 183-216).	Underline, bold, shadow, different font	Spanish preterit and imperfect verbs	10 adult learners L1 English L2 Spanish	Unenhanced group read the text No true control groups	Think aloud protocols Picture based writing	Positive effects	Enhanced used the target structure more often than Unenhanced - on both think aloud and written production tasks	Positive effects on acquisition/intake
14	Kubota (2000)	Doctoral dissertation	?	Japanese gerund adjectives/gerund of verbs	Students in classroom setting L1 English L2 Japanese	?	Grammatical judgment Sentence completion	Grammar group did significantly better Enhancement did not improve	Not tested	No effects on intake/acquisition
15	LaBrozzi (2016)	Published journal article Language Teaching Research	One type of TE in each group: underline, bolded, italics, increased font size, capital letters, different font	Spanish present and preterit tense	125 adult college-aged students learners L1 English L2 Spanish	Unenhanced group read the text No true control groups	TE positively affected second language form recognition More effective with increased font size condition	TE positively affected second language form recognition More effective with increased font size condition		Positive effects on acquisition/intake

16	Lee (2007)	Published journal article Language Learning	Bolded and different font	English passive tense	259 high school Korean learners L1 Korean L2 English	Unenhanced group read the text No true control groups	Form correction Free recall task	Positive, aided students attending to grammar	Not tested	Positive effects on acquisition/intake
17	Leow (1997)	Published journal article Applied Language Learning	Bolded and underlined entire verb form	Spanish Imperative forms	84 Spanish adults L1 Spanish L2 English	Unenhanced group read the text No true control groups	Short answer comp. task MCT form recognition task	TE had no effect on intake	TE had no effect	No effects on intake/acquisition
18	Leow (2001)	Published journal article Hispania	Underlined verb forms; formal imperative bold	Spanish imperative	74 1 st year university students L1 English L2 Spanish	Unenhanced group read the text No true control groups	Short answer task MCT MCT recognition Fill in the blank production Think aloud protocol	No effect on intake No effect on noticing	No effects 33% in the IE group mentioned target forms in their think aloud 12% in the unenhanced group mentioned target forms in their think aloud	No effects on intake/acquisition
19	Leow et al. (2003)	Published journal article Applied Language Learning	Underlined verb; bold tense morpheme; increased font size	Spanish present perfect	72 college level learners L1 English L2 Spanish	Unenhanced group read the text No true control groups	MCT comprehension MCT form recognition Think aloud	No effects	No effects on intake or noticing	No effects on intake/acquisition
20	Loewen and Inceogru (2016)	Published journal article Studies in Second Language Learning and Teaching	Highlight	Spanish preterit and imperfect past tense)	30 college level students L1 American English L2 Spanish	Unenhanced group Read the text No true control groups		Learners aware of highlighted grammatical forms in text. No difference in the amount of attention between the enhanced and unenhanced groups Both groups improved in their knowledge of the L2 forms; no differential improvement between the two groups	No effects on intake/acquisition	

21	Overstreet (1998)	Published journal article Spanish Applied Linguistic	Increased font size, bold and underline ; increased font size; underlined and shadowed	Spanish preterit/imperfect	50 adult learners L1 English L2 Spanish	Unenhanced group read the text No true control groups	T/F comprehension task Circle the verb task Written narration task	No effects on intake	Negative effects	No effects on intake/acquisition
22	Overstreet (2002)	Doctoral dissertation	Bolded, underlined and capitalized	Spanish present progressive/imperfect subjunctive	109 adult learners L1 English L2 Spanish	?	Free recall task Picture recognition	No effects	No effects on intake but a higher awareness of items with high communicative value	No effects on intake/acquisition
23	Park and Nassif (2013)	Published journal article Language Awareness	Enlarging, bold and underlining	16-17 school beginners in English	88 Korean school L1 Korean L2 English	Baseline text 28 VIE 26 VIE attention 31	Fill in the blank test (controlled production) Free production			Positive effects on acquisition/intake
24	Rassaei (2015)	Published journal article TESOL Journal	Underlined and boldfaced	English articles (definite the and indefinite a)	95 adult learners Intermediate level major English institute in Iran L1 Persian L2 English	30 in control 32 in TE group 33 in IE group	written picture description (WPD) task, a multiple-choice test (MCT), and an error correction test (ECT)	Limited effects but did show some increased difference for those in textually enhanced groups		Positive effects on acquisition/intake
25	Robinson (1997)	Published journal article Studies in Second Language Acquisition	?	English novel verbs (dative alternation)	60 adult learners L1 Japanese L2 English	?		Limited effects		No effects on intake/acquisition
26	Simard (2009)	Published journal article System	Different TE methods per group	English plural markers	188 subjects Grade 8 French learners L1 French L2 English	?		Effects of TE differed depending on the format used		Positive effects on acquisition/intake
27	Shook (1994)	Published journal article Applied Language Learning	Bolded and capitals	Spanish present perfect/relative pronouns	125 adult learners L1 English L2 Spanish	Unenhanced group read the text No true control group	Recognition test Fill-in-blank production task	Positive effect on acquisition	Not directly tested Subjects whose	Positive effects on acquisition/intake

									attention was drawn to grammatical items gained more linguistic information	
28	White (1998)	Published book chapter C. Doughty & J. Williams (Eds.), Focus on form in classroom second language acquisition (pp. 85-113).	Underline, italics, underline, enlargement	English possessive determiners	86 Primary school children L1 Francophone L2 English	Unenhanced group read the text No true control group	Passage correction task MCT Oral picture description task	Partial TE increases frequency of linguistic feature use No effect on accuracy of use	Not tested	Some positive effects on acquisition/intake
29	Wong (2003)	Published journal article Applied Language Learning	Increased font, bolded, italics and underlined structure; underlined; enlarged, bolded and italics	French past participle in relative clauses	81 adult learners L1 English L2 French	Unenhanced group read the text No true control group	Free recall task Error correction task	No effects Better recall of enhanced formation	TE not effective as a form of IE on acquisition of the past participle in relative clauses	No effects on intake/acquisition

Note. IE refers to input

Figure 4.3. Included Studies over 35-year period.

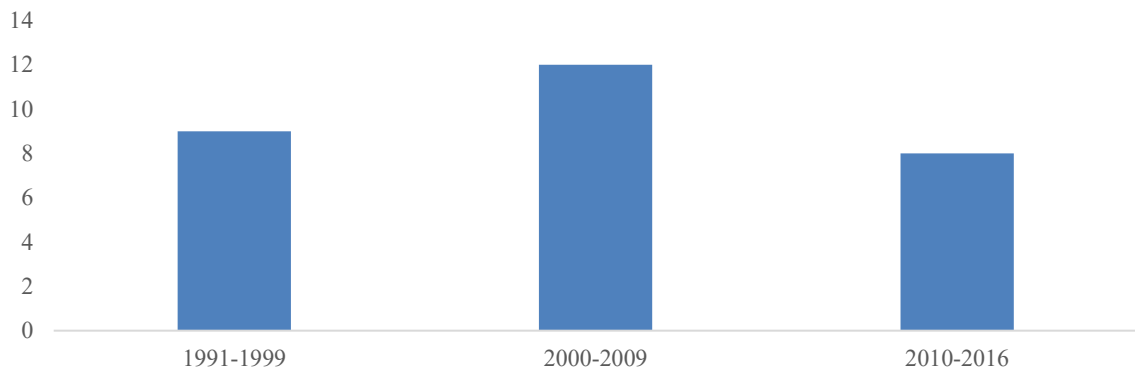


Figure 4.4. Publication Sources for Included Studies.

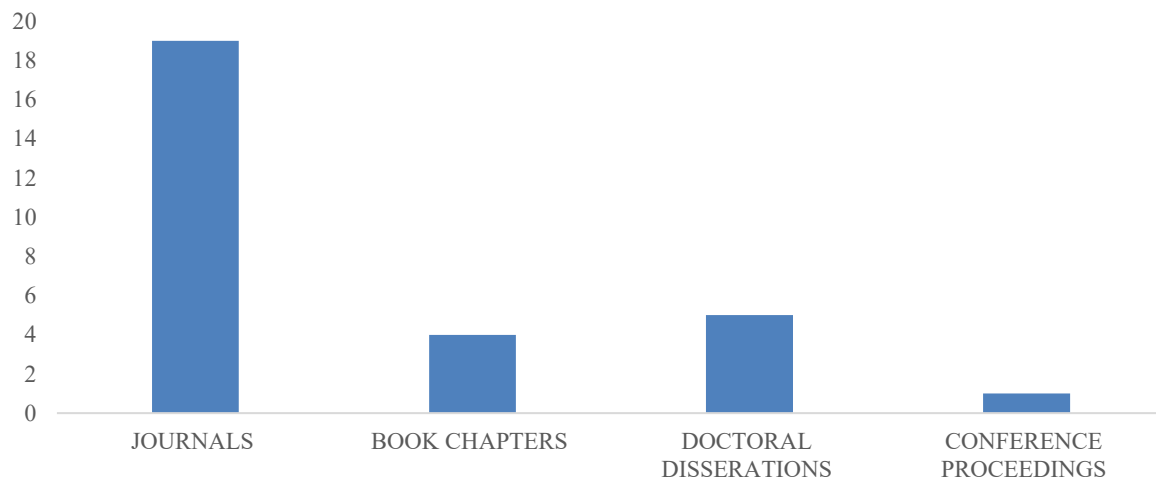


Table 4.4. Sources and Number of Studies (N = 29)

Source	n	Percentage
Journal articles		
Total journals	19	62%
Applied Language Learning	5	17.24%
Hispania	1	3.45%
Innovation in Language Learning and Teaching	1	3.45%
International Journal of Applied Linguistics	1	3.45%
Journal of Research in Reading	1	3.45%
Language Awareness	1	3.45%
Language Learning	1	3.45%
Language Teaching Research	1	3.45%
Spanish Applied Linguistic	1	3.45%
Studies in Second Language Acquisition	2	6.9%
Studies in Second Language Learning and Teaching	1	3.45%

	System	2	6.9%
	TESOL Journal	1	3.45%
Book Chapters		4	13.79%
Unpublished	Doctoral Dissertations	5	17.24%
	Conference proceedings	1	3.45%

Learner Characteristics and Study Context:

2422 participants over 29 studies (from 32 unique samples) were included in the 29-visual input enhancement and grammar learning studies. Table 4.3 and Table 4.5 provides the descriptive information for the number of participants across each study. There is a wide range of participants per study, minimum of 10 participants per study to 311 participants per study (see Table 4.5). The mean participant sample size is 87, with a median of 78 participants. The lowest number of participants was Jourdenais et al. (1995) study with a total of 10 learners. The participants in the studies were described as either school children, high school learners, college/university learners and adults. There was one study where there was no description of the learners. Studies revealed that 45% of the participants in the included studies were adult learners, and the school children accounted for 10%, less popular group of participants for visual input enhancement for grammar learning (see Figure 4.5).

Table 4.5.

Sample Sizes Across Studies (n = 29 Studies, 2422 Participants)

Measure	Full study
Mean	87
SD	69.59
Median	78
Max.	311
Min.	10
Range	10-311
Total	2342

Note. Numbers have been rounded to the nearest decimal point due to numbers representing sample sizes and participants.

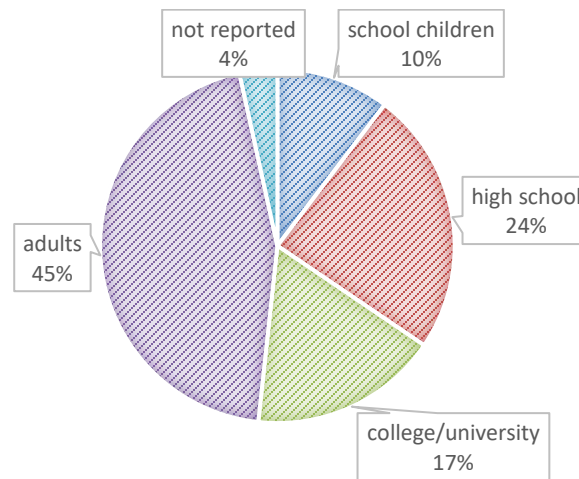


Figure 4.5. Type of Participants (school children, high school students, college/university, adults and not reported).

Learners in the studies are very varied. Table 4.6 highlights the first language of the participants. Notably, 40% of participants had English as their L1, 10% for French and Korean, and 7% with Spanish. First language was spread across 10 different languages (see Table 4.6). The target second language in the visual input enhancement studies ranged across five different languages: English (13 studies, 44.8%), Spanish (12 studies, 41%), Finnish (1 study, 3.44%), French (1 study, 3.44%), Arabic (1 study, 3.44%), and Japanese (1 study, 3.44%) (see Figure 4.6). All studies focused on one target L2. The proficiency/experience of the target L2 of participants was also varied with mixed proficiency (1 study). beginner (12 studies); intermediate (14 studies) and advanced (1 study) learners and not reported (1 study).

Table 4.6.

First Language (L1) and Target Second Language (L2) Across the 29 Studies.

Language	L1	L2
Arabic		1
Bengali	1	
English	11	13
Chinese	1	
Finnish		1
French	3	1
Haitian	1	
Japanese		1
Korean	3	
Persian	1	
Spanish	2	12
Taiwanese	1	
Mixed	1	

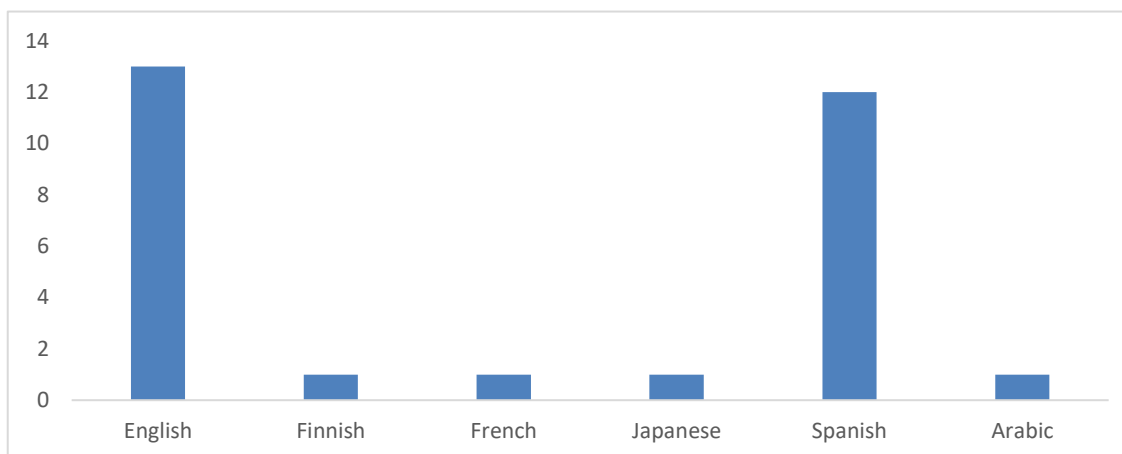


Figure 4.6. Learner’s Target Foreign/Second Language Across the 29 Studies.

Research Design and Treatment:

The 29 studies employed a wide range of different grammatical forms across different L2s (see Table 4.3 for a full overview). This choice depended on the researcher and which target form would be of some difficulty to L2 learners. Table 4.7 also details the number of grammar tokens in the input. Boldface of the target forms (appeared in 12 studies) was the most popular form of visual textual enhancement in the studies. The least popular was highlighted target forms (appeared in 2 studies) (see Table 4.3 for an overview per study). Most studies employed a mix of enhancement methods ranging from italics to enlargement of font.

The designs of studies showed that the post-tests were mostly form-oriented. Table 4.3 includes an overview of these per study for example, grammatical judgement task (Alanen, 1995; Atkinson, 2016), sentence completion (Izumi, 20002), fill-in-the-blanks (Atkinson, 2016; Lee, 2007). In the results sections of the studies, to determine whether visual textual enhancement was effective, the statistical significance was often the leading factor.

4.6.2. Quantitative Review – Effect Sizes

To tackle Research Questions 2 and 3 and assess the effectiveness and magnitude of visual input enhancement on grammar learning, Cohen’s *d* values (Cohen, 1998) were calculated for each study. Table 4.7 presents these effect sizes per study. As outlined in §4.5, effect sizes were computed by taking the mean of the experimental group (i.e. the textually/visually enhanced group) and the comparison group (control, baseline or in some circumstances, the unenhanced

group) on the immediate post-test measures. Where studies did include a form of delayed post-tests, another effect size was calculated with the same calculation as above. Table 4.8 includes a full overview of the effect sizes per included study.

In some of visual input enhancement studies, there is often more than one measure for the post-tests (especially the immediate post-test). Therefore, in line with guidance from Norris and Ortega (2000), multiple effect sizes can be averaged when examining multiple post-tests. This combines the impact of the study's treatment across the included tasks. In addition, where studies had different target grammatical items with different participants, these were treated as different studies as the participants experienced different target items. This was the case for Jourdenais (1998), Kubota (2000) and Overstreet (2002) (as indicated on Table 4.7 with multiple d values per paper). Delayed post-test effect sizes were calculated for seven studies (Atkinson, 2016; De Santis, 2008; Jahan & Kormos, 2015; Jourdenais, 1998, Kubota, 2000; White, 1998; Wong, 2003). Cohen's d was calculated using the delayed post-tests scores between the enhanced and comparison/control group.

Table 4.7 shows that students who underwent a visually enhanced treatment (often an enhanced input text using one or a multitude of enhancement techniques) outperformed their comparison group by around 0.34 units, 95% CI [0.142, 0.542]. As measured by Cohen's d , this is a small effect and can be interpreted as visual input enhancement having a small impact on the learner's grammar. The confidence intervals demonstrate that the statistical data is may not be trusted. The delayed post-tests effects were also incredibly small with 0.23, 95% CI [-0.006, 0.466]. However, the delayed post-test calculations were only derived from eight studies. The pre to post-test results focus on the how learners have performed from 0.23 delayed, 95% CI [-0.006, 0.466] pre-test (at the start of the study, before any treatment) to the post-tests (after the treatment) with 0.78 pre, 95% CI [0.496, 1.07]. This is a large effect and shows that students with the enhanced input texts improve from their pre-test scores to post-tests scores. Given that Lee and Huang (2008) found an effect size here of $d = 0.55$, this is a larger effect.

Table 4.7

Effect Sizes per Study (Cohen's d)

	Study	Overall average effect size (post-tests)	Immediate post-test(s)	Delayed post-test	Pre-to post
1	Alanen (1995)	0.08	0.08	Not tested	No pre
2	Atkinson (2016)	0.30	0.34	0.26	0.43
3	Bowles (2003)	-0.12	0.28	Not tested	0.32
4	Cho (2010)	1.04	1.12	Not tested	1.68
5	De Santis (2008)	1.99	2.15	1.82	2.28
6	Doughty (1991)	0.45	0.46	Not tested	1.85
7	Fang (2016)	0.64	0.73	Not tested	1.05
8	Fukuya & Clarke (2001)	n/a	n/a	Not tested	n/a
9	Ha (2005)	0.14	0.14	Not tested	0.26
10	Izumi (2002)	-0.18	-0.18	Not tested	0.67
11	Jahan & Kormos (2015)	0.74	n/a	0.33	0.42
12	Jourdenais et al. (1995)	1.61	1.61	Not ran	No pre
13	Jourdenais et al. (1998)	0.02	0.05	-0.10	-0.04
14	Kubota (2000)1	-0.40	-0.37	-0.45	n/a
	Kubota (2000) 2	-0.15	-0.10	-0.21	n/a
15	LaBrozzi (2016)	0.44	0.48	Not tested	0.63
16	Lee (2007)	0.34	0.34	Not tested	1.11
17	Leow (1997)	-0.06	-0.06	Not tested	0.86
18	Leow (2001)	0.51	0.51	Not tested	n/a
19	Leow et al. (2003)	-0.22	-0.22	Not tested	n/a
20	Loewen & Inceogru (2016)	0.09	0.09	n/a	0.12
21	Overstreet (1998)	0.03	0.03	Not tested	0.07
22	Overstreet (2002) 1	0.61	0.61	Not tested	Not ran
	Overstreet (2002) 2	-0.05	-0.05	Not tested	Not ran
23	Park & Nassif (2015)	n/a	n/a	Not tested	n/a
24	Rassaei (2015)	0.64	0.68	Not tested	n/a
25	Robinson (1997)	0.13	0.21	Not tested	n/a
26	Simard (2009)	0.60	0.62	Not tested	0.95
27	Shook (1994)	n/a	n/a	Not tested	n/a
28	White (1998)	0.10	0.23	-0.01	0.45
29	Wong (2003)	0.26	0.26	Not tested	0.97
	AVERAGE EFFECT SIZE	0.34	0.37	0.23	0.78
	SD	0.54	0.53	0.35	0.62

Note. n/a equals that this calculation could not be computed as the statistics was not available. Not tested means the delayed post-test did not feature in that study. Pre-to-post was pre to immediate post-test(s). Effect sizes rounded to 2 decimal places.

4.7 Interim Discussion

The primary aims of this study were to explore methodological differences between visual input enhancement studies on grammar learning and explore the magnitude and impact of the overall impact of visual input enhancement on grammar learning.

previous section presented the results of meta-analysis. This section will now focus on answering each of the research questions. The first research question aimed to review the studies published between 1981-2016 and provide information on their key findings. This research question was answered through a systematic synthesis. Research questions 2-4 aimed to use the findings from the quantitative meta-analysis focusing on the impact in learning, and the magnitude of effect size between published and unpublished literature.

4.7.1 Research Question 1: How has visual input enhancement and grammar been investigated in the literature to date (1981- end of 2016)?

The methodological synthesis was centred on learner characteristics and research design. The present methodological synthesis sampled 29 experimental and/or quasi-experimental studies over the past 35 years (1981-2016). Research on visual input enhancement for grammar learning has had inconsistent findings and therefore, different conclusions based on the researcher and author. The meta-analysis here, confirms that this is again true over the time 1981 to 2016 (a 35-year period). The findings in the methodological synthesis show the difference in way that visual input enhancement studies are designed and conducted.

Some of the shortcomings from the studies reviewed are that few of the studies included delayed post-tests to further examine the lasting effects of visual input enhancement. Most of the post-tests were immediate, and this was straight after the input treatment. As pointed out by White (1998), delayed post-tests are necessary in this type of research to assess the magnitude and long-lasting effects of the technique. Further to this is the inclusion of true control groups (see Atkinson, 2016; Jahan & Kormos, 2015; Izumi, 2002; Simard, 2009 for included delayed post-tests). This was limited in the studies reviewed and often the enhancement group was compared to that of a comparison group, ranging from those who did not read the texts, did read an unenhanced version of the input text and those who received a different form of input (e.g. input flood). True effects could be measured if true control groups were used in this type of research. Interestingly, this is a recommendation that has been called for in previous literature (Lee & Huang, 2008). It is therefore difficult to guarantee that any learning (intake and/or acquisition) in the studies from pre to post-tests is due to the enhancement techniques.

The primary research drawn in this study have conflicting conclusions on the effectiveness of VIE on grammar learning. The results in the quantitative review in this study, also highlight inconclusive and inconsistent research. The studies that fit the inclusion criteria

include those from Lee and Huang's (2008) meta-analysis and some additional studies between 2008 to 2016 (Atkinson, 2016; Cho, 2010; De Santis, 2008; Fang, 2016; Fukuya & Clarke, 2001; Jahan & Kormos, 2015; LaBrozzi, 2016; Loewen & Inceogru, 2016; Park & Nassif, 2015; Rassaei, 2015; Simard (2009)). The findings presented demonstrate how each study in visual input enhancement and grammar learning is specific to the context in which they are researching. For example, each study has its own individual way of assessing proficiency, choosing participants, choosing a target form and the development of the materials and design of the study. As the domain of visual input enhancement has grown over the past decade, there has been an increase in literature (published and unpublished) and this shows in this analysis. There were also several other visual input enhancement studies in the searching process, however these focused-on vocabulary developments. It may be that there have been more studies since Lee and Huang's (2008) with target forms of vocabulary items.

The findings here present a continued call for more visual input enhancement studies on grammar. A larger body of literature would enable more findings and conclusions to be trusted. It should also be noted that not all moderating variables were compared as there were many missing from the analysis. This was due to the studies not including the relevant description, materials, or procedure in the methodology section.

4.7.2 Research Question 2: What is the overall effectiveness of visual input enhancement for grammar learning?

To recap, the meta-analysis based on 29 studies found an overall effect size for visual input enhancement on grammar learning, $d = 0.34$, when compared to comparison/control groups. This is a small effect size, and this could be due to the amount of variability in the included studies. The studies found mixed results and often has $d = 0.78$ pre, 95% CI [0.496, 1.07]. This is a large effect and shows that students with the enhanced input texts improve from their pre-test scores to post-tests scores.

4.7.3 Limitations of Current Meta-analysis and Suggestions for Future Research

The study is not without some limitations. The search strategy for unpublished literature could have been more systematic. For example, follow up emails to authors of published material to ask if they had any unpublished studies, or using an academic discussion board/email through professional and learning societies to ask for requests of unpublished material. It should also be

noted that when searching for PhD dissertations, only those available on databases such as ETHOS were searched. This does not include all PhD studies due to embargoes, or universities not participating in that database, therefore reducing the possible visible or accessible amount of unpublished literature.

The list of qualifying studies may not be exhaustive. While an attempt to focus on new literature since Lee and Huang's (2008) meta-analysis, some may have been missed due to access to databases, and there is no guarantee that all grey-literature was found in the initial search. The decision to use Cohen's d for the computation of effect size is well-documented in the chapter, but it is worth considering the other types of effect size. In addition, future meta-analyses in this area could consider a different method of quantitative review, a quality effects meta-analysis.

In sum, the findings in this methodological synthesis and meta-analysis offer some more ground in terms of unpacking the inconsistencies found in reported results of visual (textual) input enhancement and grammar learning. The aim of this chapter was to provide a new and up-to-date meta-analysis from the past 35 years on visual input enhancement and grammar learning studies to help make headway on the former inconsistencies found in the textual enhancement literature. It must be emphasised that the current meta-analysis does not provide the final answer or underpinning of how a visual input enhancement study should be designed and conducted but a formative assessment of the literature over the past 35 years and the research domain. Nonetheless, the findings revealed that there have been some studies since Lee and Huang's meta-analysis and there are still differences in study design. These findings will help to plan and design some of the experimental studies in this thesis especially regarding reporting information and statistics, and items central to the treatment (e.g. duration, intensity, repetition, and measures).

Chapter 5: Experiment 1: The impact of input enhancement and grammatical rules on noticing, intake, and comprehension in Chinese second language learners of English

5.1 Introduction

This chapter reports the results of a classroom research study which used an experimental design on the facilitation of visual input enhancement in the teaching of the grammar form, gender pronouns to, Chinese 15-18-year olds with English as a second language in their native country, China. As discussed in §1.3.3, Experiment 1 was a typical visual input enhancement study (pre, treatment and post-test design) focusing on the highlighting of gender pronouns using boldface and use of explicit rules.

The research was primarily based on previous empirical work in the input enhancement area and revisits the question of whether visual input enhancement really is efficiently salient (despite some of the findings that it is not useful or has no impact on learning, as summarised in §2.5.3) and can contribute to effective learning. Much of the prior research has seen mixed results (see §2.5.3) which had led to an un-generalisable population of results which researchers in the field and thus, second language instructors cannot be fully confident with. Further to this, the literature review in § two raises points that noticing, and input enhancement future studies need to be aware of items in their methodologies which may lead to variability in the results.

The hypotheses for this study were that input textual enhancement would be beneficial to learners, and that the explicit rules condition and textual enhancement together may result in a cognitive load that exceeds available resources and thus, a negative impact on learning.

5.2 Pilot Study

To ensure that the design, materials, and procedures were suitable before the main study ran, it was necessary for pilot work to take place in the UK. The materials had to be printed and taken over to China from the UK and therefore, there was no room for change once the researcher was present in the field (i.e. the boarding school). This preparatory work was undertaken in the UK and inspected the relevant materials and design in three stages. First, all background documents were checked by native and second language learners to ensure the translated instructions were clear, and to test the time given for the tasks. Second, a short

survey and focus group was set up to ask learners of their difficulties in English as a second language and finally, from the findings of the survey and focus group and after pre and post-tests were designed, native and second language learners tested the materials in terms of content, level of task and readability.

5.2.1 Background documents

The background items included a consent form, participant information sheet and demographic questionnaire. These were items which participants would read and complete before the experiment began. It was advised and recommended that the consent form and participant information sheet was provided in English as well as the native language of Chinese Mandarin. The learners were younger and despite learning English for over ten years, some of them had never used English in a formal sense aside from their education. Therefore, completing a consent form and understanding a research participant information sheet could have been a new challenge. Therefore, these items were trialled with Chinese students to check the questions readability, and the translated versions.

The consent form and participant information sheet were translated by a native Chinese person who was studying on a master's level programme in the UK and had a portfolio of research experience. The English and Chinese (Simplified) texts were provided. The documents (consent form, participant information sheet and demographic questionnaire) was provided to two native speakers of English and two Chinese non-native English speakers as this was thought to provide a means for identifying any changes that needed to be made. The demographic questionnaire consisted of two pages and asked for background information of the participants' age, gender, years of learning English, average hours per week of English per educational level (i.e. primary, high school and college), and English proficiency levels in terms of International English Language Testing Systems (IELTS) results where IELTS is the English proficiency level test needed for Higher Education study abroad.

5.2.2 Participants responses to difficulties in English as a second language

A questionnaire was designed and distributed to Chinese students on pre-sessional programmes with a pathway to their undergraduate studies within a university campus and they were asked to fill in and return to me in person or by email. Responses were received from 22 students. Key questions of relevance were about chosen grammatical forms (already examined in §1.1.1 to §1.1.3) in English for second language learners, for example students

were asked which grammatical target forms they still found difficult despite their current academic and English level and asked for their opinion of which aspects of the English language should be taught more intensively in their home country before university level study (in total two questions). A focus group session was also set up with four different Chinese university students for whom English was their second language. This session ran for 20 minutes with the central topic being difficult grammatical forms in English. Questions included were: “What form still causes you concern in your writing and speaking now?,” and “Is there a grammatical form which is still of difficulty to you?”

Responses from this pilot work informed the design of the materials for Experiment 1. Most significantly, the gender pronouns item was decided upon as the target grammatical form. The next section explores the testing of the draft materials for Experiment 1.

5.2.3 Testing of draft materials

Finally, preparatory work was conducted with a sample of two different native English speakers and two different Chinese non-native English speakers. The purpose of the pilot was to use the pre-test, treatment and post-test materials among two sets of groups to assure that the content seemed suitable to the Chinese speakers who were somewhat comparable to the learners who would participate in the final experimental study (i.e. IELTS levels 5.5 & above); to determine how long it would take for students to study the treatment text and answer the tests; and to pilot test the instructions in all of the task for clarity, practicality and completeness.

The items which were reviewed were an English reading proficiency test, pre- and post-tests in the form of a GJT and production task, comprehension test and the study condition/treatment materials (enhanced text with gender pronouns in bold, unenhanced text with no textual modification to any of the writing and the presentation about explicit rules of gender pronouns).

5.2.4 Lessons learnt from the preparatory work

The feedback and response from the participants involved in this preparatory work drew out the following points (areas of concern, changes required or approval):

1. The consent form and participant information sheet were approved in terms of readability and translation from English to Chinese simplified was correct (see Appendix C2 & C3 for final copies). Participants approved the demographic questionnaire in terms of the questions or statements around age, gender, years of learning English, and average hours

of English per educational level (i.e. primary, high school and college). However, one recommended change was about the information about English proficiency levels in terms of IELTS grades. This was suggested as not being a plausible question given that the intended participants were going to be in China, at boarding school, aged between 16-18 and may have never needed to take the IELTS exam. On reflection, the question was changed to ask participants to give their self-perceived level of English, and then their class teacher would provide measures of English for each student (see Appendix C4 for the final demographic questionnaire).

2. The short informal survey revealed that students found difficulty with article use, pronouns, gender, word stress, pronunciation (/l/ and /r/). Higher education level students were appropriate for this focus group and pilot as they were still in their first year of university education, had only been in the second language country for less than a year. Their English level was comparable to that of the Chinese school level learners who would be participate in the experimental study.
3. This pilot work identified amendments to be made to the materials, for example clarity and easiness to the instructions on all pre and post-tests for learners who would be at high school level who had never studied in England. Text on the materials (PowerPoint) for the explicit rules of gender pronouns was approved, but the font size was requested to be larger. This was changed. After completing and scrutinising the English reading proficiency test, pre and post-tests in the form of a GJT and production task, comprehension test and the study condition/treatment materials (enhanced text with gender pronouns in bold, unenhanced text with no textual modification to any of the writing), the students did not have any grave concerns.

After completing the preparatory work, all the necessary changes were completed to the materials. The following section describes the main study methodology.

5.3 Main Study

The preparatory work discussed in §5.2 provided insight into the methodology this main research study would use. The methodology in terms of the materials (background questionnaire, pre-tests, post-tests) were sampled, tested, and then amended where required (as described in §5.2). This section opens with the study research questions, and then each part of the method is described, participants, ethics, instruments, data collection and finally data analysis methods.

5.3.1 Research Questions

The study was guided by the following three research questions:

1. Does visual input enhancement have any effects on learners' learning of English gender pronouns?
2. What are the effects of visual input enhancement on noticing?
3. Does studying explicit grammar roles of English gender pronouns have any effects on learners' learning of English gender pronouns?

5.3.2 Context of the main study

This study examined the effects with students in their usual educational context, in their native home country, China. The rationale for visiting China to conduct the study in the native language field was an important part of the design for the study. The learners were studying in their natural environment – most learners had not visited an English language speaking country and were subject to methods from their Chinese-English speaking teachers. China has been noted as one of the countries which implements input enhancement quite heavily (Wong, 2005), therefore, it seemed an appropriate choice to research in China and conduct the research independently. Also, from the review in §2.5.3, Chinese second language learners of English were not used as participants or a sample in some of the more popular textual enhancement studies, and thus are a suitable group which have been under-researched.

The research site was a government boarding school for 15-18-year olds and known more commonly in China as 'senior high school'. Students were required to pass an exam for their entry to the school and therefore, it was an elite school in the sense of entry and grade portfolio of the students. Students in senior high schools in China were taught in English for some of the sessions (English, citizenship and debating). The student population in the school was all Chinese students with Mandarin or Cantonese as their native first language, and English as their second language. In China, English is taught compulsory from primary school and students had been learning English in some capacity (depends on several demographic characteristics) for over ten years.

School life at this senior high school was intense over six days of the week from 7am-6pm (taught class time around eight hours daily) and there would be two hours of English daily. In classrooms, there are around 50 students and the teachers rely on rote memory, and recall methods in most of the subjects. Materials from English course books are used (e.g. New Concept English), and there are also audio materials utilised by some of the teaching

staff (often created in house by teaching staff, or from items available to the staff - books and resources.)

Students were intermediate level so developmental readiness of the target form was evident. The targeted forms of this experiment were gender pronouns. These forms were chosen because participants fail to use gender pronoun expressions within their first language, and this is then a source of difficulty for students studying the second language; English. Chinese Mandarin language belongs to the Sino-Tibetan language families, and there are vast differences between personal pronouns between English and Mandarin. One example is that in English, pronouns have cases yet in Mandarin they do not. The English pronoun system is much more specific. Alternatively, in Mandarin personal pronouns make greater distinctions between grammatical number and gender than their English counterpart. Language mistakes can be expected with Mandarin speaking English learners in the use of personal pronouns, such as unclear references and gender errors.

The research planning factored in the possible problems and limitations associated with completing the research in the field. The school was contacted and negotiating began six months before the study was completed. This process included negotiations with the school (being given free period classes for research) and having myself as the researcher on site in China to conduct the trials personally from the beginning to the end (delayed post-test) over a period of four weeks. These elements helped to reduce attrition and to ensure that the study was properly conducted so that the data were reliable.

5.3.3 Participants or Sample Selection

311 students were included from a government senior high school in the South of China. The school was a boarding school, where students sat an entrance exam to become enrolled. Their first language was either Cantonese or Mandarin and their second language was English. All participants were between ages 15 and 18 ($M = 16.61$, $SD = 0.62$, 199 females and 112 males). Participants had studied English for a total mean of 8.73 years ($SD = 2.10$). Chinese students formed a homogenous group in terms of age and English experience, thereby reducing uncontrolled and unnecessary variability associated with different cultures and their first languages.

Their English learning previously consisted of primary school ($M = 4.96$ hours, $SD = 1.95$), secondary school ($M = 7.33$, $SD = 3.19$ hours). The English level of participants was primarily informed by Lee and Huang's (2008) meta-analysis as outlined in § two and four where many learners participating in studies of input enhancement are at an intermediate

level (56%). Sample sizes for this experiment were based on the average sample size of 62 participants reported in Lee and Huang's (2008) meta-analysis. As there were six study conditions; six classes at the school were taken at random and randomly assigned to one of the six conditions (enhanced condition: 54 participants; enhanced and rules condition: 46 participants; unenhanced condition: 54 participants; unenhanced and rules condition: 54 participants; rules only condition: 55 participants; control condition: 52 participants). Despite these figures being lower than the suggested sample size from Lee and Huang's (2008) meta-analysis, the class size had to be considered. Given that the learners were in their classes – and taking each class and randomly attributing a study condition, there would be less attrition. The reason for including around 50 participants per experimental group is due to the uncertainty of the size of effect to be expected but anticipating that if the effect was medium sized ($d = .5$), groups of around 50 would provide the power necessary to detect the effect roughly 80% of the which is in line with Cohen (1988) and Fritz, Morris and Richler's (2012) suggestions. Participation was voluntary and there were no penalties for declining to participate, though students were offered a University of Northampton pen and USB drive as an incentive.

5.3.4 Ethics

The study was given full ethical approval by the University of Northampton Research Ethics Committee (see Appendix C1). Ethical issues that arose within the study were informed consent, right to withdraw and issues centred on whether learners had the real opportunity to consent. All participants were treated in line with the British Psychological Society's Ethical Guidelines (2009) especially with respect to informed consent, confidentiality, and the right to withdraw. All relevant consent forms and information sheets were administered prior to the study and were also translated into Chinese Mandarin to ensure students were fully aware of the background of the research (see Appendix C1). Some issues which needed to be considered were the permissions to which the research could go ahead in a school in China and how will consent be given by individual participants.

In line with the notion of right to withdraw, participants were briefed on their right to do so and that the information gained from the experiment would not be used within the school or shared with any other teachers. Information was disseminated about these issues three times (e.g. in the: information sheet, consent sheet and debrief). It was also noted that within the Chinese culture, gift-giving is imperative therefore, learners were given gifts in exchange for participation in the study. For example, the university provided The University

of Northampton prospectuses, pens, USB drives and other merchandise. Regarding the students' information sheet and consent form, the English and Chinese (Simplified) was provided. It was thought that by providing the Chinese, full understanding was assured.

In line with relevant ethical procedures, participants were briefed on their right to withdraw and that the information gained from the experiment would not be shared with any other department or staff within the university (see Appendix C2 and C3). It was particularly important to stress to these learners that the experiment was not part of their school course and their scores would not infringe on any of their curriculum classes. Information was disseminated to students through an information sheet, consent form and a debrief form. The information sheet and consent form were provided in English and Chinese (Simplified) (reasons explained previously in §5.2.1).

5.3.5 Research Design

The study used a 3x2 between groups research design with respect to the text, participants read an enhanced text, one without enhancement, or no text at all. Text type was crossed with the presence of grammatical rules. Table 5.1 displays the groups in the study. The group with no text and no rules provided a baseline for identifying effects of text types and rules. The dependent variable (DV) was the measures of learning via the post-tests (immediate and delayed) on the GJT and Productive Use Task. This is normal in the field of instructed second language acquisition and input enhancement studies as the interest lies in the usefulness and learning from the participants based on the study condition or treatment (i.e. textual enhancement). By using these scores as the DV, it also allowed for measurement against the pre-test to indicate any learning/acquisition. Other DVs (Dependent Variable) were the comprehension scores (to assess how the study condition or treatment affected comprehension and understanding of the input) and noticing task scores.

Table 5.1

Study Overview, Data Collection Procedures. Total sample size > 300 Learners (N between 40-58 per Group)

			Introduction	Pre-tests		Treatment		Post-tests	
			Introductory sessions	Session 1		Session 2 and 3a (same procedure)		Session 3b IMM. POST-TEST	Session 4 DELAYED POST-TEST
			30 minutes	30 minutes	30 minutes	20 minutes		60 minutes – 20 minutes per task	30 minutes
Text	Rules	N	Week 1			Week 2		Week 3	Week 4
Enhanced	No	54	Background questionnaire	L2 Reading Proficiency Test	GJT Productive Use Task	Read text with TE	Read text with TE	GJT Productive Use Task Comprehension task Noticing task	GJT Productive Use Task
Enhanced	Yes	46				Read text with TE and study rules	Read text with TE and study rules		
Not enhanced	No	54				Read text with no enhancement	Read text with no enhancement		
Not enhanced	Yes	54				Read text with no enhancement and study rules	Read text with no enhancement and study rules		
None	No	52				No treatment	No treatment		
None	Yes	55				Study rules	Study rules		

Note. GJT refers to grammatical judgement test. L2 means second-language. *N* = group size. TE refers to textual enhancement.

5.4 Instruments

Instruments for this study are now described in detail in order of administration to the participants. For further information on how they were administered, see Table 5.1.

5.4.1 Background questionnaire

To obtain background information of the participants, a brief questionnaire asked for: age, gender, years of learning English, average hours of English per educational level (i.e. primary, high school and college), and English proficiency levels (students give their self-perceived level of English, and teachers provided measures of English for each student) (see Appendix C4 for the final questionnaire).

5.4.2 Second language proficiency test

The second language reading and comprehension proficiency test was in the format of an IELTS examination. This test was included to assess the participants' reading proficiency as second language readers. Due to the preparatory study and finding that this group of learners would not have all engaged in an IELTS exam before, the level of English reading proficiency was self-assessed from each participant and then from the teacher. To avoid bias, it seemed appropriate to assess the second language reading proficiency of the participants to ascertain their level to ensure they were all homogenous in their ability of English as a second language. Most of the previous textual enhancement studies undertake a proficiency test, usually an in-house assessment however this can be flawed (see §2.5.4). Therefore, an IELTS reading exam was used.

The test was a paper version of items from an IELTS examination paper taken from the British Council website. IELTS is heavily used by higher education establishments and government bodies to ensure sufficient English levels. It reports the level of skills against the Common European Framework of Reference (CEFR) for language learning. The full test consisted of 40 items over 14 A4 pages. For this research, the test was modified and shortened (26 items with a maximum time of 30 minutes). There were three clear sections within this test.

Section 1 contained a reading passage of 755 words based on "Chronobiology". This passage was chosen due to it being an authentic text which second language testing assessments are typically based on, and that the content was unfamiliar, and the language use was standard for an intermediate learner of English (see Appendix C5). Learners were required to read the passage (maximum time 15 minutes) and then answer 7 items with

“True, False, or Not Given”. The text was available throughout the test. Section 2 contained a reading passage on the “Triune Brain” of 834 words. Learners were required to read the passage (maximum time 15 minutes) and then answer questions nine questions. These questions offered short statements and learners had to “classify the following as typical of: A the reptilian cortex, B the limbic cortex or C the neocortex. The next four questions each contained three sentences and learners were requested to complete the sentences below by writing “no more than two words” from the passage for each answer.

All participants took this pre-test to determine if the groups were equivalent prior to the experience and if there were any outliers in reading proficiency not fulfilling the B1 or B2 level. The average score for the reading comprehension was between 4.43 and 4.54 for all study conditions (see Table 5.2 for the averages scores for each study condition) with no outliers. Scoring of the IELTS test was based on the IELTS academic reading marking schemes. As the test contained 26 questions and a possible 26 maximum marks, learners scored one mark per right answer. To equate these marks into IELTS bands, Table 5.2 gives an illustration.

Table 5.2

Results for the IELTS Test of English Language Proficiency for each of the Six Experimental Groups.

Text	Rules	N	M	SD	Min.	Max.
Enhanced	No	54	4.54	0.45	4	5
Enhanced	Yes	46	4.51	0.45	4	5
Not enhanced	No	54	4.43	0.49	4	5
Not enhanced	Yes	54	4.51	0.45	4	5
None	No	52	4.53	0.45	4	5
None	Yes	55	4.49	0.46	4	5

Note. N = number of participants.

5.4.3 Pre and post-tests

There were three main stages of the data collection: pre-test in Session 1, treatment in Session 2 and 3a and post-tests in Sessions 3B and 4. The purpose of the three stages was so that the pre-test to post-test was distinct and due to the nature of the study being over the course of 4 weeks, it was methodologically advantageous to have an introductory session where all consent, background questionnaires and pre-test data were collected and the final sessions as the post-tests and debriefing. Different tests were used at pre-, immediate, and delayed post-test stages. This was to ensure that participants were not receiving the exact

same test paper with the same questions. Therefore, three tests were created and used but were equivalent in terms of design, length, number of items, and they were administered in a counterbalanced order (see Appendix C9-C10 for example tests).

The acquisition assessment task had two parts: a grammatical judgement task and a productive use task (fill-in-the-blank). Instructions were given that the task had two parts that students should read all instructions, try to write something down every time, and write their answers clearly. The maximum amount of time allowed was 15 minutes. This test was in place to check the student's priori mastery of gender pronouns. Acquisition assessment tasks were first developed using 80 questions; once piloted, 35 questions for each test, pre-test and post-test were used, 70 in total. The rationale for using this type of test is that they are commonly implemented in linguistic research and more importantly a standard element of input enhancement studies. They aim to test the learners' knowledge and use of the form and acquisition. The post-test was the same format as the pre-test (Grammatical Judgement Task (10 items) and productive use (fill-in-the-blank) task: 33 items).

5.4.3.1 Grammatical Judgement Task

The grammatical judgement task (GJT) asked students to choose whether the statements made sense or not. Answers were selected by choosing Y (yes) or N (no) (see Appendix C13). 10 questions varied in difficulty and were given in a random order. Learners had to decide whether the ten statements made grammatical sense. Examples of these sentences were: "My teacher was a man; she always looked after her books" or "She was a small girl with her hair kept short."

5.4.3.2 Productive Use Task (Fill-in-the-Blank)

Learners were asked to select which one of the options provided (he, she, his, hers, him, her) best completed a sentence (see Appendix C14). Examples of sentences were:

"My sister works in a hospital. ____ is a nurse" and "Beth said Linda and ____ could wait to shop later, after lunch."

This test was used due to prior studies exploring the impact of TE on intake (Leow, 1997; Overstreet, 1998). Two parallel versions of a multiple-choice recognition test namely as (A & B), were developed, repeated and each version had 35 questions. Each question was scored 1; therefore, the total mark was 35 for the productive use (fill-in-the-blank) task.

To be sure that both tests were equal, a pilot study was conducted where all questions of pre-test and post-test (90 questions) were put together into one test. Even numbers were

assigned to pre-test questions and odd numbers to post-test questions. Participants scored similarly therefore indicating that each set were equally difficult.

5.4.3.3 Meaning Processing: Reading Comprehension Task

Input Enhancement studies sometimes report that enhancement may have a detrimental effect on a learner's comprehension and intake of target chosen forms (e.g. Han et al., 2008; Lee, 2007). However, textual enhancement is assumed to be beneficial when the learner: notices the enhancement (input), recognises that the enhancement indicates something to think about (intake) and make sense of in relation to the form, or simply remembers to use the form in that way (learning happens). In context, learners are provided with a text with highlighted grammatical forms, allowing these forms to become intake (i.e. the learner has made an active intention to remember them) and then afterwards, using form correction, learners are assessed to see whether they have acquired the grammatical form after the learning phase.

Where comprehension measures are taken, there is mixed reporting of effects on comprehension levels of texts with enhanced forms (e.g. Doughty & Williams, 1998; Izumi, 2002; Lee, 2007; Leow, 1997; Shook, 1999; Wong, 2003). However, not all studies test for comprehension within their empirical work (e.g. Alanen, 1995; Doughty, 1991; Izumi, 2002; Jourdenais et al., 1995; Shook, 1994; White, 1998) but ought to in future research in this area.

To investigate the impact on comprehension of textual enhancement and of drawing attention to rules, the study included a 15-minute meaning comprehension task which focused on recall of the text that had been read (see Appendix C15). The task asked participants to recall as much of the text as they could remember, thinking about two key questions: (1) What was the text about? (e.g. focusing on the setting, characters) (2) What was the main idea behind the text? (more specific details including connection and the romance part) Learners were given instructions to read the two above questions above and to fill in the answers, where required.

The comprehension task was a measure of learners' understanding of the text they had received. This task was only given to study conditions where they saw and read the text. The maximum total for this task was 5 marks. This mark was driven by responses of the two characters being named (1 mark if both names), that they had not seen each other in a long time (1 mark); they used to be in love (1 mark), ideas of connecting or reunion (1 mark) with the main idea of the story being about romance, lost connections, love, and wanting to be together (1 mark).

5.4.3.4 Noticing task

The noticing task was structured differently for the study conditions dependent on which text they had seen and whether they had the rules only presentation. The maximum marks for the noticing task was 20 for learners who saw an enhanced text, 17 for learners who experienced the unenhanced, unenhanced and rules, and rules only version. Responses that expressed that the participants had noticed the target forms and expressions of the gender pronouns were considered as instances of noticing. Any answers that did not make a mention of gender pronouns were considered as ‘not noticed’ and did not receive any points.

The noticing task was split into sections. Part A was included in materials for enhanced groups and asked learners what they noticed about their materials. The total score was (3), and the marking was derived from whether learners recognised that their materials were in bold (1 mark), emphasised (1 mark), and with many pronouns included (1 mark). Part B was the understanding of gender pronouns section and learners were asked to explain their “understanding of gender pronouns (*he, she, him, her, his, hers*). When do we use them? What are the rules?” Scoring was derived from whether learners understand what gender pronouns are, how they are used, in which circumstances they are applied, and rules of masculine and feminine. The total score was (5). Part C was where learners had to produce example sentences of for each of the main gender pronouns (*he, she, him, her, his, hers*) and include one in each sentence. The total for this part was (12), with 2 marks per sentences – 1 mark for ensuring the correct gender pronoun, and 1 mark that for the sentence was being grammatically correct.

5.4.3.5 Treatment materials

The treatment has two aspects; the nature of a text to be read (enhanced, not enhanced and no text) and the provision of explicit rules (provided or not).

5.4.3.6 Targeted Grammatical Form

We have seen that there are issues with gender pronouns for Chinese second language learners of English (see preparatory work §5.2), and in reviews from Chang (2001 as cited in Swan & Smith, 2001). Gender pronouns are non-existent in the Chinese languages — they do not have separate gender pronouns such as *he/she* and *his/her*. The materials in the study were designed to capture these problems and the ways of solving these problems. The choice of the target form is always a complex one, however previous literature has noted that the target linguistic form must have some form of semantic value (Park, 2012; VanPatten, 1996,

1998). Target forms used in input enhancement studies need to have a communicative value as seen in previous studies (see Alanen, 1995; White, 1998; Doughty & Williams, 1998).

Among the issues raised in prior reviews of input enhancement were issues of prior knowledge of the enhanced form (Han, Park & Combs, 2008), where previous textual enhancement studies employ participants who possess some prior knowledge of target forms (e.g. Kim, 2006; Wong, 2005; Izumi, 2002; Overstreet, 1998, 2002; Jourdenais et al., 1995), participants who lack prior knowledge of target forms (Alanen, 1995; Shook, 1994) or participants with varying levels of prior knowledge (Park, 2011). Consequently, three main findings are offered for the relationship between textual enhancement and prior knowledge of the target forms: (1) Textual enhancement alone is more effective for learners with some prior knowledge of the form, (2) Textual enhancement may induce noticing but not understanding and, (3) Compound enhancement (e.g. textual enhancement alongside other strategies such as corrective feedback) are much more effective for noticing and deeper processing (Han, Park & Combs, 2008, p. 609). It was therefore decided that the target form was a grammatical structure which they had knowledge of, had been taught about, but had not yet fully mastered in terms of automatic processing for that second language form.

In summary, the targeted linguistic form needed to be of semantic and communicative value and be familiar to the learners. All in all, the structure chosen, and input enhancement method was not to teach the structure but to see the effects of using input enhancement methods with this grammar form and how effective the method was.

By administering the initial grammatical judgement task and productive use task, these allowed for the evaluation of prior knowledge of the form.

5.4.3.7 Input text

The conditions differed in terms of the study element, for example what the learners would be studying in the treatment condition sessions. Within the enhanced conditions, learners were given a treatment text which had all the gender pronouns highlighted using bold print. The unenhanced conditions still had the treatment text, but no textual enhancements were made (i.e. no bolding to the gender pronouns). Within rules conditions, the learners were given an explicit rule presentation in the format of a PowerPoint presentation lasting between six and ten minutes.

Treatment was a reading task whereby there were three types: enhanced treatment, unenhanced treatment, and no treatment. The text part of the treatment (session 2 and 3) involved 20 minutes to read the text with exposure twice in two weeks. Again, informed from prior research (Lee & Huang, 2008) the average treatment duration amongst the 16 studies

included in the analysis was 39.3 minutes across the entire study. This study included two sessions therefore participants were provided with 40 minutes of exposure.

In addition, the total exposure to the target form should be around an average of 78 target forms (see Lee & Huang, 2008). Any more items of the target forms may infringe on being input flood instruction (Han et al., 2008). That is, increasing the salience of a target language feature through artificially engineered frequency (i.e. appearing more times than usual in an authentic text). Figure 5.1 displays the number of gender pronouns in the text. The treatment text was 1589 words in total spaced in two columns over four A4 pages.

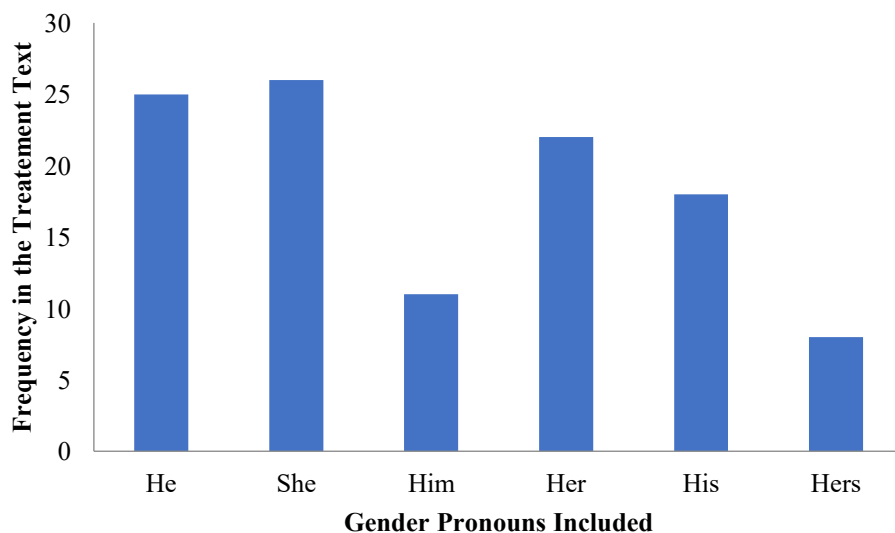


Figure 5.1. Frequency of each Gender Pronoun in the Treatment Text in Experiment 1.

The treatment text was checked for complexity using Vocabprofile (Cobb, 2002; Heatley, Nation & Coxhead, 2002). Vocabprofile is an online computer program resource which allows lexical text analysis. The analysis breaks the text into four categories based upon frequency (the most frequent 1000 words of English; the second most frequent thousand words of English, i.e. 1001 to 2000; 550 words that are most frequent in academic texts across subjects using the Academic Word List and the remainder which are not found on the other lists. Vocabprofile allows for the crude measurement of the proportions of low and high frequency vocabulary used by a native speaker or language learner in a written text. A suggested native-speaker result would be 70-10-10-10, or 70% from first 1000, 10% from second thousand, 10% academic, and 10% less frequent words (Cobb, 2002; Heatley, Nation & Coxhead, 2002). This quick and easy to use tool allows researchers and teachers to understand the lexical acquisition and performance of second language learners.

Figure 5.2 provides the findings from the treatment text on Vocabprofile. To summarise, the treatment text contained more K1 words. In sum, the treatment text contained

87% of K1 words; 4% of K2 words; 1& academic words and 7% off –list words. The results therefore indicated that the text was within the learner’s lexical competence.

	<u>Families</u>	<u>Types</u>	<u>Tokens</u>	<u>Percent</u>
K1 Words (1-1000):	247	320	1181	87.16%
Function:	...	...	(729)	(53.80%)
Content:	...	...	(452)	(33.36%)
> Anglo-Sax =Not Greco-Lat/Fr Cog:	...	...	(341)	(25.17%)
K2 Words (1001-2000):	47	49	58	4.28%
> Anglo-Sax:	...	...	(39)	(2.88%)
1k+2k		...	...	(91.44%)
AWL Words (academic):	11	11	15	1.11%
> Anglo-Sax:	...	...	( )	(0.00%)
Off-List Words:	<u>?</u>	<u>43</u>	<u>101</u>	<u>7.45%</u>
	305+?	423	1355	100%

Figure 5.2 Treatment Text results from Vocabprofile to ensure Lexical Ability.

5.4.3.8 Visual Input Enhancement

There was only one source of input enhancement used in the study; this intervention involved the textual enhancement of one reading during a two-week treatment period. This explicit input enhancement method was considered as it would help students to notice input related to the target forms. Textual enhancement utilised a **bold** font. The following is a short excerpt from the text which was taken from “The Notebook” novel:

They stayed like that for a long time before Daisy finally pulled back to look at **him**.
Up close, **she** could see the changes **she** hadn't noticed at first. **His** face had lost the softness of youth, not like **hers**.

5.4.3.9 Explicit rules

The explicit rules were explained in a 14 slide PowerPoint presentation that lasted for about 10 minutes. The presentation featured a voice over in native English, clear accent free of any dialect, which went in time with each slide – this was to ensure all learners who studied rules received the same instructions and explanations to facilitate the PowerPoint presentation.

Overall, it was a simple presentation and meant to serve as a refresher to learners (as they had intermediate levels of the grammar form: gender pronouns). The 14 slides started with outlining objectives of the presentation and then leading into brief explanations of what pronouns are and an example of how they are used. Examples of pronouns were then detailed in a list, and the explanation of “why we use pronouns” is explained. Rules were then presented for males and female, nominative, objective and possessive with some examples.

There was then an activity with a sentence including pronouns and learners were asked “Where are the pronouns.” The pronouns were then circled on the PowerPoint using animation, and the study condition class was told the answer.

5.5 Data Collection Procedures

The study was conducted from the end of May 2014 until the end of June 2014, over a period of four weeks. Table 5.1 illustrates the procedures of the study. In summary, participants were assigned to one of the six groups (enhanced, enhanced and rules only, unenhanced, unenhanced and rules only, rules only and a control group) within their classes. As the students were all at a similar academic level, was homogenous in terms of academic level, the conditions were selected, each allocated randomly to one of the study conditions. All sessions were performed in group sessions in a quiet group environment (the normal classroom outside of scheduled class time). Instructions were spoken in English but there was a Chinese speaker on hand if students needed further clarification in their first language. Each group participated in the study over a four-week period during five sessions.

Session 1 included the pre-tests. Session two and three included the study activities for each group. These sessions were identical. The text (enhanced or not) was read first. Students read the text in 20 minutes allotted without taking notes. Rules were presented next for learners who studied rules. The slideshow was provided using an overhead projector in the classroom for around ten minutes. Note that the control group neither read a text nor studied rules and so had no experiment related activities in these sessions. Session 4 was directly after session three and was where learners took the immediate post-test of Grammatical Judgement Task and Productive Use (fill-in-the-blank) task and the comprehension measure. Session 5 involved the delayed post-test of one week from the immediate post-test.

5.6 Data analysis and Scoring

5.6.1 Proficiency Test

In the proficiency test, the IELTS reading exam paper (as described in §5.4.2) was completed in paper format and then marked. The test contained 26 questions and a total score of 26 points, with one mark per right answer. Scoring of the IELTS test was based on the IELTS academic reading marking schemes (see Appendix A & C6) and to equate these marks into IELTS bands, Table 5.2 provides the details. gives an illustration.

5.6.2 Grammatical Judgement Task

In the written GJT task, for each of the tests (pre, immediate and delayed post-test) there was a total score of 10 points (excluding distractors). Each correct response was awarded one point. Half marks were not allocated, and if spelling mistakes occurred, this was ignored.

5.6.3 Productive-use Task

In the productive-use task, for each of the tests (pre, immediate and delayed post-test) there was a total score of 35 points (excluding distractors). Each correct response was awarded one point. Half marks were not allocated, and if spelling mistakes occurred, this was ignored.

5.6.4 Comprehension and Noticing Task

The comprehension and noticing task were only given to five of the study conditions where learners saw and read the text (i.e. enhanced, enhanced and rules only, unenhanced, unenhanced and rules only). There was a total score of 5 points for the comprehension task and a total score of 12 points (with 2 marks per sentence) (see Appendix C16 for tasks).

5.6.5 Statistical Analysis

All participants were provided with an eight-digit individual number to help identify their data. Once all data was collected at the end of Week four, data was entered onto a Microsoft Excel spreadsheet and later exchanged to Statistical Package for the Social Sciences (SPSS) 22.0 for Windows file. SPSS was used for descriptive and statistical analyses for Experiment 1.

5.6.6 Descriptive Statistics

Descriptive statistics are provided for the learner's proficiency tests, and performance on all pre, immediate and delayed post-tests.

5.6.7 Preliminary Analysis

Some preliminary analyses were conducted to ensure the reliability and validity of the pre and post-tests. An internal consistency test using Cronbach's Alpha was computed and tests of normality to assess whether the data provided from pre and post-tests was normally distributed.

Data screening and reporting of all the pre-measures to ensure groups were similar and then to see if the data was normally distributed and what statistical analyses could be run (§5.3.1), then followed by the results for each research question.

5.6.8 Experiment 1 Main Statistical Analysis

Quantitative analyses were conducted to compare the performance of the results from those learners in each condition on the pre-test, immediate and delayed post-test results. Therefore, the planned analyses were to compare visual enhancement groups with the unenhanced and no text groups on all post-test tasks (immediate and delayed) and use the pre-test results as a covariate.

5.7 Results

The hypotheses for this study were that visual input enhancement would be beneficial to learners in terms of learning of English gender pronouns, but the explicit rules condition and textual enhancement together may result in a lack of cognitive resources and thus, a negative impact on learning. To test these hypotheses and to answer the research questions, the analysis is structured around the three research questions. This section presents the results from this study and will be followed in §5.7 with a discussion of the key findings. The measures included in this study and section are:

- Acquisition and intake measures comprising of pre-test, immediate and delayed post-test data for the GJT and productive use task
- Comprehension measures
- Noticing measures

5.7.1 Data screening

This section screens the data prior to attempting any analysis and to ensure that the groups are similar or different. Tests of normality (homogeneity) for the pre, immediate and delayed post-tests were calculated using SPSS 22.0. Tables 5.3-5.5 detail the full results for skewness and kurtosis with Table 5.6 provides a summary of skewness and kurtosis in line with thresholds. To test skewness and kurtosis, values computed using SPSS 22.0 and then sense-checked by dividing their respective SE values and if between -1.96 and +1.96, they are not significant (George & Mallery, 2010). Results indicate that the findings are not normally distributed in most cases, except immediate delayed post-test (normally distributed according to skewness = -.77) and delayed productive-use post-test (normally distributed according to kurtosis = 2.81). Appendix C16 details all histograms for the pre, immediate and post-tests

and the Kolmogorov-Smirnov and Shapiro-Wilk test for productive-use task demonstrating again skew.

Table 5.3

Descriptive Statistics for the pre-test items (GJT and Productive-use task)

	<i>M</i>	<i>SD</i>	Skewness	<i>SE</i>	Kurtosis	<i>SE</i>
Pre GJT (total score 10)	8.09	1.64	-1.99	.14	5.29	.28
Pre-Productive-use (total score 35)	29.81	3.32	-3.05	.139	1.56	.28

Note. M refers to mean, SD refers to standard deviation, SE refers to standard error. Numbers have been rounded to two decimal places

Table 5.4

Descriptive Statistics for the immediate post-test items (GJT and Productive-use task)

	<i>M</i>	<i>SD</i>	Skewness	<i>SE</i>	Kurtosis	<i>SE</i>
Imm GJT (total score 10)	8.53	1.45	-1.93	.14	6.43	.28
Imm Productive-use (total score 35)	31.08	2.99	-.77	.14	1.12	.28

Note. M refers to mean, SD refers to standard deviation, SE refers to standard error. Numbers have been rounded to two decimal places

Table 5.5

Descriptive Statistics for the delayed post-test items (GJT and Productive-use task)

	<i>M</i>	<i>SD</i>	Skewness	<i>SE</i>	Kurtosis	<i>SE</i>
Delayed GJT (total score 10)	8.26	1.51	-1.63	.14	4.11	.28
Delayed Productive-use (total score 35)	30.07	2.78	-1.12	.14	2.81	.28

Note. M refers to mean, SD refers to standard deviation, SE refers to standard error. Numbers have been rounded to two decimal places.

Table 5.6

Summary of Skewness and Kurtosis in Line with Appropriate Thresholds

	Skewness	Kurtosis
Pre GJT	negatively skewed	Kurtosis evident
Pre Productive-use	negatively skewed	Kurtosis evident
Immediate GJT	negatively skewed	Kurtosis evident
Immediate Productive-use	Normally distributed (close to 0)	Kurtosis evident
Delayed GJT	negatively skewed	Kurtosis evident
Delayed Productive-use	negatively skewed	Normally distributed

Note. Skewness measured at 0, and Kurtosis measured above 3.0 for normally distributed data.

5.7.2 Internal Consistency Reliability

It was necessary to find out if the test items used were reliable. Cronbach's alpha was conducted on each of the GJT (pre, immediate & post-test) and results found: pre (0.64), immediate (0.65), post (0.61), which is just below the .7 good threshold in Cronbach alpha terms. These results were envisaged as the GJT included a low number of items (10) and was measuring learning before, during and after a study condition. The GJT was included as there was also the productive-use task in place to measure learning. As researchers (Pallant, 2005, 2010) have suggested, Cronbach's alpha can be reduced when the total items are also low. Cronbach's alpha was also conducted on the productive-use tasks (pre, immediate & post-test) and found: pre (0.69), immediate (0.71), post (0.7) which is good in Cronbach alpha terms. The English language proficiency test, IELTS reading test was not included in the internal consistency reliability tests as all IELTS test already go under reliability and validity test means with above 0.8 scores in place.

*5.7.3 Descriptive Statistics**5.7.3.1 Student demographics*

Learner's data from the background questionnaire has been summarised in Table 5.7. The data suggests that learners were 16 to 17 years old, and age of formal instruction to English was on average around seven to eight years old. Participant's hours of learning English varied between primary (four to six hours) and high school (six to nine hours) and may be

due to the type of school enrolled in. Participants were also asked if they received any additional outside school English tuition. Findings revealed that 37 participants (11.7%) reported receiving between 0.5 to six additional hours ($M = 2.04$, $SD = 1.23$).

Table 5.7

Overview of Learner's Age and Educational Experience of English

Text	Rules	Age		Age of L2 learning		Years learning L2		Primary		High school		Perceived English	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Enhanced	No	16.15	0.50	7.38	1.93	8.57	2.30	4.67	1.80	6.40	2.94	3.37	0.96
Enhanced	Yes	16.87	0.45	7.59	1.52	8.96	2.04	5.13	1.77	8.22	2.96	3.57	0.78
Unenhanced	No	16.13	0.48	7.53	1.81	8.31	2.10	4.66	1.44	6.56	2.68	3.28	0.98
Unenhanced	Yes	16.92	0.55	7.75	1.48	8.70	2.30	5.25	2.77	7.65	4.40	3.43	1.07
No text	No	16.70	0.56	7.23	1.60	9.02	2.16	5.16	1.62	8.07	2.81	3.54	0.78
No text	Yes	16.96	0.55	7.91	1.47	8.85	1.66	4.94	2.05	7.20	2.76	3.52	0.93

Note. L2 refers to second language, M refers to mean, SD refers to standard deviation. Numbers have been rounded to two decimal places.

5.7.3.2 *Second language proficiency*

Scores on the second language proficiency test for all six groups is displayed in Table 5.8. Participants scored similarly on average in all groups between 4.43 and 4.54, indicating participants were scoring in the 4.5 to 5.0 range on IELTS tests provided in session 1 (see Table 5.8).

Table 5.8

Results for the IELTS Test of English Language Proficiency for each of the six experimental groups

Text	Rules	N	M	SD	Min.	Max.
Enhanced	No	54	4.54	0.45	4	5
Enhanced	Yes	46	4.51	0.45	4	5
Not enhanced	No	54	4.43	0.49	4	5
Not enhanced	Yes	54	4.51	0.45	4	5
None	No	52	4.53	0.45	4	5
None	Yes	55	4.49	0.46	4	5

Note. N refers to number of participants, M refers to mean, SD refers to standard deviation, Min. refers to minimum level, Max. refers to maximum level.

5.7.3.4 Pre-test data

As described earlier, a pre-test was given prior to treatment. This was to ensure that all six groups were similar in their knowledge of English gender pronouns. There were 45 items in total split into (1) grammatical judgement task scored out of 10, and (2) productive use (fill-in-the-blank) task scored out of 35. Scores were changed to percentages to allow easier reading as pre-tests had different total scores. These scores revealed that all groups had similar knowledge base of the chosen target form before treatment (see Table 5.9).

Table 5.9

Descriptive Statistics of the Pre-test Task on GJT and Productive Use Task. Data are percentage correct.

Text	Rules	GJT Task			Productive Use Task	
		<i>N</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Enhanced	No	54	78.70	20.97	84.09	8.83
Enhanced	Yes	46	82.70	18.62	89.69	5.19
Unenhanced Group	No	54	81.00	17.28	86.49	8.79
Unenhanced	Yes	54	81.60	22.06	85.14	11.01
None	None	52	83.30	13.45	84.17	11.00
None	Yes	55	78.30	27.59	82.57	16.96

Note. GJT refers to Grammatical Judgement Task, N refers to number of participants, SD refers to standard deviation.

Pre-test: Grammatical Judgement Task

For the grammatical judgement task, Table 5.9 displays the % correct for all groups on each part. Average scores were similar, ranging between 78% to 83% correct as evidenced in Table 5.5. For example, GJT task (Control: highest mean score = 8.33, *SD* = 1.12) and (Rules only: lowest mean score = 7.83, *SD* = 2.16). An ANOVA revealed no significant main effects for rules on pre-test grammatical judgement task, $F(1, 309) = 0.02$, $MSE = 0.436$, $p = .97$, $\eta^2 \approx .00$. No main effect was found for text-type, $F(2, 309) = 0.41$, $MSE = 11.16$, $p = .96$, $\eta^2 \approx .00$. No significant interaction was found between text type and rules, $F(2, 309) = 1.94$, $MSE = 523.62$, $p = .15$, $\eta^2 = .01$.

Pre-test: Productive Use Task

For the Productive Use (fill-in-the-blank) Task, Table 5.9 displays the % correct for all groups on each part. Averages scores were similar, ranging between 82% to 89% correct as evidenced in Table 5.5. An ANOVA revealed no significant main effects for rules on pre-test

productive-use task, $F(1, 309) = 0.51$, $MSE = 5.43$, $p = .47$, $\eta^2 \approx .00$. No main effect was found for text-type, $F(2, 309) = 3.45$, $MSE = 36.98$, $p = .03$, $\eta^2 \approx .02$. No significant interaction was found between text type and rules, $F(2, 309) = 3.45$, $MSE = 483.2$, $p = .23$, $\eta^2 = .01$.

5.7.4 Research Question 1: Does visual input enhancement have any effects on learners' learning of English gender pronouns?

This research question was answered using the pre-test, immediate post-test, and delayed post-test data. First, the grammatical judgement task will be dealt with and then the productive use task. To note, the grammatical judgement task did have skew and kurtosis therefore, the main test used to answer this research question was the productive-use task.

Grammatical Judgement Task: Immediate and Delayed Post-test

This task was completed twice by participants (using comparable but different versions of the tests as explained in §5.4.3) –at once after study and one week later. Descriptive statistics are provided in Table 5.9. The analysis was completed using a 3x2x2 design with the addition of the time of test (immediate or delayed). Therefore, the factors were the text type (enhanced, unenhanced or no text), rules (inclusion of rules, no rules) and the time of post-test (immediate or delayed) (see Table 5.10).

Table 5.10

A 3x2x2 ANOVA Analysis on GJT Scores. Statistics Reported

Interactions	Effect	<i>df</i>	<i>F</i>	<i>MS_e</i>	<i>p</i>	η^2
	ME of text type	1, 301	3.576	478.162	.029	.023
	ME of rules	1, 301	32.072	4288.352	.000	.096
	ME of test time	1, 301	21.287	2526.854	.000	.066
2-way int.	Text type and rules	2, 301	2.274	304.031	.105	.015
	Text type and time	2, 301	0.477	56.627	.621	.003
	Rules and time	1, 301	12.631	1499.312	.000	.040
3-way int.	Text type x rules x time	2, 301	0.072	8.574	.930	.000

Note. *df* refers to degrees of freedom, *F* refers to ANOVA statistic, *MS_e* refers to mean squared, *p* refers to probability, η^2 refers to partial eta squared, ME refers to main effect, int. refers to interaction.

Table 5.11 provides the results for the 3x2x2 analysis on the grammatical judgement task scores. There was a significant main effect of rules, thereby showing that learners who

had rules ($M = 86.515$, $SD = 0.997$) performed better than those who did not ($M = 81.225$, $SD = 0.998$). The significant main effect of test time demonstrated that learners in the immediate post-test on the grammatical judgement task ($M = 85.240$, $SD = 1.0145$) performed better than the delayed post-test on the grammatical judgement task ($M = 82.500$, $SD = 0.998$). Moreover, the marginally significant two-way interaction between rules and time of test was significant. In the rule's conditions, learners with rules outperformed learners with no rules and learners with rules on the immediate post-test on the grammatical judgement task outperformed the no rules conditions, on both immediate and delayed post-tests.

Table 5.11

Immediate Post Treatment Measures of Grammatical Judgement Task. Data are percentage correct.

Text type	Rules				Overall	
	Provided		Not provided		<i>M</i>	<i>SD</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Enhanced	80.68	11.80	70.89	19.60	75.79	15.70
Unenhanced	90.13	11.30	80.10	13.60	85.12	12.45
No Text	90.02	15.50	80.35	11.90	85.19	13.70
Overall %	86.94	12.87	77.11	15.03		

Note. *M* refers to mean; *SD* refers to standard deviation.

Delayed Post Treatment Measures of Grammatical Judgement Task. Data are percentage correct.

Text Type	Rules				Overall	
	Provided		Not provided		<i>M</i>	<i>SD</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Enhanced	80.23	15.20	80.04	16.60	80.14	15.90
Unenhanced	80.57	12.50	80.04	15.00	80.31	13.75
No Text	80.30	18.00	80.38	12.20	80.34	15.10
Overall	80.37	15.23	80.15	14.60		

Note. *M* refers to mean; *SD* refers to standard deviation.

Productive Use Task (Fill-in-the-Blank): Immediate and Delayed Post-test

Average scores for the productive use task ranged between 82% to 90%. An ANOVA revealed a significant main effect for text type on pre-test productive use task, $F(2, 309) = 3.96$, $MSE = 342.19$, $p = .05$, $\eta^2 = .25$, 95% confidence intervals [0.12, 21.59]. No main

effect was found for rules on the pre-test productive use task, $F(1, 309) = 0.56$, $MSE = 48.65$, $p = .45$, $\eta^2 = .00$, 95% confidence intervals [0.00, 7.31]. However, a small marginal interaction was found between text type, rules and pre-test productive use task, $F(2, 309) = 4.99$, $MSE = 432.016$, $p = .07$, $\eta^2 = .03$. This result is problematic because it indicates pre-experimental differences.

This analysis was conducted using the difference scores from the pre-test on the productive use task (fill-in-the blank) to the immediate and delayed post-test. These difference scores were necessary because of pre-experimental differences. All scores were converted into percentages.

Difference from Productive-use Pre-test Scores (%) to Immediate Post-test Scores (%)

To detect any differences from the pre-test to immediate post-test on the productive use (fill-in-the-blank) task, the percentage difference from pre-test to immediate-test was analysed (see Table 5.12 for descriptive statistics).

Table 5.12

Descriptive Statistics of the Productive-use Task Difference from Immediate Post-test Minus Pre-test. Data are percentage correct.

Text type	Rules				Overall	
	Provided		Not provided		M%	SD%
	M%	SD%	M%	SD%		
Enhanced	1.82	4.36	0.16	1.70	0.90	3.27
Unenhanced	6.85	11.08	-0.56	2.29	3.21	8.82
No Text	11.53	13.13	1.65	5.04	6.68	11.14
Overall %	7.06	11.15	0.42	3.44		

Note. M% refers to mean percentage, SD% refers to standard deviation percentage.

A two-way ANOVA revealed significant main effects of: text type on the productive use task difference from pre-test to immediate post-test, $F(2, 308) = 13.63$, $MSE = 815.23$, $p = .05$, $\eta^2 = 0.08$; rules on the productive use task difference from pre-test to immediate post-test, $F(1, 308) = 51.13$, $MSE = 3057.62$, $p = .05$, $\eta^2 = .15$. The learners with no text outperformed the learners with texts (enhanced or unenhanced) (see Table 2.8). Rules groups outperformed the groups that did not have the inclusion of rules in their study condition. Therefore, highlighting that when learners have the rules presented, it aids their learning on the immediate productive use post-test. The interaction between text type and rules was significant on the productive use task difference from pre-test to immediate post-test, $F(2, 308) = 7.47$, $MSE = 446.47$, $p = .05$, $\eta^2 = .05$. Learners that had rules and no text scored

significantly better on their difference scores from pre-immediate post-test on the productive use task. Scores were computed for correlational analysis, and pre-test on the productive use task was highly correlated with the immediate productive use task, $r = 0.53$, $p = .01$, $d = 0.40$, medium effect size.

Difference from Productive-use Pre-test Scores (%) to Delayed Post-test Scores (%)

Table 5.13 shows the descriptive statistics of the difference between pre-test to delayed post-test scores on the productive use task. The ANOVA revealed no significant effects between: text type and difference from pre-to delayed test on Productive Use, $F(2, 309) = 1.60$, $MSE = 41.49$, $p = 0.203$, $\eta^2 = 0.010$; rules and the difference from pre-to delayed test on Productive Use, $F(1, 309) = 1.16$, $MSE = 29.97$, $p = 0.283$, $\eta^2 = 0.004$. No significant interaction was found between text type, rules, and the difference from pre-to delayed test on Productive Use, $F(2, 309) = 3.84$, $MSE = 99.49$, $p = 0.23$, $\eta^2 = 0.025$. The non-significant main effect and interaction highlights that any effects that were found in the pre-immediate post-test differences was diminished by the time the delayed post-test was completed.

Table 5.13

Descriptive statistics of Productive-use Task Difference from Pre-test to Delayed Post-test. Data are percentage correct.

Text type	Rules				Overall	
	Provided		Not provided		M%	SD%
	M%	SD%	M%	SD%		
Enhanced	-0.71	3.70	0.95	3.33	0.20	3.58
Unenhanced	1.38	4.86	-0.17	2.24	0.63	3.88
No Text	2.38	7.84	0.38	6.12	1.40	7.09
Overall %	1.13	5.95	0.40	4.22		

Note. M% refers to mean percentage, SD% refers to standard deviation percentage.

Table 5.14

A 3x2x2 ANOVA Analysis on Productive-use Task Difference Scores. Statistics Reported

Interactions	Effect	df	F	MS _e	p	η^2
	ME of text type	2, 302	10.319	611.843	.000	.064
	ME of rules	1, 302	31.211	1850.596	.000	.094
	ME of test time	1, 302	47.548	1260.463	.000	.136
2-way int.	Text type and rules	2, 302	8.104	480.477	.000	.094
	Text type and time	2, 302	9.231	244.719	.000	.058
	Rules and time	1, 302	46.691	1237.734	.000	.134
3-way int.	Text type x rules x time	2, 302	2.489	65.981	.085	.016

Note. *df* refers to degrees of freedom, *F* refers to ANOVA statistic, MS_e refers to mean squared, *p* refers to probability, η_p^2 refers to partial eta squared, *ME* refers to main effect, *int.* refers to interaction.

Table 5.14 provides the results for the 3x2x2 analysis on the difference scores (immediate minus pre-test) (delayed minus pre-test) on the productive use task. Significant main effects are described in the above sections for each pre-immediate post-test differences and pre-delayed post-test differences on the productive use task. The interaction between text type and rules demonstrates that the largest difference was seen in the no text and rules condition ($M = 6.958$, $SD = 0.999$) and in unenhanced text groups with rules ($M = 4.124$, $SD = 0.999$). In addition, text type and time was significant showing that the learners with no text on the immediate post-test outperformed all the other groups ($M = 6.591$, $SD = 0.997$). Learners scores on the delayed post-test were much weaker than on the immediate post-test in all text groups (enhanced, unenhanced or no text). Furthermore, the significant two-way interaction between rules and times shows that learners with rules score better on immediate-post-tests when compared to delayed post-test with rules and no rules conditions. Learners with the rules did better on immediate and delayed post-tests than the no rules groups.

Table 5.15

Immediate Post Treatment Measures Productive Use Task. Data are percentage correct.

Text Type	Rules				Overall	
	Provided		Not provided		<i>M</i>	<i>SD</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Enhanced	91.49	5.66	84.23	7.60	87.86	6.63
Unenhanced	91.66	8.74	85.94	7.37	88.80	8.06
No Text	93.97	7.06	85.83	9.43	89.65	8.25
Overall %	92.37	7.15	85.33	8.13		

Note. *M* refers to mean; *SD* refers to standard deviation.

Delayed Post Treatment Measures of Productive Use Task. Data are percentage correct.

Text Type	Rules				Overall	
	Provided		Not provided		<i>M</i>	<i>SD</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Enhanced	88.97	5.57	85.03	6.89	87.00	6.23
Unenhanced	86.40	7.54	86.34	7.86	86.37	7.70
No Text	84.66	9.77	84.57	8.89	84.62	9.33
Overall %	86.68	7.63	85.31	7.88		

Note. *M* refers to mean; *SD* refers to standard deviation.

5.6.5 Research Question 2: What are the effects of visual input enhancement on noticing?

Noticing was measured by a noticing task after the last exposure to their study condition.

Table 5.16 shows the overall descriptive statistics for noticing measures.

Noticing of Enhancement

For noticing of the enhancement where learners were scored on whether they had consciously noticed the enhancement and on which target forms, the Enhanced and Rules condition scored lower ($M = 1.27$, $SD = 0.78$) compared to Enhanced condition ($M = 1.67$, $SD = 0.91$). An independent samples t-test was conducted to determine statistical differences of the learner's scores in enhanced and enhanced and rules condition to see if they were statistically different. There was a significant difference, $t(98) = 2.37$, $SE_{diff} = 0.17$, $p = .02$, $d = 0.47$, 95% CI_{diff} [0.06 and 0.74].

Understanding Gender Pronouns

For the section that concentrated on whether learners understood the gender pronouns, a two-way ANOVA revealed that text type (enhanced, unenhanced or no text) had a significant effect on the Understanding Gender Pronouns score, $F(2, 274) = 6.41$, $MSE = 4.77$, $p = .05$, $\eta^2 = .45$, the presence or absence of rules also had a significant effect, $F(1, 274) = 10.80$, $MSE = 8.03$, $p = .05$, $\eta^2 = .39$. The interaction between text type and rules was also significant, $F(2, 274) = 6.39$, $MSE = 4.75$, $p = .05$, $\eta^2 = .045$. Rules had no effect with unenhanced texts, but improved performance for the other two conditions.

Correctly Producing Gender Pronouns

A two-way ANOVA tested the effects of text type and rules on Correctly Producing Gender Pronouns. Results indicated a significant large effect of text type, $F(2, 307) = 22.18$, $MSE = 132.37$, $p < .001$, $\eta^2 = .128$. There was also a main significant effect of rules, $F(1, 307) = 17.74$, $MSE = 105.84$, $p < .001$, $\eta^2 = .06$. The two main effects were qualified by a significant interaction between the two factors, text and rules, $F(2, 307) = 50.38$, $MSE = 300.63$, $p < .001$, $\eta^2 = .25$, indicating that rules and text had a contributable effect on the sentence production task.

Table 5.16

Post Treatment Measures of Noticing for each Group, Percentage Scores

Group	N	Noticing of Enhancement (score 3)			Understanding Gender Pronouns (score 5)			Correctly Producing Gender Pronouns (score 12)		
		M%	M	SD	Mean %	M	SD	M%	M	SD
Enhanced	54	55.66	1.67	0.91	29.20	1.46	0.91	88.83	10.66	2.85
Enhanced and Rules	46	42.33	1.27	0.78	35.60	1.78	0.97	87.91	10.55	3.10
Unenhanced	54	-	-	-	31.40	1.57	0.87	79.80	9.57	3.12
Unenhanced and Rules	54	-	-	-	29.00	1.45	0.87	90.92	11.82	0.60
Control	52				31.40	1.57	0.90	78.66	9.44	2.97
Rules Only	55	-	-	-	43.60	2.18	1.38	90.66	10.88	1.88

Note. N refers to number of participants, M% refers to mean percentage, M refers to mean, SD refers to standard deviation.

Input Enhancement and Comprehension

The learners' comprehension was gauged by their scores on the comprehension task. Groups with a text were given the comprehension task (therefore rules only and control group were not included). From the passage, there was one comprehension task with a maximum score of 5 (see Table 5.12). As seen in Table 5.17, the unenhanced and rules group scored better on the comprehension task on average. The 95% confidence intervals for the unenhanced and rules group indicate that all the other mean scores for the groups are within the CI range: 2.91, 3.53.

Table 5.17

Results from the Comprehension Questions (all items). Maximum Possible Score 5

Group	N	M	SD	95% CI [upper, lower]
Enhanced	54	2.24	0.93	1.99, 2.49
Enhanced and Rules	46	2.20	0.89	1.94, 2.46
Unenhanced	54	1.83	0.94	1.58, 2.08
Unenhanced and Rules	54	3.22	1.17	2.91, 3.53

Note. N refers to number of participants, M refers to mean, SD refers to standard deviation, CI refers to confidence interval. Also, this table excludes rules only and control group as they did not complete the comprehension questions.

5.7.5 Research Question 3: Does studying explicit grammar roles of English gender pronouns have any effects on learners' learning of English gender pronouns?

Understanding Gender Pronouns

For the section that concentrated on whether learners understood the gender pronouns, a two-way ANOVA revealed that text type (enhanced, unenhanced or no text) had a significant

effect on the Understanding Gender Pronouns score, $F(2, 274) = 6.41$, $MSE = 4.77$, $p = .05$, $\eta^2 = .45$, the presence or absence of rules also had a significant effect, $F(1, 274) = 10.80$, $MSE = 8.03$, $p = .05$, $\eta^2 = .39$. The interaction between text type and rules was also significant, $F(2, 274) = 6.39$, $MSE = 4.75$, $p = .05$, $\eta^2 = .045$. Rules had no effect with unenhanced texts, but improved performance for the other two conditions.

Correctly Producing Gender Pronouns

A two-way ANOVA tested the effects of text type and rules on Correctly Producing Gender Pronouns. Results indicated a significant large effect of text type, $F(2, 307) = 22.18$, $MSE = 132.37$, $p < .001$, $\eta^2 = .128$. There was also a main significant effect of rules, $F(1, 307) = 17.74$, $MSE = 105.84$, $p < .001$, $\eta^2 = .06$. The two main effects were qualified by a significant interaction between the two factors, text and rules, $F(2, 307) = 50.38$, $MSE = 300.63$, $p < .001$, $\eta^2 = .25$, indicating that rules and text had a contributable effect on the sentence production task.

5.8 Interim Discussion

The previous section presented the results of the main study for Experiment 1. This section will now focus on answering each of the research questions and providing a short interim discussion of results. The first research question aimed to compare the effectiveness of visual input enhancement against a baseline of text with no enhancement, and no text at all to see the difference form-focused instruction makes to learning of a grammar form. The second research question was aimed at the effectiveness of visual input enhancement on the noticing and attentional processes of learners. Finally, the third research question investigated the possibility that the different treatment conditions (explicit rules, explicit knowledge) may affect the learning of the target form, gender pronouns.

5.8.1 Research question 1: Does visual input enhancement have any effects on learners' learning of English gender pronouns?

Data analysis regarding this research question showed that the use of Bold visual input enhancement formats was more effective than no enhancement to the target form (English gender pronouns) but these effects were only short-lived, not lasting and dropping off by the delayed post-test. Based on theoretical and previous empirical research discussed in §2.4.2 (Alanen, 1995; Doughty, 1991; Jourdenais et al., 1995; Shook, 1994) on focus and form and noticing and input enhancement, input enhancement was expected to make the grammar points more salient and in return learners who were in the “enhanced” conditions would have

paid closer attention to the gender pronouns forms and learned from the examples. Statistical analyses revealed that small to moderate effects of text type on immediate grammar tasks wherein enhanced texts led to poorer learning, but those effects dissipated within a week. Therefore, it can be inferred that input enhancement in this case, did not aid learners in attending or acquiring the target form. This result was also in opposition to the prediction where textual enhancement should have raised saliency of the target grammar forms, and then in turn be more noticed by the learners, leading to intake. Further to this, the result runs counter to studies which have found input enhancement to be successful (Indrarathne, Ratajczak & Kormos, 2018; Jourdenais et al., 1995; White, 1998) however, it does run in line with other research which has found input enhancement to have no facilitating effects (Jourdenais, 1998; Izumi, 2002; Leow, 1997; Overstreet, 1998, 2002; Wong, 2003). Moreover, the results in this study demonstrate that the effects of input enhancement were detrimental to some learners and had a negative impact on their learning process of acquiring and taking in the gender pronouns.

Nassaji and Fotos (2011) claim that textually enhanced learning or methods are implicit focus on form input techniques. In the same vein, they also argue that use of grammatical rules with an explanation or instruction are explicit focus on form techniques. In terms of Experiment 1, the groups/study conditions – enhanced and unenhanced (as there was input with the grammar form featured albeit not enhanced) would be classified as implicit learning techniques, whereas enhanced and rules, rules would be explicit learning techniques. Scholars (e.g. Norris & Ortega, 2000; Sharwood Smith, 1993) have suggested that features in input (e.g. grammar forms or vocabulary items) with added saliency may gain more attention from the learner.

5.8.2 Research question 2: What are the effects of visual input enhancement on noticing?

Noticing was measured by a noticing task after the last exposure to their study condition. Table 5.12 shows the overall descriptive statistics for noticing measures. Noticing measures from learners were found to be impacted by textual enhancement and the explicit rules instructions (when compared only to the textually enhanced group). There appeared to be a lower recognition of the enhancement from learners and this could be aided by the suggestion of ‘bold’ type not being significantly different to normal text. For example, when compared to underline or colour change, the salient features may be more appealing to some learners. There were only marginal differences in terms of noticing results and as the noticing measure was quite simplistic, the findings should not be over-discussed or over-generalised. Statistically different (marginal)

In terms of the understanding of the grammar form, findings revealed that text type (enhanced, unenhanced or no text) had a significant effect on the Understanding Gender Pronouns score, the presence or absence of rules also had a significant effect. With an interaction between text type and rules. Rules had no effect with unenhanced texts, but improved performance for the other two conditions (enhanced, no rules).

When learners were reproducing the correct grammatical use of the gender pronouns, the effects of text type and rules on was impacted positively by text type, and rules. The two main effects were qualified by a significant interaction between the two factors, text, and rules, indicating that rules and text had a contributable effect on the sentence production task.

The results also showed small effects for comprehension. As in Lee (2007), textual enhancement interfered with learner's comprehension of the texts with enhanced forms. It was evident from the results of the noticing question that the presence of rules reduced noticing of the enhancement and/or target form.

5.8.3 Research question 3: Does studying explicit grammar roles of English gender pronouns have any effects on learners' learning of English gender pronouns?

Presenting rules on the other hand, did aid learning in the short term. Again, effects did not persist to the delayed post-test one week later. Three key findings emerge from this study: first, the study showed that even though multiple exposures to the enhanced input and the rules only presentation was provided, it was not effective in inducing long-term learning. However, having rules presented did help learners with their post-tests. Furthermore, from the results on noticing (understanding gender pronouns and correctly producing gender pronouns components) it was indicated that the display of a rules presentation and the text has(?) a contributable effect on understanding why gender pronouns are used and sentence production tasks. Rules also helped with no text or an unenhanced test, providing no benefit with the enhanced text.

Overall, the findings reveal that where learners received the enhanced text, with or without rules they performed worse on the learning tasks (as measured by grammatical judgement task and productive use (fill-in-the-blank) task) than the other groups. This is puzzling outcome, and one which, as highlighted above is contrary to the predictions made. More research is therefore necessary.

On reflection, some of the reasons for this puzzling outcome may be the use of enhancement (bold). Many of the other items were controlled for and planned in line with the meta-analysis findings and previous systematic reviews of the existing literature (see 2.4.2).

In future research, one way to obtain learner's attention while under an input enhancement study condition is using an eye-tracker. This would provide inferences of learner attention and what they are processing while reading the text.

Furthermore, the lack of long-standing effects (i.e. from the delayed post-test scores) might suggest that input enhancement alone is quite weak for language learners. Furthermore, the use of rules as an explicit technique does demonstrate that learners were assisted by the explicit rule condition. However, like MacWhinney (1997) that there is no real consensus on the knowledge that can be gained from explicit instruction – it is difficult to know what learners were thinking during this process. There was no online measure and some type of think aloud protocol may have been useful or a post interview.

In this study, multiple exposure to the study conditions was included (twice, over two weeks) for the texts and rules conditions. This spaced repetition was based on previous reviews of literature that assumed multiple exposures to enhanced input (and a rules presentation with further examples of the input) to increase the learner's chances of noticing the target forms. The further exposure to the input may have resulted in further processing and an increase in declarative knowledge regarding the expression of using gender pronouns.

Although this study addressed only one particular linguistic construction (gender pronouns) and a particular group of learners (Chinese high school students at a boarding school in China), the results seem consistent with ideas from Kirschner et al., (2006) that if new information is presented in a context where learners need to pay attention to a number of parallel processes (i.e. enhancements or bolding to some grammatical forms) and a variety of sources of information, (e.g. the comprehension of the reading text, the rules only presentation), then learners might not have sufficient working memory resources left for attending to the information to be acquired.

5.8.4 Limitations of Experiment 1 and Suggestions for Future Research

In line with presenting the results, it is also necessary to explore some of the limitations of the experimental study (research setting, materials, and design) and suggestions for future research including modifications for Experiment 2.

In terms of the study setting, Experiment 1 included intermediate learners in the native language setting (typically B1 proficiency, IELTS 5.0-5.5). It would be useful to see the difference in effectiveness and learning using visual input enhancement across different proficiencies, but also in different settings. Another point to consider in the design of the study was the allocation to study groups (enhanced, enhanced & rules, rules, rules & enhanced, rules only and the baseline, control group) Learners were allocated by classroom

rather than truly random allocation means. This can be a concern as there may be group differences, individual differences across the school year cohort. However, the pre-measures were similar for all groups (classrooms). Another direction of future research is to include learners of higher levels such as intermediate to higher levels of English (as a second language). This study focused on one level of learner. The level of learner was chosen based on their level comparable to the level of learners who participated previously in similar investigations. It may be that learners of a lower level do benefit from input enhancement methods and explicit rule presentation due to the altering of processing strategies. Future studies could address all these limitations via a wider span and choose new forms to gain more insights into the effectiveness of input enhancement in different English foreign language contexts.

In terms of the materials, more could have been prepared in terms of language barrier and providing all materials in the native language for ease of the learners. Learners did informally ask for the post-tests in Chinese Mandarin (questions) and then to answer in English (participants suggested after the study was over that they may have found it easier to think in Chinese to answer the question then find their answer in English). There may have also been a ceiling effect as the participants from the beginning of the study had a relatively high level of prior knowledge of the target form, English gender pronouns (as demonstrated in the pre-test scores). This is a measurement and methodology limitation and decreases the likelihood that the instruments designed accurately tested English gender pronoun prior knowledge and learning. The pre-test scores on the GJT and Productive-Use Task demonstrate scores bunched at the upper level, thus there was not much learning for the students to engage with.

In terms of the tasks and tests used to measure learning and noticing, there are some issues worth reporting. The GJT for use in pre-test, immediate post-test and delayed post-test was quite low in number of items and some of the statements included two personal pronouns for one item. Further to this, the noticing task used in the study may have influenced students' performance on the delayed post-test. This influence may be due to student's therefore having another gained opportunity to revisit the chosen grammar form and thus, students may remember more. The effects that the noticing task may produce are small but nonetheless, they should be noted as they could explain some of the marginal differences during the noticing task. The task also tested for understanding and at the point of participants completing the noticing task, they were only at the immediate post-test stage. In this case, participants may have remembered some of the functions of the chosen grammar

form, and in turn ‘understood’ the grammar more by the point of which they were tested for the delayed post-tests weeks later.

The GJT also had a low Cronbach alpha result explained due to the low number of items. As this was one of the key research instruments to measure learning in the pre, immediate and delayed post-test phrase – this does reduce the credibility of the research findings. In future research, the GJT should be more carefully designed and used in a proper pilot test to evaluate the level of validity and reliability.

In terms of design, no data were collected in this study to investigate the experimental group’s underlying cognitive processes, underlying noticing the targeted forms and processing the input further. Previous input enhancement studies (Jourdenais et al, 1995; Kim, 2003) have sometimes included think aloud protocols with a sample of their participants. This approach was not possible in this study due to time constraints in the Chinese school where there was limited free time.

The results of this study aimed to investigate the effectiveness of visual input enhancement using a typical input enhancement ‘textually’ enhancing the chosen grammar form of gender pronouns using bold as the method of salience. The role of explicit rule instructed was also investigated, their effect on learning solely and in conjunction with visual input enhancement methods were utilised. Findings revealed that visual input enhancement, in this case, did not make a difference to the learner’s performance on grammar tasks or comprehension in this study. The small to moderate effects of text type (enhanced, and unenhanced) on immediate grammar tasks wherein enhanced texts led to poorer learning infer that in this case, visual input enhancement did not aid learners in acquiring the gender pronoun construction. Any effects were also quickly diminished (as provided by the delayed post-test results) and demonstrate the short-term nature of the effects produced by visual and textual input enhancement. One finding that stands out in this study is the role explicit grammatical rule presentation played which did influence performance albeit only for a short time. According to Experiment 1 results, it may be tentatively suggested that there is a short-term benefit in teaching explicit grammar rules to learners.

These findings were apparent for the group studied (Chinese intermediate second language learners of English) and may be generalised to this student population only. From the findings and interpretation of the results, an important issue moving forward is methodological design. Input Enhancement studies struggle in some way from methodological flaws, and this is because there are no consistent forms of testing of acquisition or intake. Scholars in the second language acquisition field have recommended many items when conducting visual and textual input enhancement studies. Some of these

were followed in this study, however, not all could be considered and featured due to many research restraints. It could be recommended that future research concentrated in this area should use a well-developed method or task of measuring the outcome of the effectiveness and facilitative effect of input enhancement.

Chapter 6: Experiment 2: The Impact of Modality on Input Enhancement and Grammatical Rules on Intake and Comprehension

6.1 Introduction

This Chapter reports the results of an experimental study which used input enhancement methods (visual and audio) in the teaching of the grammar form, gender pronouns, to Chinese 18-24-year olds at university with English as their second language.

To recap on Experiment 1, the aims were to focus on how effective visual input enhancement for grammar learning is among Chinese second language learners of English, and to see the impact of explicit rules (explicit instruction) on learning of the grammar form. Findings revealed that visual input enhancement (using boldface text on target forms in visual text) did not make a resounding difference to the learner's performance on grammar tasks or comprehension in this study. The small to moderate effects of text type (enhanced, and unenhanced) on immediate grammar tasks wherein enhanced texts led to poorer learning infer that in this case, visual input enhancement did not aid learners in acquiring the gender pronoun construction. Any effects were also quickly diminished and short-lived. On reflection, Experiment 1 focused on one form of input and thus, does not shed any light on how helpful or effective aural/audio input** is to second language learners of English. Therefore, Experiment 2 is broadened by the introduction of a further input enhancement study with a focus on different modalities (visual and audio) with Chinese pre-sessional academic English students at a British university. This study focuses on whether modality has an impact on acquisition and learning of the chosen structure – through input enhancement (visual), audio input enhancement and explicit rules. It was hypothesised that audio-visual enhanced materials will be more effective based on Mayer's cognitive theory of multimedia learning (2002). Experiment 2 also uses a different population of students, university pre-degree learners who may well have pre-differences due to the nature and possibility of additional language learning outside of the formal classroom, and previous experience with their second language.

Research on input enhancement as means of improving second language learning (grammar or vocabulary) raises many unanswered questions. For example, how far should being explicit and attention demanding be in input enhancement techniques be, when should

*** Audio and aural input are used interchangeably

salient features be presented to the language learner – before or after there are problems with producing specific grammar forms, or should it be presented proactively addressing forms that students may have trouble attending to? Empirical work in noticing, input enhancement with the combined integration of cognitive psychology and modality will help answer the remaining questions. The next section briefly turns to audio input enhancement and reviews some of the literature, and conclusions drawn from that literature to ascertain the rationale for this research including two types of modality (audio and visual).

6.2 Different Types of Input Enhancement

Some prior research studies have shown positive effects of enhanced written input on the second language target forms learning (Lee, 2007; White, 1998). The next two sections will briefly discuss visual input enhancement and audio input enhancement based on findings from the literature review in §2.5.1 and 2.5.2.

6.2.1 Audio Input Enhancement

As previously highlighted in the literature review section of this thesis (see §2.5), input enhancement involves manipulating the input given to language learners to increase their attention to the selected grammatical form or vocabulary type (Sharwood-Smith, 1991, 1993). For the scope of this experimental study, input enhancement is concerned with the visual and auditory manipulation in terms of typographical or textual manipulation and not the other forms of reported input enhancement (for example, input flood, corrective feedback – repetition or recast). There are different types of input enhancement, and one which will be further explored in this study is audio (also known as aural input enhancement). The next section will detail and review previous audio input enhancement studies.

Input enhancement is the altering of input (by means of highlight, bold, italics) however, as Cho and Reinders (2013) suggest a more broadminded definition can include technological enhancement, and audio enhancement. The next section explores different modalities and liberal uses of input enhancement, their findings, and conclusions relevant to the rationale of this study. There has been an increase in uses of technology in linguistic learning methods as a means of gaining the learner's attention to language parts. One older example of this is Gascoigne's (2006) research which concentrated on learners listening to second language input and then having to transcribe what they heard on technology (i.e. the computer or on paper). Her hypotheses suggested that learners using the computer to type their responses would use a more conscious type of effort and attention. Overall, her results found that the keyboard transcription did have a positive effect on the learner's recall of the

target items when compared with the other condition, the typical paper and pen transcription.

Moreover, input enhancement studies can involve two forms of modality. The visual enhancement can involve visual information (pictures) to highlight certain aspects of the text. An example study is Labrie (2000) who investigated second language learners' acquisition of vocabulary by comparing a web-based reading text enriched with images and sounds with a paper-based text without visual and aural aids. The inclusion of visual and aural information helped with vocabulary acquisition. Thus, the multimodality effect can be suggested as successful. However, Labrie (2000) failed to include any explanation of this result.

More specifically, audio input enhancement involves the manipulation of listening materials, whereby the volume of target items in the text can alter or by including a short pause before and after the target items. Also, aural emphasis can, however, be achieved in several ways, via stress, intonation, or gestures (Gascoigne, 2008, p. 149), but there have been a limited number of studies which use this type of input enhancement. It has been suggested that this finding is surprising as compared to the number of studies on written input enhancement, the audio enhancement may occur in natural or classroom discourse as a form of corrective feedback or recast (Cho & Reinders, 2010). Therefore, it is much more natural, common, and typical to the language learner.

Table 6.1 provides a brief overview of key studies of audio enhancement in line with the theoretical underpinnings of Sharwood-Smith's (1991, 1993) input enhancement.

Table 6.1

Overview of Previous Audio (related) Input Enhancement Studies

<u>Study</u>	<u>Audio Description</u>	<u>Effect</u>
Cho and Reinders (2013)	Audiobook Enhanced by increasing volume of target words. Slowing down the speed when target items were read out	No effect
Negari, Azizi & Arani (2018)	The present study attempted to investigate the effects of audio input enhancement on EFL learners' retention of intensifiers. Assigned into two groups: an audio input enhancement group and a control group	Results show that participants instructed by audio input enhancement significantly performed better than the control group in their immediate post-test
Perez, Peters & Desmet (2017)	Investigated enhancing video (i.e. audio-visual) by (1) adding different types of L2 subtitling (i.e. no captioning, full captioning, keyword captioning, and glossed keyword captioning) and (2) informing vs. not informing students that viewing would be followed immediately by a test of vocabulary from the video (Test Announcement). The study adopted a 2 (+/- Test Announcement) x 4 (Type of Captioning) between-subject design,	Results revealed that students in the glossed keyword captions group (with access to meaning) scored best on the form recognition and meaning recall tests.

	resulting in 8 experimental groups. 227 Dutch-speaking university students watched three second language videos of French in one of eight conditions.	
Balcom and Bouffard (2015)	Used oral input flood and form-focused instruction versus a control group. Learners in the oral input flood/form-focused group received input over an 8-week period	Results indicate that input flood and form-focused instruction had a positive effect on adverb placement
Spada & Lightbrown (1993)	Oral input flood of interrogative sentences alone	Oral input enhancement alone is not enough to enable students to move to the next developmental stage with that target grammar learning
Trahey & White (1993)	Focused on input flooding with adverb placements	The oral input flooding was effective in assisting with the learning but did not show them the first language order was ungrammatical
Wong (2001)	6 tasks: Listen to content only Listen and attend to the word 'inflation.' Listen and attend to the definite article Read passage for content only Read passage for the word 'inflation' Read passage for the definite article	Comprehension affected Modality is a variable that influences input
Syedtajaddini (2014)	2 groups (1 high proficiency, 1 low proficiency) Listening sections from American Headway textbook Audio input for five sessions Following the instruction was a ten-minute listening activity which included different usages of second conditional. The learners were supposed to identify the conversation which matched the instructed usage in each session. During the last two sessions, the learners received no instructions; however, they listened to the audio material including the three different types of usages. The learners were supposed to explain the type of the usage after listening to each conversation	Greater effect on high proficiency students
Mayen (2013)	14-week study Use of visual prompts, focusing on Spanish verbal morphology with seven to nine-year olds	Input enhancement methods and visual aids helped with noticing and learners remembering verbal morphology
Jensen and Vinther (2003)	Video recordings of native speakers looking at slow/fast and baseline audio. Use of 3 groups	No difference
Reinders and Cho (2010)	16 freshmen from Korea Mobile phones Target structure was English, adverb placement and passive structures Artificially increased the volume of the target structures	Ineffective
Banados (2006)	Blended learning approach Use of enhanced input aurally and written	Improved learning, however whole host of learning cannot tease apart how effective audio input enhancement is

Rashtchi & Yousefi (2016)	Compared effects of reading input flood and listening input flood with Iranian EFL learners' speaking skill. Three groups – reading input flood, listening input flood and control group. Exposed to the numerous examples of the target structures through reading. In the same phase, the listening group was given the same task, through listening. The participants' monologues in the post-test were separately recorded, and later transcribed and coded in terms of accuracy and complexity	Outperformance of reading input flooding group over listening input flood and baseline (those who received no input)
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Note. All published audio/aural enhancement studies found have been included: studies on modality with a varied approach to testing groups in different conditions related to listening and reading are included; studies using audio input flooding have also been included to provide a comprehensive review of prior empirical work.

Wong (2001) explored the idea that some second language learners of Spanish found it increasingly difficult to attend to the meaning and aural input. Wong's study replicated VanPatten (1990) who investigated the different modes of input enhancement including written mode. The study had six tasks including (a) listening to the passage for content only, (b) listening for content while attending to the content word inflation, (c) listening for content while attending to the definite article 'the', (d) reading the passage for content only, (e) reading the passage for content while attending to the content word inflation, and (f) reading for content while attending to the definite article 'the'. Wong's findings mirrored VanPatten's original study in the aural mode condition. However, there were no significant differences observed for written mode tasks. Wong (2001) further explained that listening is more complex than reading, and modality plays a crucial role in influencing how learners process input. Wong (2001) explores the issue of modality in second language acquisition. By using replication of the VanPatten (1990) study, Wong concentrates on the issue of paying attention to form and meaning in a written mode and then an audio mode. Six study conditions were used, and the findings revealed similar patterns to VanPatten's original study although there were no significant differences for the written mode tasks. The listening mode highlighted the difficulty some learners may have over reading modes. Therefore, the results suggest that modality is a key variable which can influence learners' input. Wong did call for future research in this area relating to modality and attention. Although this research study was published in 2001, there has been a lack of research studies within this area. However, an important area to focus on when concentrating on modality and the impact it has on learners' attention and learning, is the psychological research where it originates from.

Furthermore, Cho and Reinders (2013) examined the effect of audio input enhancement in extensive listening on second language acquisition. Participants in the

experimental group received an audio book in which passive structures had been manipulated by artificially raising the volume of the target items and/or by reducing the speed with which the target items were read out. The control group listened to the unaltered audio files. The findings showed no significant aural input enhancement effect on acquiring the target form. In addition, Cho and Reinders' (2013) study was original in the sense it focused on the aural input enhancement, which had not been reported or published on prior to 2013. In this study participants listened to an audiobook outside of class. Within the audiobook, the passive grammatical structures had been manipulated by artificially increasing the volume of target items or by reducing the speed with which the target items were read out. Their control group listened to the audiobooks in their original form only. Results found no significant effect for the manipulated input (audio enhancement) on acquiring the target form.

A further study conducted by Seyedtajaddini (2014) focused on audio input enhancement with 30 Iranian second language learners of English. The audio input enhancement was in the form of listening materials chosen from Headway books and was taught over the course of five sessions. The target grammar form was the English second conditional (i.e. using the past simple after *if*, then *'would'* and the infinitive: *if* + past simple, ...*would* + infinitive). Results show that there was a significant difference dependent on the use of audio input enhancement. There was a greater effect of audio input enhancement on high-proficiency level students. However, this study fails to detail the audio input enhancement with regards to how the grammatical form was made salient. Therefore, it is difficult to apply these results.

6.2.2 Conclusions drawn from existing audio enhancement studies

From the review of input enhancement studies that considered some type of audio enhancement as reviewed above in Table 6.1, there are mixed results. Some considerations are included below:

- Most results indicate that audio input enhancement alone (even input flood) is not effective and does not work in isolation. Many of the studies reviewed above have combined their version of input enhancement with form-focused instruction and therefore results are difficult to tease apart.
- There is no uniformed way of designing and running an audio input enhancement study. More studies could contribute to this and then there could be recommendations made like what Han, Park and Combs (2008) suggested in their meta-analysis of visual input enhancement and grammar learning.

- In instances of the learning of the grammatical or vocabulary item increasing compared to the counterpart control group, this may be explained in terms of the target forms being manipulated to be more salient and noticeable prompting the learner's acquisition of the target form.
- No studies using audio enhancement and eye-tracking were found in my search. This presents a gap in the research and this type of technique could be utilised in future studies whereby the students are presented with audio-visual in comparison to visual materials and then attention data is gathered using an eye-tracking or think aloud protocols.
- In the language learning context, listening is one of the key component's learners would be focused on at some point during the duration of their study. Language listening is often extensive and comparable to reading in the sense that learners are focused upon the meaning and not the form (e.g. see Focus on Form in §2.4.3) and can listen to texts for a long duration. Purposes of listening in a language classroom is to give the learners target language input and for it to be as authentic as possible. However, in a pedagogical sense, extensive listening within a classroom can be particularly impractical and the classroom may not be the best place for students to engage with listening materials for an increased amount of time. Therefore, language learners are often advised to listen to as much television, radio, films, and music in the second language. As a result, it is easy to see how input enhancement can be utilised within an audio setting; it is comparable to extensive reading and the target grammar forms can be emphasised, manipulated, and made salient to learners.

Overall, there is a definite lack of studies in the audio input enhancement field and more need to be designed and ran. Experiment 2 will therefore add to that body of literature and hopefully in the future, there will be enough studies to warrant a meta-analysis into this area to see how effective audio enhancement is as opposed to other forms of input enhancement (e.g. visual input enhancement). It would also be useful to understand the psychological underpinning of modality and multimedia learning to understand how audio input enhancement would work with language learners and within a classroom.

6.2 Reading-while-Listening Research

Listening to language is considered a key part of developing listening skills. Research has found that listening without support can be difficult for second language learning. In the case

of a second language learner, reading and listening are often introduced concurrently. However, experience in language teaching and through reading the literature, the two skills often do not develop at the same level. Research (e.g. Chang, 2009) has previously compared second language learners who completed reading-while-listening activities. In Chang's (2009) study, second language learners were compared in two instances, those learners who performed reading-while-listening activities, and those learners who performed listening only. Findings revealed that students in reading-while-listening condition scored higher than the listening only group. More importantly, another finding was that learners enjoyed the tasks more and found them easier to process and more comprehensible.

In some language learning environments, listening skills develop more slowly than reading skills as the teacher or curriculum focus more attention on reading when compared to listening. Due to the variation in the foundation of reading and listening skills for L2 learners, one skill may be used to complement the other. Although second language listening has become a popular area, the rationale for alluding this research in Experiment 2 is down to the way audio input enhancement works. Teachers who might use this technique will design a programme of study whereby the learner listens but also reads at the same time, with the added salience to the target forms. It is useful to conceptualise this stage and to review some of the previous research in this area.

6.3 Modality Research

Modality research stems from the ideas that there is a positive impact on learning when instructional materials are presented in an audio-visual manner. This audio-visual learning includes listening materials alongside the visuals. In relation to the working memory model, this presentation uses auditory and visual channels within the working memory. Previous research has found this to be successful where it can help to enhance knowledge acquisition (Brünken, Plass, & Leutner, 2004), and retention (Mayer & Moreno, 1998; Moreno & Mayer, 1999). However, the modality effect does not always produce positive learning results. Tabbers, Martens, & van Merriënboer (2004) suggested that reverse modality effect can occur, for example, the reverse modality effect is detected when cognitive load is high (e.g. Sweller, 2010; Sweller & Chandler, 1994; Tindall-Ford, Chandler, & Sweller, 1997).

However, on further examination of modality effect studies, most studies are in the participants' first language and only immediate post-test measures in comprehension are used (e.g. Mayer & Moreno, 1998; Moreno & Mayer, 1999). With the research taking place in a controlled setting, it could be argued that learners are engaging in a limited one-off experience which cannot be generalized to other learning settings. What is of interest to this

experiment is whether the modality effect can be applied to input enhancement which encompasses both visual and auditory presentations thus, creating an audio-visual presentation with targeted grammar points being enhanced.

The wide consensus is that modality does influence input processing (Cho & Reinders, 2013). This in turn, may influence intake and acquisition. There are theories to explain the relationship between modality and aural enhancement. For example, the separate streams hypothesis (Penny, 1980) which suggests audio and visual language input are processed differently and independent of each other. First, language studies have investigated the difference between reading and listening, finding listening as more taxing than reading of the same input (Anderson, 1980; Danks, 1980; Rost, 1990), as learners do not have the same amount of control over the audio input as they do over written input. Whilst a learner is reading, the person can recognise the different elements within the text (e.g. words, sentences, and paragraphs). The learner can re-read over parts of the text (Rost, 1990).

However, in the listening and aural case, the division of word boundaries are not discrete, and learners need to rely on prosodic and intonational cues in the input to understand sequences of input (Anderson, 1980). Second language research has also shown that modality places constraints on the way input is processed. Studies (Johnson, 1992; Murphy, 1997) show that (adult) learners' performance on grammaticality judgement tasks was slower and less accurate in the aural mode than in the written mode. Besides, Wong (2001) compared the ability of learners to focus on both form and meaning in aural and written modes and found that the aural mode was more challenging than the written mode.

Overall, there has been a lack of studies which concentrate on the aural changing of the input and drawing learners' attention to this in an experimental format. Leow's (1995) study does give us some insight, as it was a replication of an earlier study (1993) into the effects of simplified written input, type of linguistic items, and L2 experience on intake, but in the aural mode, allowing for a comparison between the two. Although the studies did not reveal modality effects of simplified input on learner intake of the target form, mode of input did seem to influence learners' intake of different types of input, due to the phonological salience of different morphemes. Leow (1993, 1995) emphasised the need to further investigate the effects of modality on input processing.

While it is necessary to encourage extensive listening and listening for meaning, previous studies (Norris & Ortega, 2000) have shown that when learners' attention is focused on more formal aspects of the language (e.g. a certain grammar point) in a meaning-oriented activity (such as a classroom activity, or when reading a book), learners remember the grammar point better (see Norris & Ortega, 2000). Therefore, this experimental study

encourages language learners to pay attention to both form and meaning without interrupting their listening, for example, by giving them specific grammar instructions. This can be achieved through input enhancement by simply manipulating the language input and making sure learners will notice the target grammar forms. In respect of previous input enhancement literature, this has mostly been completed using a written text and not audio. However, this experimental study looks at the different study conditions of input enhancement (i.e. written – visual & audio) to compare the effects of the enhancement.

6.3.1. Multimedia learning

In line with cognitive psychology, and the items discussed in §3.2.4; multimedia learning is applicable here with the input enhancement modes. Previously, Mayer (1997) and Mayer and Moreno (2002) pointed out that learners may learn at a deeper level from words and pictures than words alone. This theory has now been useful in the classroom in that instructors can utilise different teaching methods (audio, visual and tactile) to engage their learners and have real depth to the learning process (Roy & Chi, 2005). The cognitive theory of multimedia learning works based on understanding how the human mind works. Three principles underline the theory: (1) the separate channels of processing information, auditory and visual, often known as the Dual-coding theory; (2) each channel in the human mind has a finite capacity (in line with the Cognitive Load theory proposed by Sweller, 2011) and (3) learning is a process by which individuals filter, select, organize and integrate information based on their previous knowledge. Mayer's (1997) multimedia learning which orientates from cognitive theory, suggests that the brain does not interpret learning in a mutually exclusive way. For example, the multimedia presentation of words, pictures and auditory information are ordered dynamically to produce reasonable mental constructs. Mayer's work highlights the importance of prior knowledge which should be integrated with the new information. In application to input enhancement, the theory of multimedia learning can be applied. It is believed that learners should have some prior knowledge of the target form (whether grammar or vocabulary) before they are exposed to it through input enhancement means (Han, Park and Combs, 2008; Lee & Huang, 2008). By displaying the forms within a natural reading text; visual or via audio and aural functions, it is useful to see whether learners work best under this type of instruction together, or in an isolated media method.

Moreover, the field of second language learning has been engaged in multimedia learning for some years. As stated in section XX, instructed second language acquisition is a sub-topic of SLA that explores any type of second language learning or acquisition that occurs as an outcome of the teaching of the L2 (Lowen, 2012). Different authors (Doughty &

Williams, 1998; Lightbrown & Spada, 2006; VanPatten, 2004) believe that within instructed second language acquisition input and output opportunities in the second language, there is room for the second language to grow in classroom acquisition. In the new era of computers and technology, input, and output opportunities for learning a second language can be generated by different tasks and activities using different types of media, for example: audio, video, or images. Therefore, in multimedia learning environments, learners are exposed to different modalities (as mentioned above) and the combinations of using these modalities may be more effective for their learning (Moreno & Mayer, 1999). As a result, second language exposure fostered through multimedia ways could lead to changes in learner's interlanguage (Chapelle, 2001).

6.3.2 Implications for the main study

The present study helps to fill gaps in the instructed second language acquisition literature by focusing on the input enhancement method again but utilising and understanding the prior work of modality researchers and theorists, and empirical work that has utilised audio input enhancement. Therefore, the study contributes to the growing body of input enhancement but also audio input enhancement and the impact of modality on input enhancement and grammatical rules on intake and comprehension. This will help to develop a critical step in the body of audio input enhancement and take a more critical step towards understanding cognitive processing in this input method technique.

6.4 Pilot Work

As in Experiment 1, preparatory work was completed for Experiment 2 to ensure materials were suitable for testing. This testing took place in three stages:

1. A session was conducted to assess which type of audio/aural enhancement to utilise with the main participants in the study. There were two procedural steps to the pilot study including the piloting of audio enhancement and the emphasis level. A focus group with eight mixed nationality (British, Chinese, African, European) students tested two different types of audio input enhancement: (1) with the grammar point enhanced through volume (artificial) and (2) with the grammar point enhanced using stress and intonation emphasised naturally by a British speaker. Each of these were set up using a text from a Headway Upper Intermediate English textbook in the two different forms. Students were played both forms with a space of a day between. Six out of the eight students preferred the natural British speaker who manipulated the enhanced forms and create "saliency"

through natural speech methods: stress and intonation. Participants within the pilot study commented that the manipulation of the target forms via enhanced volume was not very noticeable, it could depend on the quality of the enhanced volume (how much would it be enhanced, and stated it did not seem ‘authentic’).

2. All consent forms and information sheets (written in Mandarin, Chinese) were checked for accuracy among two Chinese native speakers.
3. Finally, pilot work was conducted with a total sample of four: two native English speakers and two Chinese non-native English speakers. The purpose of the pilot was to use the pre-test, treatment and post-test materials among two sets of groups to assure that the content seemed suitable to the Chinese speakers who were somewhat comparable to the learners who would participate in the final experimental study (i.e. IELTS levels 5.5 & 6.0); to determine how long it would take for students to study the treatment text; to determine if the audio input enhancement was practical and comprehensible using the equipment on the computers; and to pilot test new additions for clarity, practicality and completeness. The chosen second language learning proficiency test, Dialang web online was used by learners in the preparatory period. The native English speakers indicated that the test was easy to follow, and although the reading at times was intense, they all scored towards the top end of the scale (C1-C2) (See Appendix A for full level descriptors).
Second language learners of English scored between: B1 and B2.

6.4.1 Lessons learnt from the preparatory study

After completing the preparatory work, necessary changes were completed to the materials. This pilot work identified amendments to the materials (e.g. PowerPoint instructions) and the need to check all computers for volume accuracy and headphone jack availability. Headphones were also purchased for all participants, so the study did not rely on participants bringing their own. Principally, pilot work impacted later work in that it showed that the tests could be used with both first language and second language students.

The following section describes the main study methodology.

6.5 Main Study

Preparatory work (as discussed above in 6.4) helped design the materials for Experiment 2. This section begins with the research questions for the main study context of the main study, and then each part of the method is described, participants, ethics, instruments, data collection and finally data analysis methods.

6.5.1 Research questions

The following research questions support the objectives of the present study:

1. Does the type of input enhancement (visual, auditory) have any effects on learners' learning of English gender pronouns?
2. Does studying explicit grammar roles of English gender pronouns alongside input enhancement have any effects on learners' learning of English gender pronouns?

6.5.2 Context of the main study

Experiment 2 examined the effects with students in a study abroad context whereby the students were in a new educational context, British university. The rationale for using this group of students was to focus on a different set of learners compared to Experiment 1 and to use intermediate users of English in a university setting (see Table 1.1). The research site was a British post-92 university. Students were all enrolled on a pre-sessional academic English course which comprised of general English and English for academic purposes (EAP). The student population on these courses is typically native Chinese, Thai, and Vietnamese.

Experiment 2 used traditional visual input enhancement and a multimodal approach to aural input enhancement and explicit rules learning. Based on the research cited in the above sections (e.g. Mayer, 1997, 2002, 2009), predictions have been made. Firstly, audio-visual materials will be recalled more than the other conditions (based on Thompson and Paivio's dual coding theory (1994) and Mayer's cognitive theory of multimedia learning (1997, 2002, 2009)). These theories explain that when individuals are presented with information in an audio-visual format, the audio information is processed separately to the visual information and consequently stored independently. This enables the individual to retrieve information from both stores which may result in greater recall and a decreased cognitive load. If they were not stored independently then this will increase the cognitive load within the store and make it difficult to retrieve the information.

The experimental study took place in a university context with Chinese intermediate learners of English (as their second language). The relevant department in the university was contacted three months before the study was completed. All Chinese participants on pre-sessional academic English programmes were asked for their participation, and the researcher was on-hand to recruit the participants. As in Experiment 1, these elements helped to reduce attrition rates and ensured that the study was properly conducted, so the data was reliable. The recruitment for participants in this study was more complex and relied on the support of the university department for access to potential participants. Due to the nature of the design of the research, participants were required to be available for four weeks and an additional

three weeks for the delayed post-test. Therefore, there needed to be some form of commitment from the participants and communication between the participants and researcher regarding dates, times, and rooms. This was managed through WeChat, a digital mobile phone app which operates using instant messaging and posts which can be accessed by a chosen group.

6.5.3 Participants or Sample Selection

Participants consisted of upper intermediate second language learners of English enrolled in a British University. 105 participants took part in a pre-sessional academic English programme for 3-6 months (Males $N = 43$, Females $N = 62$). The average age of first learning English was 9.56 ($SD = 2.43$), with an average of 12.16 ($SD = 2.57$) years of learning English. Participants were asked for the number of hours per week they had studied English in primary school ($M = 5.49$, $SD = 4.14$), high school ($M = 10.17$, $SD = 5.27$), college ($M = 10.26$, $SD = 6.52$), and other private classes ($M = 10.26$, $SD = 4.37$). Participants were also asked their previous IELTS score before admission to the British university ($M = 5.17$, $SD = 0.35$). Learners were in the intermediate learners of English and this is represented by their IELTS overall scores, admission to the pre-sessional course (average of IELTS 5.5 for a pre-sessional course) and for admission to a British university the pre-sessional course needed to be passed as students would increase by 0.5 in terms of IELTS bands to an IELTS 6.0 (see Appendix A1 and A2 for further information).

After administering the proficiency test (as described in §6.6.2), all students were considered as the sample of the research. This test and their self-reported IELTS scores were used to select homogenous students according to the learner's proficiency level. If learners did not have an overall IELTS score between 5.5 and 6.0 and did not score B1 or B2 level on the proficiency test, they were excluded. After consent forms, proficiency tests and pre-tests; participants were randomly put into a study condition (see Table 6.2 for full description of the study conditions). Sample sizes for Experiment 2 were guided in a similar fashion as Experiment 1 (see § five) and based upon findings from Lee and Huang's (2008) meta-analysis which found an average sample size of 62 learners within one input enhancement study. Further to this, Han, Park and Combs (2008) found sample size varied in these types of studies, for example between 14 (Jourdenais et al., 1995) and 259 participants (Lee, 2007). Compared to Experiment 1, this study had more experimental groups (total of six including the control) and to control for attrition and the nature of the participants, a lower sample was used per group (see Table 6.2). Participation was voluntary and there were no penalties for declining to participate. Students were offered snacks in the introductory sessions.

Table 6.2

Study Conditions in Experiment 2 (n = 106)

Text	Rules	N	Description of the Study Condition
Enhanced	No	16	Participants are given an enhanced text to read with all the gender pronouns enhanced textually using bold font
Enhanced	Yes	16	Participants are given rules-based presentation on the chosen target form: gender pronouns + Participants are given an enhanced text to read with all the gender pronouns enhanced textually using bold font
Audio enhanced	No	16	Participants listen to an audio version of the text with enhanced forms aurally enhanced
Audio enhanced	Yes	16	Participants are given rules-based presentation on the chosen target form: gender pronouns Participants listen to an audio version of the text with enhanced forms aurally enhanced
None	No	21	Participants are given rules-based presentation on the chosen target form: gender pronouns
None	Yes	21	Participants do not have a study condition and only take the pre-tests and post-tests

6.5.4 Ethics

The design of this study adhered to the guidelines set out by the British Psychological Society (2006), and the University of Northampton (2016). This experimental study was granted full ethical approval by the Research Ethics Committee at the University of Northampton before beginning (see Appendix C1). Furthermore, the University of Northampton (Northampton Business School) gave consent for the research to be conducted on their premises and for initial contact and access to these students using the virtual learning environment for email purpose. All ethical issues for both experimental studies are outlined in § five.

For this experiment, the only document translated into Chinese was the information sheet and consent form. All other materials were not translated due to the student's language learning level and the nature of their upcoming academic studies. In line with relevant ethical procedures, participants were briefed on their right to withdraw and that the information gained from the experiment would not be shared with any other department or staff within the university. It was particularly important to stress to these learners that the experiment was not part of their pre-session course and was a separate research study. Thus, this is one of the reasons why the researcher did not recruit any of her own students for the experiment. Information was disseminated to students through an information sheet, consent form and a debrief form. The information sheet and consent form were provided in English and Chinese (Simplified). As in Experiment 1, by providing the Chinese version, full understanding was assured.

6.5.5 Research Design

The study used a 3x2 between groups research design. With respect to the text, participants experienced the text in three ways: enhanced text, audio enhanced text, or received and read no text at all (control group). Modality was crossed with the presence or absence of grammatical rules. Table 6.2 displays the groups in the study. The group with no text or explicit rules (audio or visual) provided a baseline for identifying a modality effect. The DVs were the measures of learning which comprised of three test scores on the immediate post-test and delayed post-test: multiple choice task, grammatical judgment task and production task. Experiment 2 participants were randomly allocated to one of six groups based on their availability (see Table 6.2 and 6.3 for a full overview of the groups, number of participants and description of each study condition).

Table 6.3

Study Overview, Data Collection Procedures. Total sample size = 106 participants (N between 16-21 per Group)

			<u>Pre-tests</u>				<u>Treatment</u>		<u>Post-tests</u>	
<u>Introductory sessions</u>			<i>Session 1</i>	<i>Session 1a</i>			<i>Session 2 (Mon, Tues, Wed)</i>	<i>Session 3a (Mon, Tues, Wed)</i>	<i>Session 3b IMM. POST-TEST</i>	<i>Session 4 DELAYED POST-TEST</i>
			Week 1		Week 2		Week 3	End of Week 3	Week 7	
Text	Rules	<i>N</i>	<i>Maximum 60 minutes</i>	<i>10 minutes</i>	<i>10 minutes</i>	<i>10 minutes</i>	<i>20 minutes each (60 minutes a week)</i>	<i>20 minutes each (60 minutes a week)</i>	<i>10 minutes per test (total 30 minutes)</i>	<i>10 minutes per test (total 30 minutes)</i>
Enhanced	No	16					Read text with VIE	Read text with VIE		
Enhanced + Rules	Yes	16					Read text with VIE and studied rules	Read text with VIE and studied rules	1. Multiple Choice Task (online)	1. Multiple Choice Task (online)
Audio Enhanced	No	16	Consent forms Background questionnaire	Dialang Reading Proficiency Test (online)	Multiple Choice Task (online)	GJT (online)	Productive Use Task (online)	Listened to AIE text Text was on the PowerPoint	Listened to AIE text Text was on the PowerPoint	2. GJT (online) 2. GJT (online)
Audio Enhanced + Rules	Yes	16						Listened to AIE + Text was on the PowerPoint and studied rules	Listened to AIE + Text was on the PowerPoint and studied rules	3. Productive Use Task (online) 3. Productive Use Task (online)
No text - Control	No	21					-	-	In no order	In no order
No text	Yes	21					Studied rules only	Studied rules only		

Note. L2 means second-language. VIE refers to visual input enhancement. AIE refers to audio input enhancement. GJT refers to grammatical judgment test.

N = group size

6.6 Instruments

Instruments for this study are now described in detail in order of administration to the participants. For further information on how they were administered, see Table 6.3.

6.6.1 Background questionnaire

The background questionnaire used in Experiment 1 (see Appendix C4) was used but modified to suit the participant's age, level, and current learning. To obtain demographic information of the participants and previous learning experiences, a brief questionnaire was given asking for: age, sex, years of learning English, average hours of English per educational level (i.e. primary, high school, college and university), English proficiency levels (in terms of IELTS before admission to the British university) and the pre-sessional course enrolled on.

6.6.2 Second language proficiency test

Participants' English proficiency was checked using the Dialang language system. This test was to ensure participants were at comparable levels as L2 readers. The test was the online computerised version which was available at: <https://dialangweb.lancaster.ac.uk/> Dialang is a language diagnosis system which was developed by several European higher education institutions, reporting the level of skills against the Common European Framework (CEFR) for language learning (Lancaster University, 2017) (Appendix D3 for further information). The original Dialang Project was carried out with the support of the commission of the European Communities within the framework of the SOCRATES programme, LINGUA 2. Dialang is now funded and maintained by Lancaster University, one of the original Dialang partners. For the research, learners were required to complete the reading section of Dialang.

The reading section of Dialang contains items intended for intermediate students. Intermediate levels according to Dialang equate to the CEFR levels of B1 or B2 (see Appendix A1, A2). Therefore, all participants took this pre-test to distinguish if there were any outliers in reading proficiency not fulfilling the B1 or B2 level. Items were all multiple-choice ranging from four to five responses. Questions often contained a short summary of a context, story, or interview – test takers are then required to answer questions on the main ideas of the text, the best title of the text and filling-in missing words from the text given.

Read the text, and choose one of the options below, then click on the button using the mouse.

More than 27,000 people are waiting for hospital treatment around the country, it was revealed this week.

In west Surrey, the number of patients on the waiting lists has gone up by nearly 20% in the last year and 10% in the previous six months.

Official figures from the Department of Health also confirm that, by the end of September, six patients in the district had been waiting longer than the maximum 18 months allowed under the Government's patient charter standards.

What is the main idea in the text?

- 27,000 people in west Surrey are waiting for hospital treatment.
- Six patients were waiting for treatment longer than the maximum 18 months.
- Figures show that the number of patients on the waiting lists has gone-up.
- The Government's patient charter standards specify that the maximum waiting time for treatment is 18 months.

Complete the task by filling the gap(s). Click on the box to make a list of options appear. Choose your answer by clicking on it.

Here are four texts (1, 2, 3, 4) which talk about an eye examination. Choose the best title (a, b, c, d) for each text.

1. Since eye problems are related to physical health and hereditary factors, problems currently or previously experienced by you or your family will be identified and taken into account. What is the best title for text 1?
 2. This checks your all round vision and can indicate neurological problems. What is the best title for text 2?
 3. This determines if your eyes are coordinated and working together properly. What is the best title for text 3?
 4. Examination of the various parts of the eye can give an overall picture of the condition of your eyes and your general health. What is the best title for text 4?

Figure 6.1. Example DIALANG Reading Question.

As noted in Zhang and Thompson (2004), Dialang was created for the use of language learners from European backgrounds (namely 14 countries including Finland). They provide evidence that Dialang may not be suitable for all learners as the instructions could be simplified. The participants used in this study were of an intermediate level and had been enrolled on British degree programmes (mostly Level 6, final year of a bachelor's course) and had just finished an intensive 20-hour weekly English for Academic Purposes course. Therefore, it was assumed that learners would be able to cope with the language given in the instructions and this was checked in the preparatory work.

All participants took this proficiency test to determine if the sample was equivalent prior to the experience and if there were any outliers in reading level not fulfilling the B1 or B2 level. The average score for the Dialang reading proficiency test was B2 for all study conditions.

6.6.3 Pre and post-tests

The acquisition assessment tasks had three parts, a multiple-choice task; a grammatical judgement task and a productive use task (see Table 6.4). Instructions were provided in a clear manner and that the assessment had three parts and participants should try to provide a response to each question. These tests were in place to check student's prior mastery of gender pronouns. Acquisition assessment tasks were first developed and piloted in the preparatory work sessions. The rationale for using these types of tests was that they are commonly used in linguistics research and in input enhancement studies with the aim to test learners' knowledge and use of the form and acquisition. Different tests were used at pre-, immediate, and delayed post-test stages. This was to ensure that participants were not receiving the exact same test paper with the same questions. Therefore, three tests were created and used but were equivalent in terms of design, length, number of items, and they were administered in a counterbalanced order (see Appendix D7, D8, D9 for summary tests).

Post-tests were given in the same format as the pre-test. They used different questions which the participants had never seen before to alleviate practice effects. In the same procedure as the pre-tests, participants completed the post-tests in a computer room with the Google form pre-loaded. Participants completed the immediate post-tests directly after their last exposure session in Session 3b (see Table 6.3). Participants completed the delayed post-tests three weeks after their last post-test in Session 4 (see Table 6.3). The delayed post-test was kept as in Experiment 1 because it can detect whether the instruction has had long-term effects.

6.6.3.1 Multiple-choice Task

The multiple-choice task was to assess learning of the target forms. This test included 20-21 items for scores (21 for pre-test, 20 for immediate and delayed post-test) with a total of 35 items including distractors (not scored). This was administered for around 10-15 minutes and included items from the gender pronouns he/she/him/her (all were equally included). In the design of the multiple-choice task, there were three different tests used for pre, immediate and delayed. Order was randomised for each participant as the test was completed using Google Forms.

6.6.3.2 Grammatical Judgement Task

The grammatical judgement task (GJT) was designed in a similar way to Experiment 1 and asked learners to choose whether the statements made grammatical sense or not. Answers

were selected by choosing Y (yes) or N (no) (see Appendix C13). 10 questions varied in difficulty and were given in a random order. Learners had to decide whether the ten statements made grammatical sense. Examples are detailed in §5.4.3.1.

6.6.3.4 Productive Use Task (Fill-in-the-Blank)

Learners were asked to select which one of the options provided (he, she, his, hers, him, her) best completed a sentence (see Appendix C14). Examples are outlined in §5.4.3.2. These tests were used in a similar fashion to Experiment 1 but an additional test (the multiple-choice test) was included to ensure there was more measures of assessing learning of the target forms. This test was used due to prior studies exploring the impact of TE on intake (Leow, 1997; Overstreet, 1998). Two parallel versions of a multiple-choice recognition test namely as (A & B), were developed, repeated and each version had 35 questions. Each question was scored 1; therefore, the total mark was 35 for the productive use (fill-in-the-blank) task.

To be sure that both tests were equal, a pilot study was conducted where all questions of pre-test and post-test (90 questions) were put together into one test. Even numbers were assigned to pre-test questions and odd numbers to post-test questions. Participants scored similarly therefore indicating that each set were equally difficult.

1. Multiple Choice Task	2. Grammatical Judgement Task	3. Productive Use Task
<p>Learners choose the most appropriate word from the four choices provided.</p> <p><i>I took my sister to her doctor. The doctor said _____ was developing symptoms of depression.</i></p> <p>he she him her</p> <p>See Appendix D7</p>	<p>Learners choose whether the statements are grammatical correct or not.</p> <p><i>That is the girl I told you about. Him is extremely knowledgeable in science.</i></p> <p>Grammatical Ungrammatical Not sure</p> <p>See Appendix D8</p>	<p>Learners use gender pronouns correctly in a sentence.</p> <p>Using the gender pronouns, he/him/she/her, create a sentence.</p> <p>_____ _____ _____ _____</p> <p>See Appendix D9</p>

Figure 6.2. Acquisition Assessment Tasks at Pre-tests and Post-test (immediate and delayed).

6.6.4 Treatment materials

Treatment materials consisted of the input text with the visual input enhancement and then the audio input enhancement, and the explicit rules materials.

6.6.5 Targeted Linguistic Form

To keep consistency with the body of experiments in this thesis, the grammatical form was identical to Experiment 1 (gender pronouns) however the input texts were changed.

6.6.5.1 Input text

Texts were explored from the English Language Zone in the library and only text from the relevant learner's English language ability were assessed. The same input text was used for all study conditions. It was a § taken from the authentic text of 'Oliver Twist.' This text was chosen due to the number of gender pronouns that already appeared in the text and mapped on to previous research (Lee & Huang, 2008, see §5.4.3.7) where an optimal number of 78 target items was sufficient. Therefore, no artificial editing was needed to the text.

The text was 1782 words (including the title). The treatment duration with the text was 20 minutes each exposure, and this exposure was repeated three times over two weeks. Therefore, the learners received 120 minutes of the exposure in total. From the text provided, learners were subject to total exposure of 70 target forms (made up of gender pronouns, he; she; him; her; his; hers). This fits in line with previous findings by Lee and Huang (2008) reported an average of 78 target forms per reading, anything more than this would fringe upon input flood (Han et al., 2008).

The treatment text was checked for complexity using VocabProfile (Cobb, 2002; Heatley, Nation & Coxhead, 2002). VocabProfile is an online computer program resource which allows lexical text analysis. The analysis breaks the text into four categories based upon frequency (the most frequent 1000 words of English; the second most frequent thousand words of English, i.e. 1001 to 2000; 550 words that are most frequent in academic texts across subjects using the Academic Word List and the remainder which are not found on the other lists. VocabProfile allows for the crude measurement of the proportions of low and high frequency vocabulary used by a native speaker or language learner in a written text. A suggested native-speaker result would be 70-10-10-10, or 70% from first 1000, 10% from second thousand, 10% academic, and 10% less frequent words (Cobb, 2002; Heatley, Nation & Coxhead, 2002). This quick and easy to use tool allows researchers and teachers to understand the lexical acquisition and performance of second language learners.

Figure 6.3 provides the findings from the treatment text on Vocabprofile. To summarise, the treatment text contained more K1 words. In sum, the treatment text contained 80% of K1 words; 5% of K2 words; 2% academic words and 13% off-list words. The results therefore indicated that the text was within the learners' lexical competence.

	Families	Types	Tokens	Percent
K1 Words (1-1000):	323	390	1451	79.81%
Function:	...	...	(899)	(49.45%)
Content:	...	...	(552)	(30.36%)
> Anglo-Sax	...	...	(336)	(18.48%)
=Not Greco-Lat/Fr Cog:	...	...	...	...
K2 Words (1001-2000):	65	71	90	4.95%
> Anglo-Sax:	...	...	(40)	(2.20%)
1k+2k	...	...	...	(84.76%)
AWL Words (academic):	23	24	33	1.82%
> Anglo-Sax:	...	...	(6)	(0.33%)
Off-List Words:	<u>2</u>	<u>144</u>	<u>244</u>	<u>13.42%</u>
	411+?	629	1818	100%

Figure 6.3. Treatment Text Results from Vocabprofile to ensure Lexical Ability.

The Visually Enhanced Text was modified by the researcher where all gender pronoun examples (he, she, him, her, his, hers) highlighted using bold to make the grammatical feature salient. These were the only grammatical items highlighted and the only words in bold in the entire text. Example from the Visually Enhanced Text:

a woman of wisdom and experience; **she** knew what was good for children; and **she** had a very accurate perception of what was good for **herself**. So, **she** appropriated the greater part of the weekly stipend to **her** own use, and consigned the rising parochial generation to even a shorter allowance than was originally provided for them. Thereby finding in the lowest depth a deeper still; and proving **herself** a very great experimental philosopher.

Everybody knows the story of another experimental philosopher who had a great theory about a horse being able to live without eating, and who demonstrated it so well, that **he** had got his own horse down to a straw a day, and would unquestionably have rendered **him** a very spirited and rampacious animal on nothing at all, if **he** had not died, four-and-twenty hours before **he** was to have had **his** first

For the Unenhanced Text, the text remained in a consistent font, and no grammatical forms were enhanced using bold. The text appeared identical to the Visually Enhanced version; it just did not have the bold target grammatical forms. Example from the Unenhanced Text:

was a woman of wisdom and experience; she knew what was good for children; and she had a very accurate perception of what was good for herself. So, she appropriated the greater part of the weekly stipend to her own use, and consigned the rising parochial generation to even a shorter allowance than was originally provided for them. Thereby finding in the lowest depth a deeper still; and proving herself a very great experimental philosopher.

Everybody knows the story of another experimental philosopher who had a great theory about a horse being able to live without eating, and who demonstrated it so well, that he had got his own horse down to a straw a day, and would unquestionably have rendered him a very spirited and rampacious animal on nothing at all, if he had not died, four-and-twenty hours before he was to have had his first

Visual input enhancement was one source of input enhancement used in this study. This textual enhancement of one reading occurred over a two-week period. Each reading session was performed three times in one week for 20 minutes each time (total of 60 minutes per week). This explicit input enhancement method was considered as it would help students to notice input related to the target forms. Textual enhancement utilised a **bold** font, and there was a total of 73 tokens across he/she, him/her, his/hers.

6.6.6.6 Audio input enhancement

Audio input enhancement was another source of input enhancement used in this study. This audio enhancement occurred in the same procedure as the Visually Enhanced Text, and Unenhanced text (e.g. three times per week over a two-week period equating to a total of 120 minutes approximately). Each audio session lasted a maximum of 15 minutes.

This explicit input enhancement method was considered as it would help students to notice input related to the target forms via an audio-visual means thus, trying to investigate the modality effect. Learners were provided with the text on screen using Microsoft PowerPoint in eight slides and then the audio over the top. The audio enhancement utilised a native British spoken voice with the target forms enhanced using stress and intonation of the speaker.

6.6.6.7 Explicit rules

The rules presentation was in the format of a PowerPoint presentation and consisted of 14 slides. The explicit rules matched the level of the participants and lasted for a total of 10-15 minutes.

6.7 Data Collection Procedures

The study was conducted from January 2016 until March 2016 over a period of seven weeks. Table 6.3 illustrates the full procedure of the study. Participants were recruited from the pre-session academic English (PAE) programme and from undergraduate courses (level 6 top-up programmes in Business) at the University of Northampton, UK. There were seven sessions spread over three weeks sectioned into three main stages of data collection. In sum, there were three main stages of the data collection: introductory and pre-tests in Session 1-1a, treatment in Sessions 2 and 3a, and post-tests in Session 3b and 4. The purpose of the three stages was so that the pre-test to post-test were separate due to the study running over a period of seven weeks. As in Experiment 1, it was methodologically advantageous to have the introductory sessions where consent, background questionnaire and pre-test data was

collected and in week seven when delayed post-tests and debriefing took place. Participants were randomly assigned to one of the six study conditions based on their availability as they were required to attend sessions weekly for three weeks, a short break then back again to complete the delayed post-tests.

On recruitment, participants were given an information sheet and completed a consent form. There was a total of 105 participants and luckily no attrition occurred. Participants then attended a pre-test session where they all took the pre-test (recognition and production tasks). After a week, they were organised into six randomly selected study conditions for the duration of their treatment.

In the second and third week, participants were exposed to their study condition three times per week and completed mini tests at the end of each session lasting 10-15 minutes. In the final session of the third week, the immediate post-tests were administered. Participants also took part in a four-week delayed post-test.

Within the reading group (E, E+R), the material consisted of two reading texts in which, grammatical points were **bolded**. Students were exposed to one text each research session and then rotated until the end session in week 3. Therefore, participants received the same amount of input from each text (e.g. three reading sessions per text in total) Students were instructed to read the text and try to understand it. Only in the E+R and A+E groups were the explicit rules to the enhanced grammatical forms explained. At the end of the final session in the second week immediate post-tests were administered. Delayed post-test measures were taken four weeks after the final research study session.

Within the listening audio groups (Listening Groups: AE, AE+R), participants were presented with a text on the computer. Similarly, listening comprehension measures suggested by Doff (1988) were followed: topic, guided question, and any unknown vocabulary. Only in the AE+R were the grammatical rules of the enhanced grammar point explicated explained. The audio versions of the texts were recorded by a native English speaker with an emphasized intonation on the chosen grammar points (gender pronouns: he/she/him/he). On the final session in the second week immediate post-tests were administered. Delayed post-test measures were taken after three weeks of the final research study session.

The study employed several instruments. *Pre-tests* were in the form of *recognition test and production test*. *Post-tests* were the same as pre-tests but with different questions ensuring counterbalancing, and the inclusion of a noticing and metalinguistic task. This was a short task designed to determine whether participants in the experimental groups (E, E+R, AE, AE+R) had noticed anything while reading or listening to the text. The question simply

enquired into whether the participants had noticed “anything specifically while reading the text.” An additional metalinguistic task was also administered. This post-exposure task had only one question where the participants were asked to explain their understanding of the functions of ‘he/she’ and ‘him/her.’ The participants of the experimental groups were asked to answer the question based on their exposure to the text, whereas the control group who were not exposed to the input, had to answer it based on their current level of knowledge of the target forms.

For the Treatment, like many input enhancement study materials, an authentic text from the English Language learning zone in the university library was selected and a text from there which was in line with the level of the participants (intermediate level of reading). The same reading text was used for all study conditions. Listening materials for the audio enhancement were guided from the pilot study findings. As per the pilot study and considering recommendations from Cho and Reinders (2013) that listening should be in its natural environment, the text was read by a native English speaker with authentic pauses and control. The text was recorded using professional software. *The Rules presentation* was like the materials used in §5: Experiment Study 1. It consisted of a PowerPoint presentation giving the rules behind gender pronouns. Materials in English Language Teaching were consulted and used to design the rules materials.

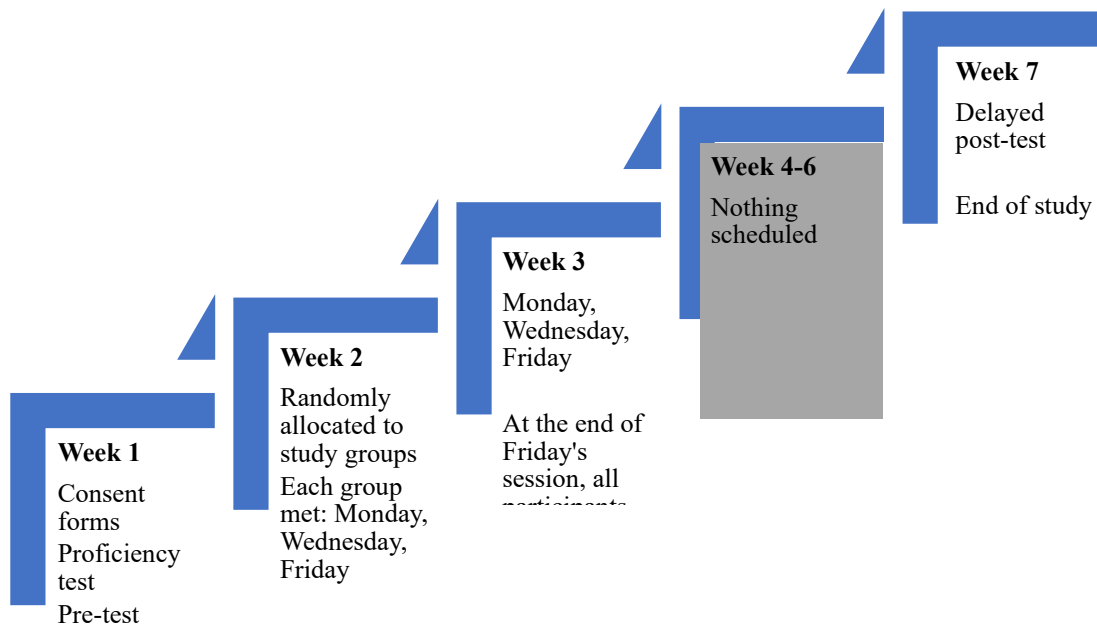


Figure 6.4. Data Collection Procedures Outlined.

6.8 Data Analysis and Scoring

6.8.1 Proficiency Test

In the proficiency test, the Dialang reading proficiency test (as described in §6.6.2) was completed online via an internet link with a total score computed automatically from the 20 questions. Intermediate levels according to Dialang equate to the CEFR levels of B1/B2 (see Appendix A1, A2).

6.8.2 Grammatical Judgement Task

In the written GJT task, for the pre-test there was a total score of 10 points (excluding distractors). For the immediate and delayed-post-test, there was a total score of 12 points (excluding distractors). Each correct response was awarded one point. As in Experiment 1, half marks were not allocated and if spelling mistakes occurred, this was ignored.

6.8.3 Multiple-Choice Task

In the multiple-choice grammar task, for the pre-test there was a total score of 21 points (excluding distractors). For the immediate and delayed post-test there was a total score of 20 points (excluding distractors). Each correct response was awarded one point. Half marks were not allocated, and if spelling mistakes occurred, this was ignored. As in Experiment 1, half marks were not allocated and if spelling mistakes occurred, this was ignored.

6.8.4 Productive-use Task

In the productive-use task, for each of the tests (pre, immediate and delayed post-test) there was a total score of 20 points (excluding distractors). As in Experiment 1, half marks were not allocated and if spelling mistakes occurred, this was ignored.

6.8.5 Statistical Analysis

All participants were provided with an eight-digit individual number to help identify their data. Once all data was collected at the end of week seven, data was entered onto a Microsoft Excel spreadsheet and later exchanged to Statistical Package for the Social Sciences (SPSS) 22.0 for Windows file. SPSS was used for descriptive and statistical analyses for Experiment 2.

6.8.6 Descriptive Statistics

Descriptive statistics are provided for the learner's proficiency tests, and performance on all pre, immediate and delayed post-tests.

6.8.7 Preliminary Analysis

Some preliminary analyses were conducted to ensure the reliability and validity of the pre and post-tests. An internal consistency test using Cronbach's Alpha was computed and tests of normality to assess whether the data provided from pre and post-tests was normally distributed.

6.8.8 Experiment 2 Main Statistical Analysis

Quantitative analyses were conducted to compare the performance of the rules, audio enhanced and visual enhanced groups on the pre-test, immediate and delayed post-test results. First, by identifying cells in the research design as a shorthand for analysis plans (based on Table 6.2 and 6.3), Table 6.5 details the groups. Therefore, the planned analyses were to compare visual enhancement groups with audio enhancement groups on all post-test tasks (immediate and delayed) and use the pre-test results as a covariate.

Table 6.5

Cells in the Research Design to help identify Analysis Plans

	<u>Visual enhancement</u>	<u>Auditory enhancement</u>	<u>No text</u>	<u>margins</u>
Rules	VE-R	AE-R	NT-R	R
No rules	VE-Nr	AE-Nr	NT-Nr	Nr
margins	VE	AE	NT	

Note. VE-R refers to visually enhanced and explicit grammatical rules, VE-NR refers to visually enhanced and no explicit grammatical rules, VE refers to visually enhanced, AE-R refers to audio enhanced and explicit grammatical rules, AE-Nr refers to audio enhanced and no explicit grammatical rules, AE refers to audio enhanced, NT-R refers to no text and explicit grammatical rules, NT-Nr refers to no text and no explicit grammatical rules (the true control group), NT refers to no text, R refers to explicit grammatical rules.

6.9 Results

The previous section provided full methodological details for experiment 2. This section now includes the results from this study and then followed in 6.10 with the full discussion of the findings. The measures included in this study and section are: Acquisition and intake measures comprising of pre-test, immediate and delayed post-test for grammatical judgement task, multiple choice task and the productive use task. Data screening and reporting of all the

pre-measures to ensure groups were similar and to see if the data were normally distributed was conducted to ensure that appropriate statistical analyses could be run.

6.9.1 Data screening

This section screens the data prior to attempting any analysis and to ensure that the groups are similar or different. Tests of normality (homogeneity) for the pre, immediate and delayed post-tests were calculated using SPSS 22.0. Tables 6.6 detail the full results for skewness and kurtosis with Table 5.6 provides a summary of skewness and kurtosis in line with thresholds. To test skewness and kurtosis, values computed using SPSS 22.0 and then sense-checked by dividing their respective SE values and if between -1.96 and +1.96, they are not significant (George & Mallery, 2010). Results indicate that the findings are not normally distributed in most cases, except the multiple-choice test in all instances, pre/immediate and delayed. Appendix D10 details all histograms for the pre, immediate and post-tests.

Table 6.6

Descriptive Statistics for the pre-test items (GJT, MCT & Productive-use task)

	<i>M</i>	<i>SD</i>	Skewness	<i>SE</i>	Kurtosis	<i>SE</i>
Pre GJT (total score 10)	7.43	1.51	-1.56	.24	2.66	.47
Pre MCT (total score 21)	16.87	1.90	-.24	.24	1.22	.47
Pre-Productive-use (total score 35)	16.86	3.98	-2.53	.24	7.61	.47

Note. M refers to mean, SD refers to standard deviation, SE refers to standard error. Numbers have been rounded to two decimal places

Table 6.7

Descriptive Statistics for the immediate post-test items (GJT, MCT & Productive-use task)

	<i>M</i>	<i>SD</i>	Skewness	<i>SE</i>	Kurtosis	<i>SE</i>
Imm GJT (total score 10)	9.05	2.03	-.87	.24	2.6	.47
Imm MCT (total score 20)	17.73	1.38	-1.05	.24	1.22	.47
Imm Productive-use (total score 35)	15.04	3.52	-2.55	.24	7.73	.47

Note. M refers to mean, SD refers to standard deviation, SE refers to standard error. Numbers have been rounded to two decimal places

Table 6.8

Descriptive Statistics for the delayed post-test items (GJT, MCT & Productive-use task)

	<i>M</i>	<i>SD</i>	Skewness	<i>SE</i>	Kurtosis	<i>SE</i>
Delayed GJT (total score 10)	9.65	1.62	-1.06	.24	.34	.47
Delayed MCT (total score 20)	17.84	1.34	-.87	.24	.98	.47
Delayed Productive-use (total score 35)	15.54	2.88	-3.08	.24	13.06	.47

Note. *M* refers to mean, *SD* refers to standard deviation, *SE* refers to standard error. Numbers have been rounded to two decimal places.

Table 6.9

Summary of Skewness and Kurtosis in Line with Appropriate Thresholds

	Skewness	Kurtosis
Pre GJT	Negatively skewed	Kurtosis evident
Pre MCT	Normally distributed	Kurtosis evident
Pre-Productive-use	Negatively skewed	Normally distributed
Immediate GJT	Negatively skewed	Kurtosis evident
Immediate MCT	Normally distributed	Kurtosis evident
Immediate Productive-use	Negatively skewed	Normally distributed
Delayed GJT	Negatively skewed	Kurtosis evident
Delayed MCT	Normally distributed	Kurtosis evident
Delayed Productive-use	Negatively skewed	Kurtosis evident

Note. Skewness measured at 0, and Kurtosis measured above 3.0 for normally distributed data.

5.6.2 Internal Consistency Reliability

It was necessary to find out if the test items used were reliable. Cronbach's alpha was conducted on each of the GJT (pre, immediate & post-test) and results found: pre (0.66), immediate (0.67), post (0.66), which is just below the .7 good threshold in Cronbach alpha terms. These results were envisaged as the GJT included a low number of items (10) and was measuring learning before, during and after a study condition. The GJT was included as was the MCT and productive-use task to measure learning. As suggested in Experiment 1, researchers (Pallant, 2005, 2010) have suggested, Cronbach's alpha can be reduced when the total items are also low. Cronbach's alpha was also conducted on the multiple-choice tasks (pre, immediate & post-test) and found: pre (0.72), immediate (0.77), post (0.73) which is good in Cronbach alpha terms. Cronbach's alpha was also conducted on the productive-use tasks (pre, immediate & post-test) and found: pre (0.67), immediate (0.68), post (0.71) which is good in Cronbach alpha terms. The English language proficiency test, Dialang, was not included in the internal consistency reliability tests as this test has already been through sufficient testing on the official programme and has sufficient reliability and validity test scores.

6.9.2 Student demographics

Learner's data from the demographic questionnaire issued in the introductory session is summarised below in Table 6.10. The data highlights that the learners were on average between 21 to 22 years old. This was an expected finding as most of the participants have already studied for their bachelor's degree in China, but come to the UK to enrol on a 'top-up- course which then provides them with a British bachelor's certificate and qualification.

Table 6.10

Overview of Learner's Age and Educational Experience of English (n = 106)

Text	Rules	Age		Age of L2 learning		Years learning L2		Primary hours per week		High school hours per week		College hours per week	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Enhanced	No	21.63	1.20	12.19	1.56	9.44	2.10	5.30	2.8	11.71	5.30	10.57	6.80
Enhanced	Yes	21.47	0.92	10.84	3.87	9.90	2.55	7.14	6.63	11.17	6.57	9.96	2.53
AIE	No	21.94	1.39	12.44	3.49	9.5	2.90	4.80	2.56	8.28	4.18	8.67	6.67
AIE	Yes	21.67	0.98	11.82	3.82	9.07	2.05	3.62	2.13	7.97	4.23	7.07	8.51
No input	No	21.75	1.21	11.90	2.14	9.76	2.50	4.36	2.60	9.40	4.82	9.52	4.80
No input	Yes	21.67	1.20	5.98	5.30	8.85	2.21	3.45	2.01	8.00	5.03	8.39	8.00

Note. Some of these numbers have been rounded to two decimal places. M refers to mean, and SD refers to standard deviation. No input refers to no text or audio.

6.9.3 Second language proficiency

Scores on the second language proficiency test through Dialang were all recorded as between B1 and B2 grades. All learners had an IELTS score of 5.5 or 6.0 as this is what was required for visa purposes for entry to the UK to study at a university for their intended courses. Therefore, it was assumed that all the participants were of a similar level in terms of their English language level.

6.9.4 Pre-test data

Screening of the data for normality and ceiling effects is important before statistical analysis begins. For the acquisition/intake measures, there were three measures taken (multiple choice task, grammatical judgement task, and production task). As described earlier, a pre-test was given prior to treatment. This was to ensure that all six groups were similar in their knowledge of English gender pronouns and to take a measure before the study condition. Three measures were taken (multiple choice task, grammatical judgement task and production task). The results were converted into percentages to allow comparisons as each test had a different total score. Table 6.11 displays the descriptive statistics for scores on all pre-tests.

Table 6.11

Descriptive Statistics of the Pre-test Task on Multiple choice task (%), Grammar Correction task (%) and Production task (%)

	<i>N</i>	<u>MCT</u>		<u>Grammar correction</u>		<u>Production task</u>	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Rules VIE	15	73.66	17.67	70.00	22.36	84.65	29.10
No rules VIE	13	76.20	14.70	76.20	8.70	92.70	21.45
Rules AIE	16	81.57	19.30	81.30	9.57	76.55	54.90
No rules AIE	16	82.76	21.25	79.40	8.54	83.75	35.50
Rules, no IE	20	87.14	27.90	74.00	11.8	89.50	22.50
No rules AIE	16	82.76	21.25	79.40	8.54	83.75	35.50

Note. VIE refers to Visual input enhancement, AIE refers to Audio input enhancement, IE refers to Input enhancement, MCT refers to Multiple Choice Task, GJT refers to Grammatical Judgement Task.

On review of the pre-test scores and examining the data for normality, the GJT and production tasks are not normally distributed and negatively skewed. They have serious ceiling effects and therefore the learners are already scoring towards the maximum score

therefore, they cannot show improvement and they do not differ from one another. Because of this finding, these two measures were not analysed further. The multiple-choice pre-test scores are normally distributed and therefore used as a covariate for further analysis for all research questions.

6.9.5 Research Question 1: Does the type of input enhancement (visual, auditory) have any effects on learners' learning of English gender pronouns?

Looking at the data for gender pronoun learning in visually enhanced and audio enhanced study conditions as per the multiple-choice task, Table 6.12 describes the data. The pre-test scores vary between 15.44 points (visual input enhancement and rules) to 17.38 points (audio input enhancement). In the immediate multiple-choice post-test, audio input enhancement group scored the highest (18.38 points) and visual input enhancement the lowest from the four groups (17.38 points). The delayed multiple-choice post-test reveals that again the audio input enhancement group increased their score slightly (from 18.38 to 18.63), but audio input enhancement with rules saw a slight decrease from their immediate post-test scores.

Table 6.12

Descriptive Statistics Scores for Multiple-choice Task (pre-test, immediate, delayed) for Visual and Audio Enhanced Groups

		<u>Pre-test MCT</u>		<u>Immediate MCT</u>		<u>Delayed MCT</u>	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Visually enhanced	VIE	16.13	1.36	17.38	1.15	17.62	0.89
	VIE-R	15.44	1.71	17.56	1.32	18.00	1.21
Audio enhanced	AIE	17.38	2.13	18.38	1.20	18.63	1.15
	AIE-R	17.13	1.93	17.81	1.33	17.69	1.30

Note. Some of these numbers have been dropped to two decimal places. VIE refers to visually enhanced, VIE-R refers to visually enhanced and explicit grammatical rules, AIE refers to audio enhanced, AIE-R refers to audio enhanced and explicit grammatical rules. MCT refers to multiple-choice test. M refers to mean, and SD refers to standard deviation.

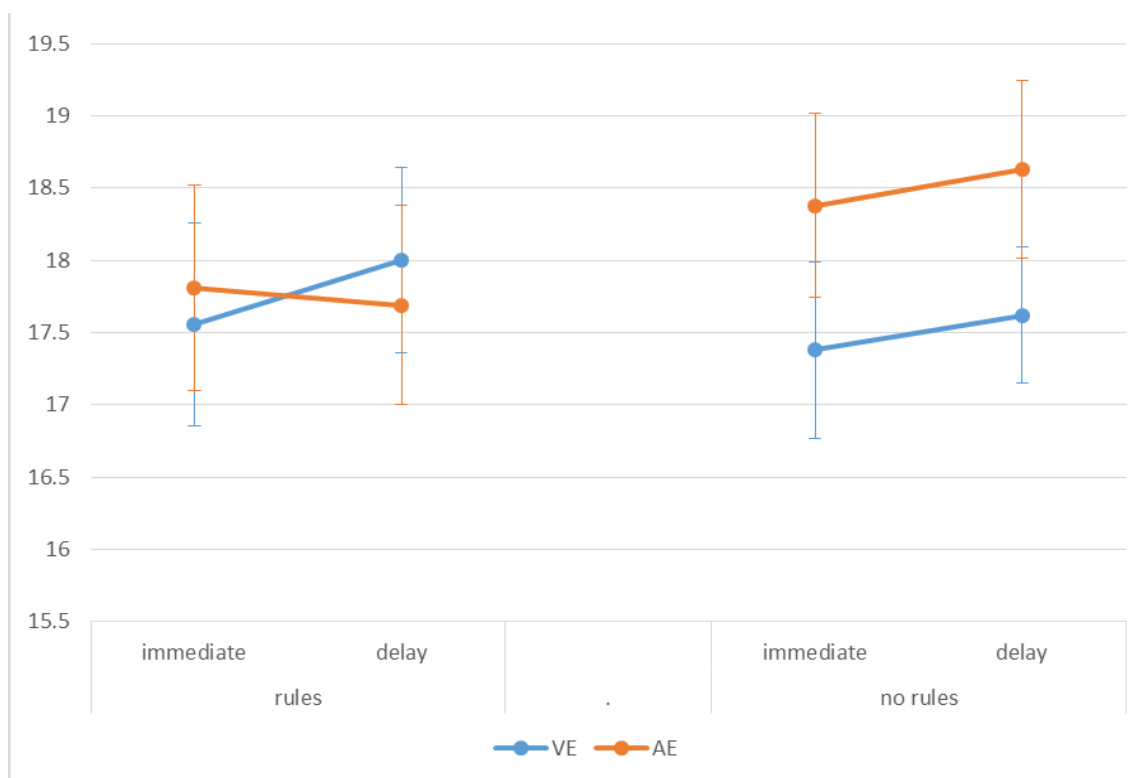
A one-way ANCOVA was conducted to compare the effectiveness of input enhancement (visually and audio) on the delayed multiple-choice post-test scores while controlling for the pre-test multiple choice scores. Levene's test and normality checks were carried out and assumptions were met. Results revealed that there was a non-significant difference in mean delayed multiple-choice test scores for rules [$F(1, 99) = 0.40, p = 0.53$], and for enhancement [$F(2, 99) = 1.61, p = 0.21$]. However, there was a small significant interaction between rules and enhancement on the delayed multiple-choice post-test [$F(2, 99) = 5.44, p = 0.05, \eta^2 = 0.10$; very small effect].

A one-way ANCOVA was conducted to compare the effectiveness of input enhancement (visually and audio) on the immediate multiple-choice post-test scores while controlling for the pre-test multiple choice scores. Levene's test and normality checks were carried out and assumptions were met. Results revealed a non-significant difference for rules, [$F(1, 99) = 0.81, p = 0.37$], enhancement [$F(2, 99) = 2.03, p = 0.14$] and no interaction between rules and enhancement [$F(2, 99) = 3.68, p = 0.03$].

6.9.6 Research Question 2: Does studying explicit grammar rules of English gender pronouns alongside input enhancement have any effects on learners' learning of English gender pronouns?

Once again, the multiple-choice test data was used for the following statistical analyses. The main effect of rules in a 2x2x2 mixed design was considered for this research question and included the repeated measures variables of test time (pre, immediate and delayed). Pre-tests scores were then the co-variates and the immediate and delayed post-test scores were the repeated measures of the DV. Findings revealed that (see Figure 6.5) with rules, there are no effects of Audio enhancement versus Visual Enhancement nor of delay (very small d values, all non-significant). Without rules, Audio enhancement performs better than Visual Enhancement at both points of the test, immediate ($d = 0.85$) and delayed ($d = 0.98$). The effect of the delay of the test is small and non-significant.

Figure 6.5. The Effect of Time (immediate and delayed) on the Multiple-choice Test for



Enhanced (visual and audio) and explicit grammatical rules.

6.10 Interim Discussion

In §6.9 I presented the results of the main study for Experiment 2. This section will now focus on answering each of the research questions. The first research question aimed to compare the effectiveness of the two different types of input enhancement used in this study and the effectiveness for learning of the chosen target grammar form; gender pronouns. The second research question investigated the possibility that the different treatment conditions (explicit rules, explicit knowledge) may affect the learning of the target form, gender pronouns.

6.10.1 Research question 1: Does the type of input enhancement (visual, auditory) have any effects on learners' learning of English gender pronouns?

The findings did not reveal much difference between the two study conditions and types of input enhancement, textual and audio. The results can be explained whereby the stimuli, the enhancement was not ecologically valid to produce the expected effect. For example, the audio and visual enhancement was not enough to evoke any learning or acquisition of the target grammar form.

Literature and studies to consider here are the reading-while-listening findings. Learners in the audio enhancement study conditions also had access to the written text, and were instructed to read while they listened. This, like Chang's (2009) study may lead to better learning and more enjoyable learning. It is also useful to unpack the outcomes as they are not as predicted where audio enhancement may lead to better learning and acquisition on the post-tests.

Also, audio enhancement may be designed differently in future studies, following Cho and Reinders' (2015) recommendations. Their audio enhancement used a software programme to manipulate and enhance the reader's book. The reader in this experiment used a natural voice and naturally enhanced the target forms as and when they appeared. Although the listening was pre-recorded, so it was the same voice to each participant in the corresponding groups (AIE, AIE + Rules). The combination of the reader's book and the native, natural voice may be a future way forward in terms of audio enhancement.

6.10.2 Research question 2: Does studying explicit grammar roles of English gender pronouns alongside input enhancement have any effects on learners' learning of English gender pronouns?

Relevant findings to this research question, with rules, there are no effects of Audio enhancement versus Visual Enhancement nor of delay (very small d values, all non-significant). Without the accompany of explicit rules, Audio enhancement performs better than Visual Enhancement at both points of the test, immediate ($d = 0.85$) and delayed ($d = 0.98$). However, the delayed test results are small and non-significant.

These findings could be explained by consideration explicit rule presentation which has been a crucial issue in second/foreign language teaching. This issue has been between the methods of implicit or explicit instruction and which is more effective.

Krashen (1985) stated that “the only contribution that classroom instruction can make is to provide comprehensible input that might not otherwise be available outside the classroom.”(p. 33-34). Doughty and Williams (1998) explained that though it is possible that second/foreign language acquisition could take place without instruction, we should not limit ourselves to the possible and try to search for the most effective. In fact, Long (1983) was the first one who posed the question of whether second/foreign language instruction makes a difference or not.

In both cases of instruction (implicit or explicit), attention is available but what differs is the issue of awareness of the learning situation (Carr & Curran, 1994; Nissen & Bullemer, 1987; Tomlin & Villa, 1994). Many studies have shown an overall advantage for explicit over implicit instruction (Carroll & Swain, 1993; DeKeyser, 1994; Fotos, 1993; Lightbown & Spada, 1990; Master, 1994; Scott, 1990; Spada & Lightbown, 1993; White et al., 1991). In addition, some have shown a positive effect of explicit over implicit instruction in grammar learning of locative suffixes and four types of consonant alternation of semi-artificial Finnish (Alanen, 1995), English relative clauses (Doughty, 1991), easy rules and hard rules (Robinson, 1995, 1997), past counterfactual conditional sentences (Rosa & O'Neil, 1999) and categorical rules and prototypical rules of an artificial language (DeKeyser, 1995). Many have also argued that some rules are best learned explicitly such as the easy rules that refer to basic categories which could be applied mechanically and which do not depend on other rules (Green & Hecht, 1992). As mentioned above, Swain (1998) has shown that talking about the grammatical rules and using meta-linguistic terms help in attracting the students' attention to the new target forms. As a matter of fact, there has been a great deal of argument over the issue of which approach is better. DeKeyser (1998) stated that the argument on this issue will

remain always unresolved. However, the aim of this study is not to show which one is better than the other one. The goal is to show the difference between the two instructional approaches and to explain how teachers can use explicit rule presentation to increase the language learners' "noticing" of the target grammatical form(s).

When using explicit rule presentation, second/foreign language teachers present the learners with a meta-linguistic description of the new target form (White, 1998). However, the degree of explicitness and elaboration may differ. Explicitness means the extent of the use of meta-linguistic terms or, in other words, the amount of rules presented to the language learner. Elaboration means the amount of time spent in presenting the rules. A high degree of explicitness and elaboration takes place in the classroom when the language teacher presents the rule to the language learners with a detailed explanation that might take a long period of the class time. On the other hand, a low degree of explicitness and elaboration is achieved when the teacher simply presents an example with a quick hint to the rule. In explicit instruction, it is assumed that the language learners go through two processes: memorization and problem-solving. This happens when the learners must memorize the grammatical rules such as verb conjugations. Then, they use such memorized knowledge to produce new target forms in the target language (Ellis, 1994).

Second/foreign language researchers conducted several studies to test the effect of explicit teaching on second/foreign language grammar "noticing" and/or acquisition (Akakura, 2009; Alanen, 1995; Ayoun, 2001; Bitchener & Knoch, 2008; Brender, 2002; Day & Shapson, 1991; De Graaff, 1997; DeKeyser, 1995; Erlam, 2003; Fotos & Ellis, 1991; Harley, 1989; Hulstijn, 1989; Leow, 1998; Macrory & Stone, 2000; Master, 1994; N. Ellis, 1993; Rosa & Leow, 2004; Rosa & O'Neill, 1999; Robinson, 1995, 1996, 1997; Sanz & Morgan-Short, 2004; Scott, 1989, 1990; Spada & Lightbown, 1993; Wu, 2007). The form of explicit instruction in these studies differed. In some studies, the explicit instruction was a form of meta-linguistic feedback (explicit rule presentation of the misused target form) provided to the learners (e.g. Ayoun, 2001). In other studies, the explicit instruction was explicit rule presentation provided at the beginning of the treatment followed by practice activities (e.g. Erlam, 2003). Some of the studies that examined explicit instruction have shown a positive effect of the explicit instruction on grammar "noticing" and/or acquisition while others have not.

6.10.3 Limitations and Future directions

This study investigated whether external manipulation of features in second learning visual and aural input contributes to the acquisition and learning of the gender pronoun. The main findings reveal that neither forms of input enhancement had a big impact on the learners.

Considering the findings, it is important to notice and attempt to understand the audio enhancement groups (audio enhancement only, and audio enhancement with explicit rules). The audio enhancement group may be suggested as suffering from ‘forgetting.’ Literature on ‘forgetting’ and more so, ‘The forgetting curve’ focused on the decline of memory over time. For example, findings from Ebbinghaus include the ‘forgetting curve’ which demonstrated how information is lost over time when there is no attempt to retain it. There is a similar and related concept whereby memory strength depends on the durability of memory traces (e.g. memory is stronger, the longer the duration of time that a person can recall the memory). The forgetting curve graph typically shows that people halve their memory of newly learned knowledge and material in several days unless they have consciously reviewed the learned materials. In application to this study, the audio enhancement group who saw a benefit at immediate post-test but not at delayed post-test (four weeks later), may have forgot the newly learned knowledge on gender pronouns. Further to this, is the finding that the audio does create some short-term benefit, here modality played a role as the visual input only (enhanced and with rules) did not outperform the audio and rules group.

Experiment 2 was not without methodological limitations. The pre-tests had issues with ceiling effects and were negatively skewed. This means that the participants found the pre-tests (GJT and productive use task) too easy and thus, did not have much improvement to make. To improve this type of study and in subsequent studies, the tasks need to be more challenging and therefore would offer more variability at each pre-test measurement point and give the participants room for improvement. Future research should ensure thorough piloting testing of these pre-measures and discard learners who do reach a maximum of 70%+ correct as this demonstrates advanced knowledge of the target form. There needs to be enough room for the learner to improve from immediate, and then delayed post-test (if the enhancement has been effective). This is a method which has been utilised in input enhancement research before, however due to time constraints and participants availability for the main study – this process did not happen.

Furthermore, the tasks used was a GJT and as explored previously in the meta-analysis, these measures are often used in input enhancement studies but not without criticism (Birdsong, 1989). However, Cho and Reinders (2015) suggest that in their

experiment investigating audio enhancement, the GJT was the most suitable measure for pre- and post-test as is seemed appropriate as the extensive listening treatment.

Adjustments made to this study follow on from the recommendations from the meta-analysis and Experiment 1 featured in Chapter 5 in this thesis. One of the changes made to this study was the change in participant pool. Participants were no longer ‘at home’ students and were university students ‘studying abroad.’

Overall, the results from this experiment highlight an interesting result for input enhancement. In terms of the multiple-choice data, the audio enhancement group was clearly more effective in the absence of explicit rules. For example, audio enhancement without rules was better than audio enhancement with rules at the immediate test ($d = .45$) and at the delayed test ($d = .77$). In this circumstance, the explicit rules were causing some sort of interference. However, this was not true for the visual input enhancement group, the explicit rules did not create interference. The audio enhancement group did also have visual as they saw the input text on the PowerPoint slides and had the voiceover. This used two modalities at the same time and may have had negative impact in some senses.

In sum, the aim of Experiment 2 was to test the impact of modality (visual or audio) on input enhancement and grammatical rules on intake and comprehension. The findings revealed that modality did not show any impact on the language learners. The one finding which stands out is where audio input enhancement was used and explicit rule instruction, learners suffered and subsequently did not perform well on the post-tests compared to other learners. This finding is insightful into the potential cognitive factors which may be involved. The role of implicit and explicit methods simultaneously may be advantageous in some circumstances, but not for grammar learning. Furthermore, use of audio enhancement through a native speaker and use of natural speech enabling the grammar forms to be salient is only one method of using this audio input enhancement methods. Further research may compare the effects of different types of audio enhancement (use of technological enhancement, through intonation and stress and through increased artificial volume).

Chapter 7: General Discussion and Conclusion

7.1 Summary of the Thesis

The goal of this thesis was to investigate the role of input enhancement in the development of second language learning of English, focusing on the effectiveness of different types of input enhancement (textual and audio) to explore how they may draw learners' attention to grammatical rules. The extant research on input enhancement is mostly conducted in relation to written text, and therefore may be restricted to reading contexts. There is a small amount of research on audio input enhancement, using different modalities for input enhancement. As a result, the aim of this body of research was to compare effectiveness of input enhancement across different modalities, and whether this promoted the use of second language grammatical knowledge.

To achieve the outlined goals, the thesis includes a meta-analysis on existing textual enhancement studies was conducted to provide an update to the previous effectiveness of this technique found (see Lee Huang, 2008) and to further unpack the previous findings of textual enhancement and grammar. Then, two empirical studies focused on different types of input enhancement (e.g. textual and audio) and how learner's attention was drawn to the chosen grammatical target form. This section will synthesise the achievements and contribution of the research (for a full review see §4, 5,6, 7).

The main aims of the thesis were to provide a thorough understanding of input enhancement techniques with Chinese second language learners of English including their effectiveness, magnitude, and the difference between visual and audio-visual enhancement. The role of cognitive processes within input enhancement techniques was also probed. To achieve these aims, there were three stages of the thesis: (1) Meta-analysis on visual input enhancement and grammar learning, (2) Experiment 1, (3) Experiment 2 and I will now explore how these three stages of the research fit together.

The meta-analysis was stage one whereby textual enhancement and grammar studies up until the end of 2016 were reviewed. This served as useful for experiment 1 and 2 in terms of design as it highlighted the need for some methodological musts such as sample sizes per group, use of baseline/true control groups and delayed post-tests. The two experimental studies on input enhancement (different variations) explored the debatable and mixed result phenomena of this instructed second language acquisition method where results are not always consistent and cannot be generalised in many circumstances. The studies have large sample sizes (especially Experiment 1). Furthermore, the experiments add to the field of

input enhancement in two different and distinct ways: visual input enhancement and grammar learning study focusing on gender pronouns, audio input enhancement and the changing modality. The empirical studies attempted to understand the variability in results of input enhancement from the viewpoint of cognitive psychology and it is apparent that attention and cognitive load play a role for learners in conditions where there is more than one item of input occurring (e.g. enhanced forms and just before the reading or listening begins, an explicit rule presentation on the forms which are salient). Each study has the necessary statistics reported (as advised by Plonsky and colleagues, 2015) including the descriptive statistics and information including the details around the visual or audio input enhancement (learner background, treatment length and intensity, number of enhanced tokens, prior knowledge, use a robust second language proficiency measure).

The next section will review the extent to which the aims were achieved for the meta-analysis and the experimental studies.

7.2 Major Findings from the Meta-analysis and Experiment 1 and 2

7.2.1 Meta-analysis Research Questions and Summary of Results

The purpose of the meta-analysis was to focus on published and unpublished studies on visual input enhancement for grammar learning between 1981 and 2016 to establish whether input enhancement was an effective method of helping them assimilate grammar rules and to make a judgement about the most appropriate forms of intervention / enhancement. This provided contextual understanding about the variability in results of visual input enhancement and the mixed results previously reported in published studies and literature. The methodological synthesis is the latest attempt at synthesising relevant studies in the visual input enhanced and grammar learning domain. This study can now very easily be enhanced into a meta-analysis once another coder comes on board and rates the blind codes the studies. The synthesis focused on visual input enhancement and grammar learning studies from the period 1980-2016. Using these dates was an achievement and forms a contribution as there is only one published meta-analysis which includes a synthesis of the methodologies employed by published studies in this area between 1981 and 2008. There has been a flurry of studies after 2008 and therefore Chapter 4 contributes to the unpacking of how visual input enhancement studies are designed, and whether these may account for the difference in findings (in terms of effectiveness and acquisition/learning).

The meta-analysis findings are summarised in line with the research questions:

Research question 1: How has visual input enhancement and grammar been investigated in the literature to date (1981- end of 2016)

in the literature to date (1981- end of 2016)?

The methodological synthesis was centred on: learner characteristics and research design. The present methodological synthesis sampled 29 experimental and/or quasi-experimental studies over the past 35 years (1981-2016). Research on visual input enhancement for grammar learning has had inconsistent findings and therefore, different conclusions based on the researcher and author. The meta-analysis here, confirms that this is again true over the time 1981 to 2016 (a 35-year period). The findings in the methodological synthesis show the difference in way that visual input enhancement studies are designed and conducted. Some of the shortcomings from the studies reviewed are that few of the studies included delayed post-tests to further examine the lasting effects of visual input enhancement. Most of the post-tests were immediate, and this was straight after the input treatment. As pointed out by White (1998), delayed post-tests are necessary in this type of research to assess the magnitude and long-lasting effects of the technique. Further to this is the inclusion of true control groups (see Atkinson, 2016; Jahan & Kormos, 2015; Izumi, 2002; Simard, 2009 for included delayed post-tests). This was limited in the studies reviewed and often the enhancement group was compared to that of a comparison group, ranging from those who did not read the texts, did read an unenhanced version of the input text and those who received a different form of input (e.g. input flood). True effects could be measured if true control groups were used in this type of research. Interestingly, this is a recommendation that has been called for in previous literature (Lee & Huang, 2008). It is therefore difficult to guarantee that any learning (intake and/or acquisition) in the studies from pre to post-tests is due to the enhancement techniques.

The primary research drawn in this study have conflicting conclusions on the effectiveness of VIE on grammar learning. The results in the quantitative review in this study, also highlight inconclusive and inconsistent research. The studies that fit the inclusion criteria include those from Lee and Huang's (2008) meta-analysis and some additional studies between 2008 to 2016 (Atkinson, 2016; Cho, 2010; De Santis, 2008; Fang, 2016; Fukuya & Clarke, 2001; Jahan & Kormos, 2015; LaBrozzi, 2016; Loewen & Inceogru, 2016; Park & Nassif, 2015; Rassaei, 2015; Simard (2009). The findings presented demonstrate how each study in visual input enhancement and grammar learning is specific to the context in which they are researching. For example, each study has its own individual way of assessing proficiency, choosing participants, choosing a target form and the development of the materials and design of the study. As the domain of visual input enhancement has grown over the past decade, there has been an increase in literature (published and unpublished) and this shows in this analysis. There were also several other visual input enhancement studies in the

searching process, however these focused-on vocabulary developments. It may be that there have been more studies since Lee and Huang's (2008) with target forms of vocabulary items. The findings here present a continued call for more visual input enhancement studies on grammar. A larger body of literature would enable more findings and conclusions to be trusted.

It should also be noted that not all moderating variables were compared as there were many missing from the analysis. This was due to the studies not included the relevant description, materials, or procedure in the methodology section.

Research Question 2: What is the overall effectiveness of visual input enhancement for grammar learning?

From the 29 studies reviewed, the findings revealed that visual input enhancement for grammar learning studies shows a small to medium effect size ($d = 0.34$) demonstrating exceedingly small effects and impact on second language learner's acquisition/intake. Effect sizes from the meta-analysis were small for overall effect and delayed post-tests ($d = 0.23$). However, the pre to post-test results demonstrate a large effect size ($d = 0.78$). This is a large effect and shows that students with the enhanced input texts improve from their pre-test scores to post-tests scores. Given that Lee and Huang (2008) found an effect size here of $d = 0.55$, this is a larger effect. Findings do need to be taken with caution as there were some studies not included in the final quantitative analysis due to not included their full results in the written study.

7.2.2 Experiment 1 Research Questions and Summary of Results

Experiment 1 aimed to investigate the facilitation of visual input enhancement in the teaching of the grammar form, gender pronouns to, Chinese 15-18-year olds with English as a second language in their native country, China in a classroom-based study (see Table 7.1 for a full overview). The hypotheses for this study were that input textual enhancement would be beneficial to learners, and that the explicit rules condition and textual enhancement together may result in a cognitive load that exceeds available resources and thus, a negative impact on learning. Experiment 1 results are outlined below in line with the research questions:

Table 7.1.

Summary of the findings produced from Experiments 1-2.

<u>Experiment</u>	<u>Target form</u>	<u>N</u>	<u>Measure of assessment</u>	<u>Findings Form processing</u>	<u>Findings Meaning processing</u>
1: The Effect of Input Enhancement and Grammatical Rules on Noticing, Intake, and Comprehension in Chinese Second Language Learners of English	Gender pronouns he, she, him, her, his, hers	315	1. GJT 2. Productive Use Task 3. Comprehension Task 4. Noticing Task	Rules only group performed best in the immediate short-term Having rules and enhancement created cognitive overload	No effect
2: The Impact of Modality on Input Enhancement and Grammatical Rules on Intake	Gender pronouns he, she, him, her	106	1. Multiple Choice Task 2. GJT 3. Productive Use Task	No effects of audio vs. visual enhancement. Without rules, audio enhancement outperformed visual enhancement at immediate and delayed post-test	Not tested

Note. N refers to number of participants. GJT refers to grammatical judgement task.

Research question 1: Does visual input enhancement have any effects on learners' learning of English gender pronouns?

On the one hand, in Experiment 1 the enhanced text did appear to distract from rules-based learning. Table 7.1 highlights the findings in terms of what was measured, and the outcomes. There were some findings worth sharing for form processing, but no effect detected in the meaning processing findings. It would be worth in future research considering the varying type of enhancement either systematically or randomly. For example, highlighting all male pronouns in blue and then female pronouns in yellow (i.e. systematically).

Research question 2: What are the effects of visual input enhancement on noticing?

Noticing was measured by a noticing task after the last exposure to their study condition (see Table 5.12 for overall descriptive statistics for noticing measures). Noticing impacted by enhanced and rules (compared to only enhanced). For the section that concentrated on whether learners understood the gender pronouns, a two-way ANOVA revealed that text type (enhanced, unenhanced or no text) had a significant effect on the Understanding Gender

Pronouns score, the presence or absence of rules also had a significant effect. With an interaction between text type and rules. Rules had no effect with unenhanced texts, but improved performance for the other two conditions (enhanced, no rules).

Research question 3: Does studying explicit grammar roles of English gender pronouns have any effects on learners' learning of English gender pronouns?

Explicit rule instruction had a greater impact than visual input enhancement in the immediate short-term. However, when explicit rules are provided, and the learner then reads an enhanced text, their learning suffers thereby creating cognitive overload. Because of these findings and in application to the classroom and to instructor, classroom materials must be designed to use a different form of enhancement randomly and sequentially for each occurrence. For example, bold then underline then large text then highlight.

7.2.3 Experiment 2 Research Questions and Summary of Results

Experiment 2 aimed to broaden the first study by continuing to investigate the effectiveness of textual enhancement but to bring in the focus on different modalities (visual and audio) when using the input enhancement technique. This was due to the mention of audio enhancement in the literature, and the ability for cognitive processes to be more present in differing or one of more modalities when processing text and/ or audio. Experiment 2 used Chinese pre-sessional academic English students at a British university (see Table 7.1 for a full overview). This study focuses on whether modality has an impact on acquisition and learning of the chosen structure – through input enhancement (visual), audio input enhancement and explicit rules. It was hypothesised that audio-visual enhanced materials will be more effective based on Mayer's cognitive theory of multimedia learning (2002). Experiment 2 also used a different population of students, university pre-degree learners who may well have pre-differences due to the nature and possibility of additional language learning outside of the formal classroom, and previous experience with their second language. Experiment 2 results are summarised in line with the research questions:

Research question 1: Does the type of input enhancement (visual, auditory) have any effects on learners' learning of English gender pronouns?

The notion of modality and the difference between textual and audio did not bear much of a difference. Again, Table 7.1 provides an overview of the target forms, measurements, and findings. In terms of form processing, effects of input enhancement (textual and/or audio) were short-lived and there was no meaning processing tested or collected in Experiment 2.

Research question 2: Does studying explicit grammar roles of English gender pronouns alongside input enhancement have any effects on learners' learning of English gender pronouns?

Findings revealed that there were no effects of audio enhancement versus visual enhancement, but that without rules audio enhancement outperforms visual enhancement at immediate and delayed stages (although very short-lived). The notion of modality and the difference between textual and audio did not bear much of a difference. Again, Table 7.1 provides an overview of the target forms, measurements, and findings. In terms of form processing, effects of input enhancement (textual and/or audio) were short-lived and there was no meaning processing tested or collected in Experiment 2.

In both Experiments, one of the key findings was the possible impact of learner awareness (also discussed in Limitations). As the experiments included a level of repeated testing, learners may have become accustomed to the study procedure and purpose. Thus, this may have impacted the research findings from learners as results could be limited by this awareness. As in other second language studies, this is of concern because it limits the findings and we may not be experiencing the a 'real' type of learning we would see in the classroom. In the future, the use of repeated measures does hold purpose in terms of measuring those learner's outcomes from pre-immediate to delayed post-test, but we would need to design more distractor items and outcomes of studies should always consider the impact on the findings.

7.3 Implications

This section will review the theoretical, methodological, and pedagogical implications of the research presented in this thesis.

7.7.1 Theoretical Implications

One general implication from this study is that input can impact acquisition in the second language. As pointed out by VanPatten and Leiser (2006) "the business of language teaching is to help acquisition in any way it can" (p.9). Therefore, some of the goals are to maximise acquisition and to get learners to do tasks with the input for this to take place. However, in some circumstances, input enhancement can be detrimental to language learning.

Second, although input enhancement was the main input method tested in this study, results highlighted another effective method. The use of explicit rules was beneficial to learners and when presented in isolation, led to the best immediate performance. However,

despite other research stating that rules teaching should not be completed in isolation, teachers may wish to focus on the implementation of rules presentation but in an interactive way. The mixed results of findings in input enhancement require further investigation with the learner's experiences regarding cognitive processing. The introduction of an eye-tracker into a simple input enhancement study would provide some measure of cognitive processing of the visually enhanced examples of the grammar form and help to provide further understanding to changes in cognitive processing and the relationship to learning gains of the grammar forms.

Existing studies on input enhancement (both visual, textual, and auditory) present mixed findings. Therefore, it is worth adding to this body of literature by ensuring that the experiments take note of previous issues raised such as prior knowledge, a true control group and the inclusion of a delayed post-test. Prior knowledge where the participants possess adequate prior knowledge of the target form as findings demonstrate that textual enhancement is more effective for learners with previous knowledge. A true control group should feature in input enhancement studies so there is a baseline measurement. Often, control groups in this type of research are unenhanced texts where the participants have still received some intervention or study condition (i.e. a text with no enhancement). Previous input enhancement studies have included only immediate post-tests and thus do not collect any information regarding longer-term effects or learning. The delayed post-test will feature in both experiments as it provides a different point of measurement and attempts to ascertain some form of long-term learning (albeit short scale).

Often, input enhancement research focuses on the immediate and short-term benefits and includes immediate post-tests. This type of design only focuses on the short-term impact of input enhancement and not the long-term value in this teaching method or instructed second language acquisition method. For this reason, all experiments in this research included delayed post-tests in the research design. The delayed post-test helped to achieve insight and findings on the longer-term value and effectiveness of input enhancement. Use of the delayed post-test and more of a longitudinal design add to the body of evidence of the effectiveness of input enhancement in the long-term for the learner.

As mentioned by Lee (2007), prior textual enhancement research tends to elicit the treatment text on one occasion. In the experimental studies, participants had more than one exposure to the treatment and thus experienced the study condition multiple times. In this study, participants were provided with two exposure sessions in total. Experiencing the treatment text multiple times allows students to become familiar with the text with TE i.e. the bolding

of articles. Furthermore, additional exposure to the target form (e.g. gender pronouns) attracts more attention resources during their form-processing.

The overall findings of Experiment 1 and 2 also link to the principles of transfer-appropriate processing, which argues that learners better recall what they have learned if the encoding and retrieval processes are similar (Blaxton, 1989; Lightbown, 2008; Morris, Bransford, & Franks, 1977). For example, learners may perform better on the post-tasks which were items such as the learning materials (e.g. explicit rules, enhancement either textual or auditory). Participants did not outwardly perform better on meaning oriented assessment tasks (i.e. productive tests) than on form-oriented assessment tasks (i.e., grammaticality judgement test and receptive test). However, this could have been due to the tests and ceiling effects (as mentioned later in Limitations). The meaning-oriented assessments were more aligned with the treatment and therefore, if the results from the productive use task in Experiment 1 and 2 were higher, findings could be explained through this processing method.

Findings from Experiment 2 support the ideas of Dual Coding Theory (Paivio, 2007) and Mayer's (2001, 2002) Cognitive Theory of Multimedia Learning. These models work on the assumption that input in multiple modalities (aural and textual) can stimulate both verbal and imagery systems, therefore resulting in the facilitation of information processing and further improving learning outcomes. In Experiment 2 where multiple modalities were included, the audio enhancement group did outperform visual enhancement at immediate and delayed stages (although very short-lived). These findings do suggest that, as predicted by Dual Coding Theory (Thompson & Paivio, 1994) and the Cognitive Theory of Multimedia Learning (Mayer, 2003; Mayer & Moreno, 1998), learners benefit more from input provided through multiple modes (audio and visual).

Research included in this thesis contributes methodologically and theoretically to the fields of second language acquisition and the link to cognitive psychology. In terms of understanding the impact of cognitive processes on input enhancement techniques, it is worth summarising some of the patterns and findings that emerged across the experimental studies. Although some of the findings were quite small, there are some explanations when considering explanations through cognitive psychology.

As reviewed in §3.1 and §3.2, the cognitive factors in second language learning help to unpack the variability which exists in visual and audio input enhancement. Even in the studies presented in this thesis, there is variability with the findings. In relation to the findings with input enhancement, it is possible that learners may habituate to the form of enhancement. Thinking back to each experiment, there was repetition of the exposure to the

enhancement. After the first few occurrences, the enhancement may become ‘normal’ to the learners. If this is true, then the participants in both experiments would not show any benefit in their learning.

Based on the findings of the study, however, input enhancement may be overloading the cognitive processing constraints of the learner to the extent where learners are not able to attend to the target form. Pedagogically, learners may benefit from other aspects of the reading passages (by which the input enhancement is either included or not included) such as vocabulary exposure, reading comprehension practice for acquiring the target form, there may be better options available such as structured input. However, there are issues with overloading the learner where they may not benefit at all.

In terms of cognitive overload in some of the tasks and learning, pronoun learning is suggested as being significantly more dependent on cognitive processing and may become difficult with age (Reifegerste & Felser, 2017). Previous work investigating resolving pronoun errors is not common in studies on children or second language learners. Therefore, this thesis added to the body of work on pronoun learning and thought that some second language speakers may find it more difficult to interpret pronouns due to the processing cost. In terms of noticing and input enhancement, the studies detailed in this thesis – both visual and audio have yielded inconclusive results. The last meta-analysis on this body of research was by Lee and Huang (2008) who found small effect sizes. Whilst these experiments and the meta-analysis are not exhaustive, they have contributed to the already existing research in the field and taken note of previous findings and methodological limitations.

Considering explicit rules instruction which was included in Experiment 1 and 2, similar findings were shared with Norris and Ortega’s (2000) meta-analysis on the effects of second language instruction. This meta-analysis found that explicit grammar instruction (FoFs) was more effective than Long’s recommended, more discrete focus on form (FoF) approach through procedures such as textual enhancement. Findings from Experiment 1 and 2 saw some advantages of using explicit rule instruction.

This research looked to contribute to the ever-growing body of instructed second language acquisition research, provide a meta-analysis as a means of providing a recent input on the visual input enhancement for grammar learning debate and provide two empirical studies which looked to focus on the cognitive processes input enhancement may elicit.

7.3.2 Methodological Implications

To this point we have identified a multitude of issues which still need to be investigated. For example, varying modalities of input enhancement, and what role cognitive processes play

when using different types of input enhancement. This thesis attempts to fill some of these gaps in the body of existing research. In this next section we will consider the methodological strategy to identify elements of good practice and areas for improvement that can form the basis for recommendations for further research in this area. This section will reflect on the methodology and any other observed limitations.

The design of the methodological synthesis followed guidance from Lee and Huang (2008). One of the positive decisions in the meta-analysis in this research was the decision to include unpublished and grey literature. This was important because fugitive literature, for example working papers, are still relevant and add to the body of empirical studies. The meta-analysis is the second of its kind (see also Lee & Huang, 2008) to carefully synthesise visual input enhancement and grammar learning studies and suggest how effective this grammar learning method is. With a ten-year gap between the synthesis carried out in this research and Lee and Huang's (2008) analysis, it can be clearly shown that the research presented in this thesis contributes to the ever-growing need for meta-analysis in the field of second language learning. Kang and Sok (2018) published a recent meta-analysis investigating instructed second language acquisition research on form-focused instruction and methods. Of their 54 studies sampled from applied linguistics journal articles only, they found a large effect size ($g = 1.06$, 95% CI = 0.84-1.29).

Further to this is the use of statistical analysis and reporting of statistics in second language acquisition and applied linguistics research. Norouzian and Plonsky (2018) recently reviewed the use of effect size in second language research in terms of eta and partial squared effect sizes. This research utilises the correct effect size calculation which should be labelled appropriately in published papers. The authors called for the improvement of study quality. The three research chapters included in this thesis attempt to include as much detail in terms of reporting and analysis as possible so if replication, or another author wants to use the studies as part of a meta-analysis of grey literature – there would be enough detail to report and calculate relevant effect sizes and magnitude of the study conditions.

Furthermore, one of the conclusions Plonsky mentions is the need for experimental studies to include a thorough methodology. The experimental studies in this thesis reported the necessary information for replication and for use in a meta-analysis or systematic review. For example, full description of the participants including sample size, detailed information on the enhancement length/occurrence/groups and the inclusion of true control groups in both experiments. The guidance followed was from reviewing PRISMA and other sources.

As for the experiment studies, they contribute to the body of input enhancement studies but more importantly there are key take-home messages from the methodology. The

experimental studies included different types of acquisition assessment tasks (e.g. GJT, productive-use task and use of a multiple-choice task in Experiment 2). Therefore, the experiments did not rely on singular tasks to test for learning or acquisition. The use of one or more assessment items enabled further explanation of the results and findings in relation to the effectiveness of Input Enhancement. Experiment 2 used a different mode of input enhancement which is under-researched. Audio input enhancement can be achieved through different means. This research focused on a more oral equivalent of textual enhancement whereby the salience on the target grammatical items was created through stress and intonation. This study is one among few studies which has attempted to research audio input enhancement. Due to the nature of the findings, there is a need for further research into this area to help build the body of research on this type of instructed second language acquisition. By conducting further research, it will be easier to synthesis results and complete a meta-analysis on this body of research and compare it to that of visual input enhancement. Moreover, there is a call for further modality research into input processing.

Another part of the methodological design of the two experiments presented in this thesis was the *Longitudinal Designs* featuring delayed-post-tests. This design consideration was a real strength of both studies and is a step in the right direction of recognising that immediately measured gains may not persist. Both experiments utilised delayed post-tests of two to four weeks later however, if this study were to be run or replicated, it would be worth running a longer design. A longitudinal design could be embedded into the classroom and run as part of an English Language instruction to further understand the long-term effects and nature of input enhancement. Therefore, a recommendation from the research presented in this thesis is longer designs for input enhancement studies with the inclusion of a delayed post-test should be a standard part of the research design.

Both Experiment 1 and 2 adhered to the recommended sample size in second language research of 19 participants per study condition (Plonsky, 2013). Even the notion of having two experimental studies which built from each other was important to ensure that the thesis and investigation did not solely rely on one study. As part of the design of the experiments, ecological validity was incredibly necessary to ensure a language-type learning experience for the learners. In identifying samples for the two experiments, Experiment 1 was planned and designed to take place in the native first language country, and Experiment 2 in the current learning environment and in labs due to the design of the audio enhancement and needing quiet, small group spaces.

One challenge with classroom-based research is the condition allocation. In Experiment 1, the study took place in a boarding school in China. There were already 12 pre-

established classes, each with varied but comparable ability in terms of grades, scores, and English language experience, therefore each of the chosen six classes were randomly allocated to one of the study conditions. Experiment 2 conditions were allocated randomly.

In response to calls for ecologically valid effect-of-instruction research (see Mitchell 2000; Spada 2015), Experiment 1 was a classroom-based and completed in the natural classroom, and in the native language environment where input-based methods are poor. Experiment 2 was more lab-based and did take place with individual learners in a learning setting but not the natural classroom. However, it was conducted in a university and early in the student's time in the UK. A cautionary note is that in both experiments, learners may have been engaging in additional self-study on grammar methods while each study ran. Therefore, this may have impacted the results. Despite the findings not being very strong in terms of learning outcome on the acquisition measures, the experiments were all ecologically valid.

The use of delayed post-tests also ensured that if some effects drifted, there would be a mechanism to capture this in the findings. Delayed post-tests should become part of standard practice in input (textual and audio) enhancement studies.

7.3.4 Pedagogical and Teaching Implications

The thesis offers two input enhancement studies which are in different settings. I investigated input enhancement in a school and a university. Most textual enhancement studies operate in university settings however, the value of completing Experiment 1 in a school setting was to ensure the environment was as close to where grammar learning happens. Participants in both settings were intermediate, although the university students did have slightly more English language command (according to IELTS and proficiency tests). Therefore, the results presented in this thesis from the experimental studies are relevant to English foreign language teaching for intermediate learners in upper school and the start of the university journey.

In combination with the meta-analysis findings, the research presented in this thesis highlights the effectiveness of input enhancement (in different forms, textual and audio) and what teaching practitioners should be aware of when using the outlined instructed second language acquisition techniques. The issues of concern to teachers are: how enhancements and saliency should be presented to learners (e.g. type of enhancement, number of times enhancement appears, target form) and the use of explicit grammar rules and instruction. The planning and delivery of using input enhancement – whether textual or through audio means should be planned carefully by teachers and practitioners.

How enhancements and saliency are presented to learners (e.g. type of enhancement, number of times enhancement appears, target form) will depend on the class and teaching purpose. One of the first pedagogical implications is that input enhancement is an accessible and plausible way to encourage learners to focus on the target forms chosen. Despite results not demonstrating great gains to acquisition, it does highlight how the input enhancement method could be useful in raising awareness to forms chosen by their instructors. Teachers could use this method very easily and adapt it within their teaching method.

One general implication from this study is that input can impact acquisition in the second language. Therefore, some of the goals are to maximise acquisition so learners can do tasks with the input. However, a negative implication is that, at times, input enhancement can cause detrimental effects for learning for the students.

The implications from this research study are based within the classroom. The findings from this study imply that audio type materials may engage students and be effective in teaching grammar methods. Changing the modality of the input can introduce variety to the classroom and thus, students may be receptive to a change in materials or combining both audio and visual. However, there is the issue of cognitive load which should be explicitly shared with language instructors to ensure that language learners are not overloaded in their classes and with methods and tools that teachers may utilise. The research completed also raises teaching issues concerning input enhancement. For example, these issues are concerned with how enhancements should be presented, how many times, in what context, how instruction to the enhancements should be presented and the role of attention and cognitive processes in relation to input enhancement. Findings suggest that enhancing reading materials or audio-visual material requires meticulous planning and to be quite simple thus to not overload the learner.

There has been a shift in grammar instruction and since Wong (2005)'s textbook focusing on the essential ingredient of input, yet her words still ring true. In Psychology, input is still important, and, in the classroom, the students most important input is that of the teachers. Whether it is speech, presentations, or writing – these all provide opportunities for the student to become engaged in developing their language comprehension. The reason input plays an important role in the classroom is that teachers select the input, can modify, or change the input therefore, as recognised and evidenced in this research investigation Input Enhancement provides a method whereby teachers and facilitators can add input

Most importantly, despite being an old quotation, it is still imperative to remember that input will always be one of the “single most important concepts of second language acquisition” (Gass, 1997, p.1). There is a reason language teacher, practitioners and learning

psychologists urge students to read and listen and this is because of the input. If the tentative conclusions of my research are confirmed then second language acquisition can help to take notice of the cognitive processes involved in learning to help understand why salience is modified by psychological cognitive processes (Cintron-Valentin & Ellis, 2016).

Input enhancement is still an important issue and one which is included in teacher design and within learning how to teach a second language. For example, it still appears in master's level courses and modules for Applied Linguistics, TEFL and TESOL.

As recently posited by Leow and Martin (2018), second language instructors should be warned that enhancing grammar items in the second language does not always lead to "robust learning" (p.182). From a pedagogical perspective, the use of the target form (gender pronouns) has implications which should be explored. These implications are that Chinese students still struggle with this target form and while input enhancement may be one way of helping learners overcome this difficulty, it is not the only method. The experimental studies support the argument that input enhancement (in all forms, visual and auditory) are still relevant in classroom second language learning as they can lead to some form of learning. From the studies, there is also the consideration that learners' cognitive differences may explain difference in variation between learners who understand the grammatical form and those who do not. One way in the classroom for this to be investigated and for teachers to gain information regarding their learner's cognitive profiles are through two ways: subjective and objective methods (Shaofeng, 2017). The subjective way would be to ask learners to complete a short self-report tool which would detail their cognitive preferences. The objective way would be through a validated test such as LLAMA or other working memory tests which are often cited and used in published journal articles.

Another conclusion relating to the use of explicit grammar rules is now explored. Though input enhancement was the main input method tested in this study, results highlighted another effective method. The use of explicit rules was beneficial to learners and in isolation, led to the best immediate performance. However, despite other research stating that rules teaching should not be completed in isolation (Ediger, 2012), teachers may wish to focus on the implementation of rules presentation but in an interactive way utilising different modalities. For example, with the use of digital technology, the teaching of grammar rules can be created, displayed, and taught in interactive means in line with recent movements in mobile phone apps, and learning programmes.

Other ideas for the classroom activities which involve some form of noticing, or input enhancement are: teacher directed noticing activities, data driven learning (Flowerdew, 2015), hypothesis formation through inductive corpus-based exercises, explicit explanations

from the teacher to confirm or correct these hypotheses, hypothesis testing through follow-up exercises, learner production, and pattern-hunting (turning up ideas and expressions) versus pattern-defining (checking a specific target pattern).

7.4 Limitations

When interpreting the findings presented in this research, the limitations must also be considered. There were some shortcomings in the thesis in terms of methodological decisions made when designing the experiments and these are discussed in the respective Experiment chapters (see 5.7.4 & 6.10.3). This section will briefly cover the overall limitations in terms of research setting, materials, design and procedure from the meta-analysis, Experiment 1, and Experiment 2.

Within the meta-analysis, thorough analysis was completed and there is value in the up to date meta-analysis which reviews literature from the beginning of textual enhancement research until 2016. This meta-analysis is timely and fills the gap in that the last meta-analysis in this area was from 2008 (see Lee & Huang, 2008). However, one drawback is that it is purely limited to visual input enhancement and grammar (e.g. it did not synthesise and analysis the effectiveness of audio enhancement research). Thus, the findings do not apply to the entire body of input and textual enhancement. Further research into the effectiveness of audio/aural input enhancement is required and input enhancement and vocabulary. Using a different modality may produce a larger effect size and knowledge of the effectiveness of input enhancement, it has only focused on visual input enhancement.

In the experimental studies, there were several limitations which should be acknowledged. *Participant Demographics* means the generalisability of the findings from the experimental studies are limited. It should be made clear that while the participants used in the experimental studies were all Chinese, the findings of the studies are restricted and limited to this nationality when learning English and using input enhancement. All participants in Experiments 1 and 2 were Chinese second language learners of English. This group of students, whether 16-18 or 18-25-years olds have been subject to a certain type of education in Mainland China. It is possible that this learning history and experience fed into the experimental studies. For example, China's education relies on rote memory learning and achieving. Students who are in still in China, or just arrived in the UK at a British university may still have certain habits which come into play in research situations. For example, the fact that explicit rules were used as a study condition may be a very similar learning experience to how the students are normally taught and assessed. Therefore, the materials

used (a PowerPoint presentation with grammar rules included so students can read and recall) were of a similar nature to their own learning experience through school and college.

One methodological weakness is that there was no online measurement of cognitive processing for example, eye-tracking or even think aloud. If measures such as eye gaze or think aloud protocol data was collected in Experiment 1 and 2, this would have allowed the measurements and ability to further understand the level of processing per participant when engaging in the bold target grammar forms. Therefore, the results presented in Experiment 1 and 2 could be interpreted less tentatively. Future research into textual and/or audio enhancement could incorporate think aloud protocols or stimulated recall protocols to gain insights into conscious thinking that may be induced by the enhanced target words or sounds. Furthermore, as in Ryan et al's (2017) commentary on salience, cognitive effort and word learning, there is recommendation that pupillometry could also be measured in input enhancement studies to recognise cognitive effort and processing load (Sirious & Brisson, 2014). The author comments that this method has not yet been utilised fully in second language acquisition research and could allow assessment of the role of cognitive effort in attention related learning occurrences. Further studies in input enhancement should include the eye-tracker but also ensure that there is a large enough sample.

A further limitation related to the target grammar form of gender pronouns, is that 'he, she' are categorised as function words and are short. Participants may have skipped over these words when reading. Therefore, not truly attending to the bolded salient areas of interest and thus, them not being very prominent despite being enhanced typographically. The choice of target grammar form was evidence-based and the pilot study in Experiment 1 outlines this (see §5.2). Other choices of target form may have worked in a different way and this may have been valuable to present. However, the trade-off here was to use a consistent grammar form and one from student and teacher experience, can still be problematic to intermediate learners of English as a second language. The target forms despite being chosen with careful choice in the planning and piloting stages, may have been easy for the participants (as captured in the pre-test scores on both experiments). This in turn could have affected the amount of attention paid to the forms in the treatment sessions and then on post-tests (immediate and delayed), thus affecting the relationship between cognitive processes and learning gains. The pilot stage in the initial experience did lend itself to caution when choosing an English grammar form that the intended participants would have difficulties with. I wanted to choose a form that Chinese learners would find demanding due to the grammatical differences between the Chinese Mandarin and English language system.

Whilst the *target grammatical form* was one which is of clear inaccuracy to Chinese speakers, it may have been worth using a grammatical structure which held more communicative value such as passive voice. The target form within Experiment 1 and 2 was gender pronouns. On reflection, this target form does not have a large communicative meaning. If a sentence does not contain these pronouns, or they were used in the wrong way –it would not change the meaning of the text much. The gender pronouns were used due to my experience of Chinese learners even at intermediate and advanced stages of English and some of the previous literature which cites this as a source of grammatical difficulty for the second language learners.

Furthermore, the role of measurement for the proficiency test can also be criticised (Rastelli, 2018). In §6 and 7, the two experiments utilised Dialang reading proficiency tests which use the CEFR scales to produce a score. These scores were then converted into IELTS scores for checking the groups were homogenous in terms of their language reading proficiency. One limitation may be the use of the CEFR levels. Rastelli (2018) puts forward the notion that cognitive linguistics have previously realised that proficiency scales which are based on skills such as the CEFR scales. These scales are not necessarily supported by language theories and do not distinguish between meaning and function. Furthermore, language proficiency is difficult to operationalise in second language acquisition studies. A review by Hulstijn (2012) focused on a written corpus where learning proficiency was measured in 140 empirical articles published in volumes 1–14 (1998–2011) of the journal *Bilingualism: Language and Cognition*. His findings revealed that in 55% of these reviewed articles, language proficiency was not measured via an objective test.

Outcome measures in the experiments did include some distractors which were added to divert learner's attention from the target grammar structures, so they could not easily identify the focus of the assessments. However, some of the groups were in a treatment group of explicit rule presentation and therefore, may have noticed the target grammatical structures and more so when salient through bold or audio enhancement (raised voice, emphasis, and intonation). Here, the use of different target grammar forms that were less salient in the input (text or audio) may yield different effects of input enhancement in future studies.

Despite the outlined limitations, the present research extends the line of research on the effectiveness of input enhancement (textual and audio) by focusing on the visual and audio salience of English gender pronouns with Chinese learners of English as their second language. Future research should take note of the outlined limitations and develop more rigorous forms of input enhancement issues. Input enhancement is still an important issue in foreign and second language instruction and one which requires additional studies, and

replication of previous studies especially ones which found large effect sizes and real learning, in the short and long term. The next section will consider four areas that could be researched in second language learning and cognitive psychology while reading or listening to enhanced salient features.

7.5 Future Research

During the conducted research, from meta-analysis to the two experiments, future research directions and questions have developed. This section will take stock of four areas of future research questions and other areas worthy of being investigated in the field of input enhancement.

First, the results presented in this thesis have contributed to an improved understanding of the types of cognitive processes which underlie Input Enhancement (textual enhancement, aural enhancement, and explicit rules instruction). Future research might explore further online processes and measures of cognitive ability and processing when students are undertaking instructed second language acquisition methods. It would be conducive and an improvement in this type of research for more think-aloud protocols to be incorporated to reflect explicit knowledge, corroborated by the learner's ability to articulate the target rule, often using appropriate metalanguage, on the metalinguistic post-test (Hanan, 2015).

Second, several potential future projects emerge from the results of the experiments and meta-analysis on input enhancement methods and grammar learning. These projects may be focusing on the systematic and randomisation of input enhancement methods (e.g. using bold, then highlight, then colour) to see if the learners are habituated the method of input enhancement. Future research could explore the type or format of textual enhancement on intake. For example, this study only focused on using bold in the study. If different formats such as font, underline or different sizing may have contributed to more of a success in students' intake if their text was enhanced. Simard (2009) focused on this feature and found that at the time no other study in second language acquisition had focused on the effect formatting can have on textual enhancement on intake. Previous studies which have investigated input enhancement on the presentation of novel information. For example, the use of capital letters is known to help subjects retain novel information presented in a text written in their first language. Other authors (e.g. Farahani & Sarkhosh, 2012; Simard, 2009) also found that the choice of typographical cues made the subject react differently to the task they were asked to carry out. Remember that in the present study, subjects who read a text in

which plural words were enhanced with capital letters obtained the highest scores and performed significantly better than those who were exposed to underlined target features.

Third, an alternative group of participants could also be used in future research studies investigating input enhancement. Chinese learners present different cultural issues and possess previous learning habits which may have influenced the findings of the input enhancement gain and gain scores on the tests. For example, the use of explicit grammar rules was included in the experimental designs for the research studies. This was based on previous research and to see if this mediated successful learning and acquisition of the chosen grammatical form. This type of ‘teaching method’ is heavily used in China and participants, therefore, were more accustomed to this type of learning; hence some of the positive results. Moving forward, research in input enhancement could assess different language grammatical forms and among various participants. It may be assumed that input enhancement is more frequent and more useful language and contexts. Further research is needed for this to be established.

Finally, future research should investigate the effects of textual and audio input enhancement in terms of the long-term retention effects. Studies in this thesis used delayed post-test of one week and three weeks. The delayed post-test data only provided a slight insight into the retention of input enhancement (how many weeks) and moving forward, there should be more consideration given into how well input enhancement effects last over time. These findings can then provide knowledge into the application of input enhancement and whether it makes grammar learning (to the given form) more effective. Moving forward, it would be appropriate to acknowledge these research limitations and when conducting future input enhancement studies – these problems may be alleviated. Future studies would also ensure that they are included through the Open Science and IRIS repository (Marsden, Thompson & Plonsky, 2017).

Recent studies in the input enhancement field (Cintrón-Valentín, García-Amaya & Ellis, 2019; Lee & Révész, 2018, 2020) (with a move towards captions) highlight that this is still an area under consideration and questions remain. This thesis should add to this literature and it is hoped that the contents, such as the meta-analysis will provide an up-to-date review from 1981-2016 and two studies on textual enhancement and audio enhancement can aid grammar learning.

7.6 Conclusion

In conclusion, despite the study’s outlined limitations, this body of research extends the prior work on input enhancement and focusing on uncovering the effectiveness of increasing the

salience (through visual, textual and auditory means) of English gender pronouns with the view of drawing second language learner attention to the target grammar structure, and this further promote second language grammatical knowledge. There are future studies needed on other grammatical features to investigate the value of textual and audio enhancement in input-based tasks for facilitating the acquisition of second language grammatical knowledge. Research findings involved in Experiment 1 and 2 of this study need to be considered with the learning context they were conducted in. For example, Experiment 1 was conducted in the native country and the school classroom, whereas Experiment 2 was conducted on a university campus in laboratory settings. The findings from these studies are limited in terms of generalisability. However, the strength of the studies is the use of two different groups of students in two different contexts. The population used was an under-researched one in terms of published textual enhancement studies as they do not include Chinese learners. One may question the applicability of the findings to other English Foreign Language contexts and groups, but the reading level and behaviour was in line with most Chinese learners of English at an intermediate level. If the research was completed with students with advanced English, there may have been different results. Previous research on input enhancement notes that context is extremely important for its use and that considerations to age, level and learning approaches and methods are relevant. Future research may focus on different groups of learners and measure the effectiveness of the technique.

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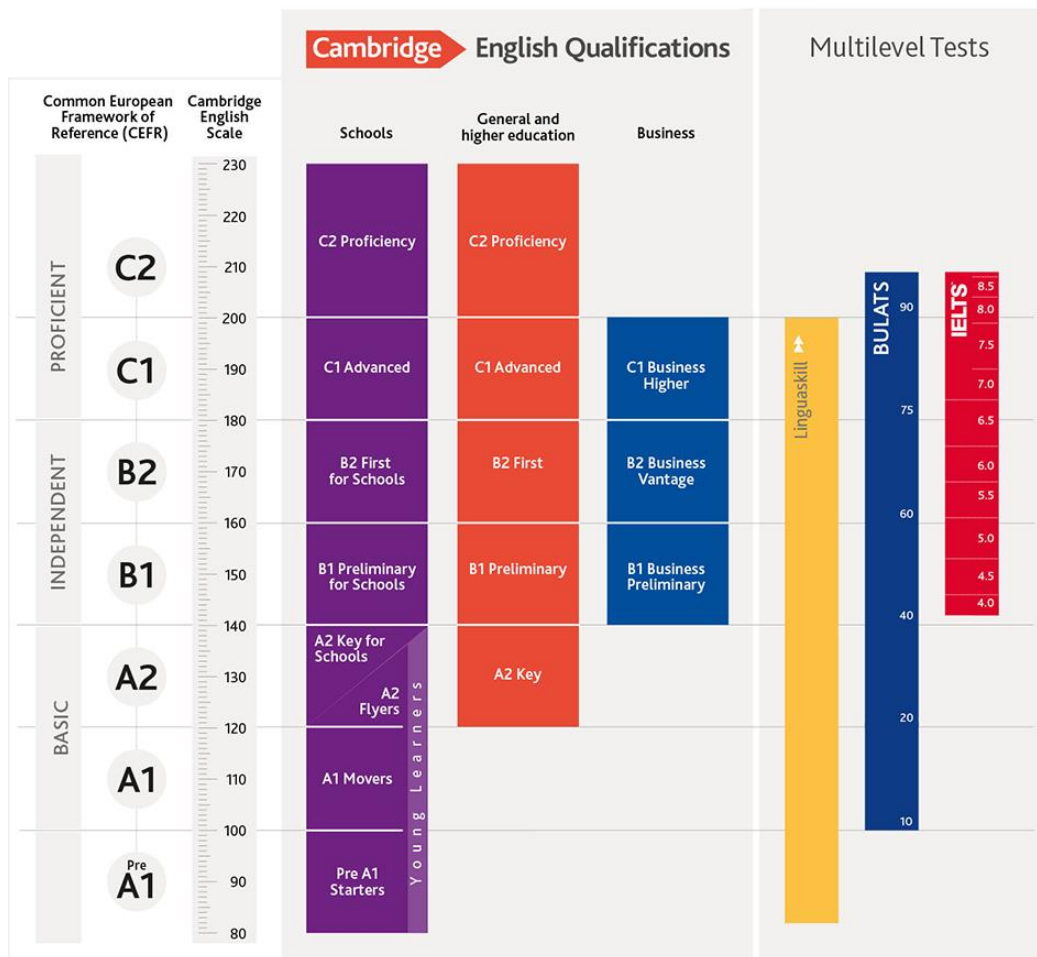
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Appendices

Appendix A: English language proficiency indicators

Appendix A1: CEFR equivalents to IELTS

IELTS	CEFR
9.0	
8.5	
8.0	C2
7.5	
7.0	
6.5	C1
6.0	
5.5	
5.0	B2
4.5	
4.0	B1



Appendix A2: CEFR Reading Descriptors (City & Guilds, 2011)

<p>Preliminary - A1</p>	<p>Can understand and use familiar everyday expressions and very basic phrases satisfying practical needs in connection with education, training and social roles.</p> <p>Can introduce him/herself and others and can ask and answer questions about personal details such as possessions, address and people known.</p> <p>Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.</p> <p>Can read and understand short texts on familiar topics and obtain information from common signs and symbols.</p> <p>Can write short simple phrases and sentences in documents such as forms, lists and messages.</p>
<p>Access – A2</p>	<p>Can understand sentences and frequently-used expressions related to areas of most immediate relevance such as basic personal and family information, shopping, local geography, employment, education, training and social roles.</p> <p>Can communicate in simple and routine tasks requiring a direct exchange of information, feelings and opinions on familiar and routine matters.</p> <p>Can engage in conversation to establish shared understanding about familiar topics.</p> <p>Can read, understand and obtain information from short documents, familiar sources, signs and symbols.</p> <p>Can write to communicate with some awareness of the intended audience.</p>
<p>Achiever – B1</p>	<p>Can understand the main points of clear standard communication on matters regularly encountered in social roles, work, school, leisure, education and training.</p> <p>Can convey information, feelings and opinions on familiar topics, using appropriate formality.</p> <p>Can engage in discussion in a familiar situation making relevant points and responding to reach a shared understanding.</p> <p>Can deal with most situations likely to arise whilst travelling in an area where the language is spoken.</p> <p>Can produce a simple connected text on topics which are familiar or of personal interest adapting to the intended audience.</p> <p>Can describe experiences and events, dreams, hopes and ambitions and briefly give explanations for opinions and plans.</p>
	<p>Can understand the main ideas of complex communication on both concrete and abstract topics, including technical discussions in his/her field of specialisation.</p> <p>Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party.</p>

Communicator – B2	<p>Can adapt to take account of the listener(s), the context and the medium.</p> <p>Can engage in discussion in familiar and unfamiliar situations making clear and relevant contributions.</p> <p>Can obtain information from different sources.</p> <p>Can communicate clearly and in detail on a wide range of subjects and explain a viewpoint giving the advantages and disadvantages of various options, varying length, format and style appropriate to purpose and audience.</p>
Expert – C1	<p>Can understand a wide range of demanding, longer texts, both written and spoken, and recognise implicit meaning.</p> <p>Can use the language fluently and spontaneously without much obvious searching for expressions.</p> <p>Can respond to extended information and narratives, follow detailed explanations and complex instructions, adapting response to audience, medium and context.</p> <p>Can engage in discussion in a variety of situations making clear and effective contributions.</p> <p>Can use language flexibly and understand a range of texts of varying complexity and length. for social, academic and professional purposes.</p> <p>Can produce clear well-structured, detailed text on complex subjects, showing controlled use of organisational patterns, connectors and cohesive devices.</p> <p>Can communicate ideas and opinions effectively, using length, format and style appropriate to purpose, content, and audience.</p>
Mastery – C2	<p>Can understand with ease virtually everything heard or read.</p> <p>Can summarise information from different spoken or written sources, reconstructing arguments, and accounts in a coherent presentation.</p> <p>Can express him/herself spontaneously, very fluently and precisely, differentiating finer shades of meaning even in more complex situations.</p>

Appendix B: Meta-analysis Documents

Appendix B1. Rationale for excluding articles (screened and full-text articles assessed)

<u>Reason</u>	<u>Citations/Studies</u>
Conference proceedings	
Master's thesis	Williams (2007), Pacheco (2004), Zanotto (2014), Salas (2014), Nogueira (2014), Yu (2013), Comeaux (2012), Alsadahn (2011), Salas (2014), Yu (2013)
Study not in English	
Unable to access the full text	
L1 studies	Lorch, Lorch, & Klusewitz (1995), Tolentino & Tokowicz (2014)
Studies involving single-sentence reading tasks rather than natural reading tasks	Robinson (1997), Williams (1999)
No natural reading task (computer generated)	Tolentino & Tokowicz (2014)
Examined the development of vocabulary knowledge	Barcroft (2003), Kim (2003), Motlagh & Naseb (2015), Khatib & Mahmood Safari (2013), Morimoto & Loewen (2007), Nassaji (2003), Boers, Demechelee, He, Deconick, Stengers and Eychmans (2016), Szudarski & Carter (2014), Ehsan & Tahereh (2012)
L2 pragmatic awareness	Witten (2002)
Studies in which VIE groups served as comparison groups to address questions other than the effects of VIE were therefore excluded	Sato (2005), Seiba (2001)
Studies that failed to report descriptive statistics were not included	Leeman et al., (1995)
Listening input enhancement	Chuang & Wang (2015), Rezaei & Hashim (2013), Cho and Reinders (2013)
Noticing study - no enhancement	Park (2011), Mak (2009)
Phonology studies	Trenchs-Parera (2009)
Oral communication	Nakatani (2005)
Combined effects of IE and recasts	Nguyen, Pham & Pham (2015)

*Appendix B2. Coding scheme for the identified studies
(adapted from Plonsky & Oswald, 2012)*

Coding category	Items
Study identification	Author, Year, Source, Journal, Title, Published/Unpublished, full APA reference, short citation
Learner Characteristics (study context)	Total participants in study, Age of participants, Participants per study condition, First language, Second language, Other languages, Length of second language study (total), Context of the second language study, Institution status, Impressionistic judgement, Previous knowledge of the target form (No knowledge (no formal exposure)/Minimal knowledge/Some knowledge), Proficiency level of participants, How proficiency was tested
Research Design and Measures	Target language, Target forms (grammar element), Reading materials, Independent variables, Other measured variables, Dependent variables – receptive and production*, Type of measures included, Intensity of the treatment sessions – amount of exposure to the target forms, Time between immediate and delayed (if a delayed post-test was part of the design), *When measuring the dependent variables, the processing demands of the participants were coded: a) receptive b) productive
Treatment Materials	Measures – form processing, Measures – meaning processing, Materials – text type, Materials – text length, Number of treatment sessions, Duration of treatment, Total amount of treatment time Total amount of reading time, Total exposure, Intervals between pre-test and first treatment, Intervals between last treatment and post-test, Delayed post-test
Data/Statistics	Means and standard deviations for both control/comparison and experimental groups, effect sizes (d value, eta-squared, partial eta-squared, frequencies, percentages, p values, statistical test values To calculate: <i>Immediate post-test effect size</i> <i>Delayed post-test effect size</i> <i>Post-to delayed</i> <i>Pre-to immediate contrast</i> <i>Meaning comprehension</i>

Appendix B3: Meta-analysis (list of studies included in the study)

Study and date	Source citation	Paper type and source	
1	Alanen (1995)	*Alanen, R. (1995). Input enhancement and rule presentation in second language acquisition. In R. Schmidt (Ed.), <i>Attention and awareness in foreign language learning</i> (pp. 259-302). Honolulu, HI: University of Hawaii.	Published book chapter In R. Schmidt (Ed.), <i>Attention and Awareness in Second Language Learning</i> (Technical Report #9) (pp. 259-302).
2	Atkinson (2016)	*Atkinson, L. (2016). <i>The Impact of Cognitive Processes on Input Enhancement Techniques: studying Chinese Students with English as their Second Language</i> . (Doctoral Dissertation).	Doctoral dissertation
3	Bowles (2003)	*Bowles, M. 2003. 'The effects of textual input enhancement on language learning: An online/offline study of fourth-semester Spanish students' in P. Kempchinski and P. Pineros (eds): <i>Theory, Practice, and Acquisition: Papers from the 6th Hispanic Linguistic Symposium and the 5th Conference on the Acquisition of Spanish & Portuguese</i> . Somerville, MA: Cascadilla Press, pp. 359–411	Conference proceedings Theory, Practice and Acquisition
4	Cho (2010)	*Cho, M. Y. (2010). The effects of input enhancement and written recall on noticing and acquisition. <i>Innovation in Language Learning and Teaching</i> , 4(1), 71-87. http://dx.doi.org/10.1080/17501220903388900	Published journal article Innovation in Language Learning and Teaching
5	De Santis (2008)	*De Santis, P. (2008). Text Enhancement and the Acquisition of English Verbal Inflection -s by L1 Haitian Creole Speakers. <i>Applied Language Learning</i> , 18(1&2), 27-50.	Published journal article Applied Language Learning
6	Doughty (1991)	*Doughty, C. J. (1991). Second language instruction does make a difference: Evidence from an empirical study of SL relativization. <i>Studies in Second Language Acquisition</i> , 13(4), 431-469	Published journal article Studies in Second Language Acquisition
7	Fang (2016)	*Fang, Z. (2016). Teaching Close Reading with Complex Texts across Content Areas. <i>Research in the Teaching of English</i> , 51(1), 106 -116.	Published journal article Journal of Research in Reading
8	Fukuya and Clarke (2001)	*Fukuya, Y. J., & Clark, M. K. (2001). A comparison of input enhancement and explicit instruction of mitigators. L. Bouton (Ed.), <i>Pragmatics and language learning</i> , Vol. 10 (pp. 111–130). Urbana, Ill, Division of English as an International Language Intensive English Institute: University of Illinois at Urbana-Champaign.	Published book chapter L. Bouton (Ed.), <i>Pragmatics and language learning</i> , Vol. 10 (pp. 111–130).
9	Ha (2005)	*Ha, J. (2005). <i>Developing English determiners through Internet chat: An experiment with Korean EFL students</i> (Doctoral dissertation). Available from ProQuest Dissertations and Theses databases. (UMI No. 3192395)	Doctoral dissertation
10	Izumi (2002)	*Izumi, S. (2002). Output, input enhancement and the noticing hypothesis: An experimental study of ESL relativization. <i>Studies in Second Language Acquisition</i> , 24(4), 541-577.	Doctoral dissertation
11	Jahan & Kormos (2015)	*Jahan, A., & Kormos, J. (2015). The impact of textual enhancement on EFL learners' grammatical awareness. <i>International Journal of Applied Linguistics</i> , 25(1), 46-66. https://doi.org/10.1111/ijal.12049	Published journal article International Journal of Applied Linguistics
12	Jourdenais (1998)	*Jourdenais, R. (1998). <i>The effects of textual enhancement on the acquisition of the Spanish preterit and imperfect</i> (Doctoral dissertation). Available from ProQuest Dissertations and Theses databases. (UMI No. 9924386)	Doctoral dissertation
13	Jourdenais et al. (1995)	*Jourdenais, R., Ota, M., Stauffer, S., Boyson, B. & Doughty, C. (1995). Does textual enhancement promote noticing? A think-aloud protocol analysis. In R. Schmidt (Ed), <i>Attention and awareness in foreign language learning</i> (pp. 183-216). Honolulu, HI: University of Hawaii.	Published book chapter In R. Schmidt (Ed.), <i>Attention and awareness in foreign language learning</i> (pp. 183-216).
14	Kubota (2000)	*Kubota, S. (2000). <i>Input enhancement in classroom second language acquisition of Japanese</i> (Doctoral dissertation). Available from ProQuest Dissertations and Theses databases. (UMI No. 3017822)	Doctoral dissertation
15	LaBrozzi (2016) *	*LaBrozzi, R. M. (2016) The effects of textual enhancement type on L2 form recognition and reading comprehension in Spanish. <i>Language Teaching Research</i> , 20(1), 75–91.	Published journal article Language Teaching Research
16	Lee (2007)	*Lee, S. K. (2007). Effects of textual enhancement and topic familiarity on Korean EFL students' reading comprehension and learning of passive form. <i>Language Learning Journal</i> , 57(1), 87-118.	Published journal article Language Learning
17	Leow (1997)	*Leow, R. P. (1997). The effects of input enhancement and text length on adult L2 readers' comprehension and intake in second language acquisition. <i>Applied Language Learning</i> , 8(2), 151-182.	Published journal article Applied Language Learning
18	Leow (2001)	*Leow, R. P. (2001). Do learners notice enhanced forms while interacting with the L2? An online and offline study of the role	Published journal article

		of written input enhancement in L2 reading. <i>Hispania</i> , 84(3), 496-509.	Hispania
19	Leow et al. (2003)	*Leow, R., Egi, T., Nuevo, A. & Tsai, Y. (2003). The roles of textual enhancement and type of linguistic item in adult L2 learners' comprehension and intake. <i>Applied Language Learning</i> , 13(2), 1-16	Published journal article Applied Language Learning
20	Loewen and Inceoglu (2016)	*Loewen, S., & Inceoglu, S. (2016). The effectiveness of visual input enhancement on the noticing and L2 development of the Spanish past tense. <i>Studies in Second Language Learning and Teaching</i> , 6, 89-110	Published journal article Studies in Second Language Learning and Teaching
21	Overstreet (1998)	*Overstreet, M. (1998). Text enhancement and content familiarity: The focus of learner attention. <i>Spanish Applied Linguistics</i> , 2, 229-258.	Published journal article Spanish Applied Linguistic
22	Overstreet (2002)	*Overstreet, M. (2002). The effects of textual enhancement on second language learner reading comprehension and form recognition (Doctoral Dissertation). Available from ProQuest Dissertations and Theses databases. (UMI No. 3070405)	Doctoral dissertation
23	Park and Nassif (2013)	*Park, E.S. & Nassif, L. (2014) Textual enhancement of two L2 Arabic forms: A classroom-based study. <i>Language Awareness</i> , 23, pp. 334-352.	Published journal article Language Awareness
24	Rassaei (2015)	*Rassaei, E. (2015). Oral corrective feedback, foreign language anxiety and L2 development. <i>System</i> , 49, 98-109	Published journal article System
25	Robinson (1997)	*Robinson, P. (1997). Generalizability and automaticity of second language learning under implicit, incidental, enhanced and instructed conditions. <i>Studies in Second Language Acquisition</i> , 19(2), 223-248	Published journal article Studies in Second Language Acquisition
26	Simard (2009)	*Simard, D. (2001). Effet de la nature des éléments grammaticaux sur la saisie en français langue seconde. <i>The Canadian Modern Language Review</i> , 64(3), 491- 522. Singleton, D.	Published journal article System
27	Shook (1994)	*Shook, J. D. (1994). FL/L2 reading, grammatical information, and the input-to intake phenomenon. <i>Applied Language Learning</i> , 5(2), 57-93.	Published journal article Applied Language Learning
28	White (1998)	*White, J. (1998). Getting the learners' attention: A typographical input enhancement study. In C. Doughty & J. Williams (Eds.), Focus on form in classroom second language acquisition (pp. 85-113). Cambridge: Cambridge University Press.	Published book chapter C. Doughty & J. Williams (Eds.), Focus on form in classroom second language acquisition (pp. 85-113).
29	Wong (2003)	*Wong, W. (2003). Textual enhancement and simplified input: Effects on L2 comprehension and acquisition of non-meaningful grammatical form. <i>Applied Language Learning</i> , 13(2), 17-45	Published journal article Applied Language Learning

Note. All studies are also featured in the final reference list with * to mark that they were included in Chapter 4: Meta-analysis chapter.

Appendix B4: Excerpt of excluded studies from Meta-analysis

Reason for excluding	Study	Published year	Source type
No no natural reading task	Tolentino & Tokowicz (2014)	2014	Published Language Learning
No Single sentence task	Robinson (1997)	1997	Published
No Single sentence task	Williams (1999)	1999	Published
No Vocab used Multi-word units	Boers, Demechelee, He, Deconick, Stengers and Eychmans (2016)	2016	Published International Journal of Applied Linguistics
No Examined the development of vocabulary knowledge	Barcroft (2003)	2003	Published
No Examined the development of vocabulary knowledge	Kim (2003),	2003	Published
No Examined the development of vocabulary knowledge	Motlagh & Naseb (2015),	2015	Published
No Examined the development of vocabulary knowledge	Khatib & Mahmood Safari (2013),	2013	Published
No Examined the development of vocabulary knowledge	Morimoto & Loewen (2007)	2007	Published
In house working paper	Wijaya (2000)	2000	Published
Conference proceedings	Izumi (2003)	2003	Published
Master's thesis	Williams (2007),	2007	Published
Master's thesis	Pacheco (2004),	2004	Published
Not in english according to Lee/Huang	Simard (2009)	2009	Published
No L1 study	Lorch, Lorch, & Klusewitz (1995)	1995	Published
No L2 pragmatic awaren.	Witten (2002)	2002	Published
No Studies in which VIE groups served as comparison groups to address questions other than the effects of VIE were therefore excluded	Sato (2005),	2005	Published
No Studies in which VIE groups served as comparison groups to address questions other than the effects of VIE were therefore excluded	Seiba (2001)	2001	Published
No Studies that failed to report descriptive statistics were not included	Leeman et al (1995)	1995	Published
No Audio enhancement	Chuang & Wang (2015)	2015	Published
No Audio enhancement	Rezaei & Hashim (2013)	2013	Published
No Noticing study	Park (2011)	2011	Published
No Phonology study	Trenchs-Parera (2009)	2009	Published
No Oral communication	Nakatani (2005)	2005	Published
No true control group Comparison group was another form on TE	Putta (2016)	2016	Published Studies in Second Language Research
No Vocab based, collocations	Szudarski & Carter (2014)	2014	Published
No Collocations	Ehsan & Tahereh (2012)	2012	Published International Journal of Research Studies in Language Learning
No Combined effects of IE and recasts	Nguyen, Pham & Pham (2015)	2015	Published innovation in Language Learning and Teaching
??? IE group and output group	Ferdous (2015)	2015	Published Journal of Applied

Is the output group a comparison group?			Linguistics and Language Research
No	Zanotto (2014)	2014	Published
Masters dissertation			
No	Alsadah (2011)	2011	Unpublished Diss
Masters and meta-analysis			
No	Comeaux (2012)	2012	Unpublished Diss
Masters			
No	El al (2002)	2002	Unpublished Diss
Unrelated topic			
No	Yu (2013)	2013	Unpublished Diss
Masters			
No	Noguera (2014)	2014	Unpublished Diss
Masters			
No	Mak (2009)	2009	Unpublished Diss
Form focused			
No	Salas (2014)	2014	Unpublished Diss
Masters			
No	Cho and Reinders (2013)	2013	Book chapter
Audio enhancement			
No visual input enhancement	beltran (n.d.)		Working paper

Appendix C: Experiment 1 Documents

Appendix C1: Ethical Approval Documents



Feedback from Research Ethics Committee	
Student: Lucy Atkinson	Date: 13 th May

Action required	Tick
No action required	<input type="checkbox"/>
Submit confirmation for Chair's Action	
Submit amendments for consideration by members by email	
Resubmit application to future REC meeting	

Decision relating to the proposal	Tick
Full approval was given	<input type="checkbox"/>
Advisory comments were given	
Amendments are required before full approval can be given	
Approval in principle was given	
Amendments are required before approval in principle can be given	
In its current form, approval could not be given	

Feedback on proposal
The REC received the full response to previous feedback and approved the project. The issue of consent in the Chinese school setting was discussed and the researcher was encouraged to contact Dr Mary Feng, a former PhD student and associate of the UoN in this regard.

Advice and guidance:
Please note that if you have been asked to make amendments then you should include a cover note with your resubmission that notes the way(s) in which you have responded to RDB comments and suggestions. You should also highlight any changes made to the proposal (e.g. by using a different ink colour).
The Chair of the Board/Committee can be contacted via the Graduate School if you have any questions about this feedback.



INFORMATION SHEET

Thank you for showing an interest in my study, which forms part of my PhD research and is concerned with finding ways to improve teaching and learning of English for second language learners. I am a current PhD student in the Division of Psychology, School of Social Sciences at the University of Northampton. I have approached you because you are a second language learner of English and I am interested in how differences among second language learners influence their learning. It would be great if you would agree to take part.

Study Title: Cognitive Processes involved in Second Language Learning

Purpose of the research/study:

This research is to find out about different study conditions differences and also the contribution of attention and working memory.

Who the researchers are:

The research team consists of me, a postgraduate researcher in the Division of Psychology in the School of Social Sciences at the University of Northampton and my two supervisors: Catherine Fritz (catherine.fritz@northampton.ac.uk) and Steve Kilpatrick (steve.kilpatrick@northampton.ac.uk).

What the study involves:

The proposed study assesses the effectiveness of textual enhancement. This is where a grammar point in the text is enhanced or highlighted and then you may be asked to recall or complete a short test on that grammar form later. This study is not a test of how well you can read or have learnt English. It is a comparison of different ways of presenting and working with materials in English.

What will happen to my data?

The data without any personally identifying information will be used as part of a research project and may be used in subsequent scientific publications.

What will happen to the information?

The information given will be stored in a locked filing cabinet. The identity of each participant (you) will remain anonymous throughout the research process and in the report. We will do this by assigning a number for your data. From then on you will be known only by your number. This is so your response cannot be traced back to you and your identity is protected. Once the research is completed, the identifying information will be destroyed. When we write any report of the study, it will not be possible to identify you or anyone else who participated in the study. The information you give will be for research purposes only.

Most importantly, I hope that from this study we will gain insights into how best to present materials as part of an English learning programme. Therefore, we hope to make it easier for second language learners in the future to be able to master English as a foreign language. The results of this study are hoped to be presented at conferences involving Teaching English as Foreign Language (TEFL) providers and in psychology/teaching journals.

Not sure about participating? Or Do I have to take part?

If you do not want to participate, that is fine; you have the right not to participate. You can also stop at any time if you do not want to finish the study i.e. without any penalty; just let us know if you want to stop. If you decide after finishing that you did not want to participate, that's alright, too; simply email me with your participant number and ask me to remove your data and I will do so. You do not need to provide a reason.

Contact the Researcher:

Lucy Atkinson

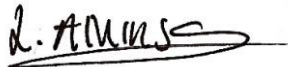
Phone 07737449354

**Email lucy.atkinson@northampton.ac.uk
l.e.atkinson2@gmail.com**

If you have any queries about the study, please feel free to contact myself or my academic supervisors, Catherine Fritz (Catherine.fritz@northampton.ac.uk) or Steve Kilpatrick (steve.kilpatrick@northampton.ac.uk).

Thank you for your interest and support. If you would like to participate in the research, please complete and return the consent form and the contact details form in the envelope provided.

Lucy Atkinson



Postgraduate Researcher, Division of Psychology
School of Social Sciences
University of Northampton
Park Campus
Boughton Green Road
Northampton
NN2 7AL

说明书

感谢您对本人博士论文的研究调查感兴趣！本人是来自英国北安普顿大学社会科学学院心理系的博士生。本人的博士论文题目是寻求提高以学习英文为第二语言的学生的教与学方法。本次调查主要是针对以学习英文为第二语言的学生，并且希望通过本次研究能了解同一学习群体里个人学习的差异。本人会表示十分感谢如果您能参与本次调查。

研究题目：第二语言学习的认识性

研究目的：

本次研究主要针对被调查者在学习第二语言期间的注意力和记忆力。调查项目具体有在学习期间的注意力，注意力的时长，学习目的。

研究者：

本次研究人员包括本人还有本人的两位博士指导老师，他们分别是 Catherine Fritz (catherine.fritz@northampton.ac.uk) 和 Steve Kilpatrick (steve.kilpatrick@northampton.ac.uk)。

本次调查的内容：

本次调查主要是了解文本加强的有效性。调查的其中一部分会要求被调查者完成一份简短的关于英文语法的表格，但并非测试。此调查主要是用于对比不同英文教学材料对第二语言学习者学习的影响。

第三环节

日期

地点

调查所获得的信息去向：

本次调查所获得的信息将会被锁在文件柜里。本次学习的被调查者所提供的资料与个人信息将以匿名的形式出现在本次调查报告中，并以编号的形式保存被调查的数据。这样可以避免被调查者身份的暴露。调查结束的同时，被调查者的个人资料也会被删除。更重要的是，本人希望通过此次调查能了解到哪种形式的教学才能更有效，更好的提高第二语言学习者的教与学质量，从而使第二语言学习者能更好的掌握英文。本次调查的结果将有可能发表在关于教英文为第二语言的会议以及心理 / 教学杂志里。

可以不参与者调查吗？

本次调查不是强制性的，所以如果您不愿意参与，可以无理由的随时在任何一个阶段退出。您只需要发邮件告诉本人您的“被调查者号码”并提及希望本人删除所有有关您参与本次调查的信息即可。

本人联系方式：

姓名： Lucy Atkinson

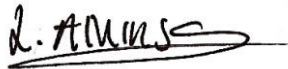
电话： 07737449354

邮件： lucy.atkinson@northampton.ac.uk OR l.e.atkinson2@gmail.com

如果你有任何关于本次调查的疑问，请随时联系本人或者本人的指导老师 Catherine Fritz (Catherine.fritz@northampton.ac.uk) , Steve Kilpatrick (steve.kilpatrick@northampton.ac.uk)。

感谢您的时间！如果你有兴趣参与本次调查，请填写以下同意书连同您的联系方式，并用本人所提供的信封寄回本人。

Lucy Atkinson

A handwritten signature in black ink, appearing to read 'L. Atkinson', with a long horizontal flourish extending to the right.

Postgraduate Researcher, Division of Psychology
School of Social Sciences
University of Northampton
Park Campus
Boughton Green Road
Northampton
NN2 7AL

Appendix C3: Consent form for participants

Consent Form

Project title: Cognitive Processes in Second Language Learning: The Role of Noticing, Input Enhancement and Working Memory

Please read the following and tick the boxes if the answer is 'yes'

- a. I have read and had explained to me by Lucy Atkinson, the Information Sheet relating to this project.

Initial name:

Yes	No
-----	----

- b. 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 as far as they relate to my participation.

Initial name:

Yes	No
-----	----

- c. I understand that my participation is entirely voluntary and that I have the right to withdraw from the project for up to a month.

Initial name:

Yes	No
-----	----

- d. I have received a copy of this Consent Form and of the accompanying Information Sheet.

Initial name:

Yes	No
-----	----

If you are unable to tick yes to any of the above or would simply like to discuss the project further before giving your consent to participate then please speak to Lucy.

Name:

Signed:

Date:

同意书

研究题目:

第二语言学习认知性调查: 注意力, 文本加强和学习记忆力的重要性

请阅读以下内容并选择 'yes' 如果您同意相对应事项

- 1. 我已阅读关于本次调查的说明书, 以及明白Lucy Atkinson对本次调查的讲解。

您名字的首个拼音字母.....

	Yes
--	-----

- 2. Lucy Atkinson已经讲解了本次调查的目的和需要我参与的相关环节, 我对本次调查的疑问也得到了满意的答复。我同意本次调查说明书所提及的关于我所将参与环节的解
释。

您名字的首个拼音字母.....

	Yes
--	-----

- 3. 我明白本次的参与是完全出于自愿的, 我也有权在调查期间和调查后一个月以内退出
本次调查。

您名字的首个拼音字母.....

	Yes
--	-----

- 4. 我有收到关于本次调查的同意书和说明书各一份。

您名字的首个拼音字母.....

	Yes
--	-----

如果你有任何不同意的事项, 或者想在提交此同意书之前了解更多关于本次研究调查
的内容, 请直接联系 Lucy.

姓名:

您名字的首个拼音字母:

日期:

Appendix C4: Background Questionnaire for participants

please answer the following questions.
your answers will remain confidential.

you are not required to answer these questions, but it would be very helpful to my research.

please circle the correct choice or write your response

Name:

Sex: Male Female

Age:

Student level: Grade 1 2 3

First language (please state Mandarin or Cantonese):

.....

What other languages do you speak fluently:

.....

What age did you start learning English:

.....

How many hours a week (approx.) of English teaching at:

Primary	<input type="text"/>
High School	<input type="text"/>
Other (please state)	<input type="text"/>

English teacher *Have you ever had, or do you have a native English-speaking teacher?*

Yes No

Overseas experiences: *Have you spent a longer period (at least a total of three months) in English-speaking countries (e.g., travelling, studying)?*

Yes No

English ability: *Please rate your current overall proficiency in English by ticking one.*

Upper Intermediate level and over —

Able to talk about general matters of daily life and topics of one’s specialty and understand most of what is going on. Able to read high-level materials such as newspapers and write about personal ideas.

Intermediate level —

Able to talk about general matters of daily life. Able to read general materials related to daily life and write simple passages.

Lower Intermediate level —

Able to talk 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 is your perceived level of English:

	Level (rate from 1-5) 1 being low, 5 being very good
Reading	
Listening	
Speaking	
Writing	

*Thank you for completing this questionnaire ☺
If you have any questions, please ask or email
lucv.atkinson@northampton.ac.uk*

Appendix C5: Second language (English) proficiency test
(Adapted from British Council and IELTS)



Name _____

Number

INTERNATIONAL ENGLISH LANGUAGE TESTING SYSTEM

Academic Reading

PRACTICE TEST

40 minutes

Time 40 MINUTES

INSTRUCTIONS TO CANDIDATES

- Do not open this question paper until you are told to do so.
- Write your name in the space at the top of this page.
- Read the instructions for each part of the paper carefully.
- Answer all the questions.
- Write your answers on the answer sheet.
- You must complete the answer sheet within the time limit.
- At the end of the test, hand in both this question paper and your answer sheet.

INFORMATION FOR CANDIDATES

- There are 20 questions on this question paper.
- Each question carries one mark.



respect; studies demonstrate that vegetables grown in season and ripened on the tree are far higher in essential nutrients than those grown in greenhouses and ripened by laser.

Knowledge of chronobiological patterns can have many pragmatic implications for our day-to-day lives. While contemporary living can sometimes appear to subjugate biology – after all, who needs circadian rhythms when we have caffeine pills, energy drinks, shift work and cities that never sleep? – keeping in synch with our body clock is important.

The average urban resident, for example, rouses at the eye-blearing time of 6.04 a.m., which researchers believe to be far too early. One study found that even rising at 7.00 a.m. has deleterious effects on health unless exercise is performed for 30 minutes afterward. The optimum moment has been whittled down to 7.22 a.m.: muscle aches, headaches and moodiness were reported to be lowest by participants in the study who awoke then.

Once you're up and ready to go, what then? If you're trying to shed some extra pounds, dieticians are adamant: never skip breakfast. This disorients your circadian rhythm and puts your body in starvation mode. The recommended course of action is to follow an intense workout with a carbohydrate-rich breakfast; the other way round and weight loss results are not as pronounced.

Morning is also great for breaking out the vitamins. Supplement absorption by the body is not temporal-dependent, but naturopath Pam Stone notes that the extra boost at breakfast helps us get energised for the day ahead. For improved absorption, Stone suggests pairing supplements with a food in which they are soluble and steering clear of caffeinated beverages. Finally, Stone warns to take care with storage; high potency is best for absorption, and warmth and humidity are known to deplete the potency of a supplement.

After-dinner espressos are becoming more of a tradition – we have the Italians to thank for that – but to prepare for a good night's sleep we are better off putting the brakes on caffeine consumption as early as 3 p.m. With a seven hour half-life, a cup of coffee containing 90 mg of caffeine taken at this hour could still leave 45 mg of caffeine in your nervous system at ten o'clock that evening. It is essential that, by the time you are ready to sleep, your body is rid of all traces.



READING PASSAGE 1

You should spend about 15 minutes on Questions 1–7, which are based on Reading Passage 1 below.

MAKING TIME FOR SCIENCE



Chronobiology might sound a little futuristic – like something from a science fiction novel, perhaps – but it's actually a field of study that concerns one of the oldest processes life on this planet has ever known: short-term rhythms of time and their effect on flora and fauna.

This can take many forms. Marine life, for example, is influenced by tidal patterns. Animals tend to be active or inactive depending on the position of the sun or moon. Numerous creatures, humans included, are largely diurnal – that is, they like to come out during the hours of sunlight. Nocturnal animals, such as bats and possums, prefer to forage by night. A third group are known as crepuscular: they thrive in the low-light of dawn and dusk and remain inactive at other hours.

When it comes to humans, chronobiologists are interested in what is known as the circadian rhythm. This is the complete cycle our bodies are naturally geared to undergo within the passage of a twenty-four hour day. Aside from sleeping at night and waking during the day, each cycle involves many other factors such as changes in blood pressure and body temperature. Not everyone has an identical circadian rhythm. 'Night people', for example, often describe how they find it very hard to operate during the morning, but become alert and focused by evening. This is a benign variation within circadian rhythms known as a chronotype.

Scientists have limited abilities to create durable modifications of chronobiological demands. Recent therapeutic developments for humans such as artificial light machines and melatonin administration can reset our circadian rhythms, for example, but our bodies can tell the difference and health suffers when we breach these natural rhythms for extended periods of time. Plants appear no more malleable in this



Questions 1–7

Do the following statements agree with the information given in Reading Passage 1?

In boxes 1–7 on your answer sheet, write

TRUE	if the statement agrees with the information
FALSE	if the statement contradicts the information
NOT GIVEN	if there is no information on this

- 1 Chronobiology is the study of how living things have evolved over time.
- 2 The rise and fall of sea levels affects how sea creatures behave.
- 3 Most animals are active during the daytime.
- 4 Circadian rhythms identify how we do different things on different days.
- 5 A 'night person' can still have a healthy circadian rhythm.
- 6 New therapies can permanently change circadian rhythms without causing harm.
- 7 Naturally-produced vegetables have more nutritional value.

READING PASSAGE 2

You should spend about 15 minutes on Questions 14–26, which are based on Reading Passage 2 below.

The Triune¹ Brain



The first of our three brains to evolve is what scientists call the reptilian cortex. This brain sustains the elementary activities of animal survival such as respiration, adequate rest and a beating heart. We are not required to consciously “think” about these activities. The reptilian cortex also houses the “startle centre”, a mechanism that facilitates swift reactions to unexpected occurrences in our surroundings. That panicked lurch you experience when a door slams shut somewhere in the house, or the heightened awareness you feel when a twig cracks in a nearby bush while out on an evening stroll are both examples of the reptilian cortex at work. When it comes to our interaction with others, the reptilian brain offers up only the most basic impulses: aggression, mating and territorial defence. There is no great difference, in this sense, between a crocodile defending its spot along the river and a turf war between two urban gangs.

Although the lizard may stake a claim to its habitat, it exerts total indifference toward the well-being of its young. Listen to the anguished squeal of a dolphin separated from its pod or witness the sight of elephants mourning their dead, however, and it is clear that a new development is at play. Scientists have identified this as the limbic cortex. Unique to mammals, the limbic cortex impels creatures to nurture their offspring by delivering feelings of tenderness and warmth to the parent when children are nearby. These same sensations also cause mammals to develop various types of social relations and kinship networks. When we are with others of “our kind” – be it at soccer practice, church, school or a nightclub – we experience positive sensations of togetherness, solidarity and comfort. If we spend too long away from these networks, then loneliness sets in and encourages us to seek companionship.

Only human capabilities extend far beyond the scope of these two cortices. Humans eat, sleep and play, but we also speak, plot, rationalise and debate finer points of morality. Our unique abilities are the result of an expansive third brain – the neocortex –

¹ Triune = three-in-one

which engages with logic, reason and ideas. The power of the neocortex comes from its ability to think beyond the present, concrete moment. While other mammals are mainly restricted to impulsive actions (although some, such as apes, can learn and remember simple lessons), humans can think about the “big picture”. We can string together simple lessons (for example, an apple drops downwards from a tree, hurling others causes unhappiness) to develop complex theories of physical or social phenomena (such as the laws of gravity and a concern for human rights).

The neocortex is also responsible for the process by which we decide on and commit to particular courses of action. Strung together over time, these choices can accumulate into feats of progress unknown to other animals. Anticipating a better grade on the following morning’s exam, a student can ignore the limbic urge to socialise and go to sleep early instead. Over three years, this ongoing sacrifice translates into a first class degree and a scholarship to graduate school; over a lifetime, it can mean ground-breaking contributions to human knowledge and development. The ability to sacrifice our drive for immediate satisfaction in order to benefit later is a product of the neocortex.

Understanding the triune brain can help us appreciate the different natures of brain damage and psychological disorders. The most devastating form of brain damage, for example, is a condition in which someone is understood to be brain dead. In this state a person appears merely unconscious – sleeping, perhaps – but this is illusory. Here, the reptilian brain is functioning on autopilot despite the permanent loss of other cortices.

Disturbances to the limbic cortex are registered in a different manner. Pups with limbic damage can move around and feed themselves well enough but do not register the presence of their littermates. Scientists have observed how, after a limbic lobotomy², “one impaired monkey stepped on his outraged peers as if treading on a log or a rock”. In our own species, limbic damage is closely related to sociopathic behaviour. Sociopaths in possession of fully-functioning neocortexes are often shrewd and emotionally intelligent people but lack any ability to relate to, empathise with or express concern for others.

One of the neurological wonders of history occurred when a railway worker named Phineas Gage survived an incident during which a metal rod skewered his skull, taking a considerable amount of his neocortex with it. Though Gage continued to live and work as before, his fellow employees observed a shift in the equilibrium of his personality. Gage’s animal propensities were now sharply pronounced while his intellectual abilities suffered; garrulous or obscene jokes replaced his once quick wit. New findings suggest, however, that Gage managed to soften these abrupt changes over time and rediscover an appropriate social manner. This would indicate that reparative therapy has the potential to help patients with advanced brain trauma to gain an improved quality of life.

² Lobotomy = surgical cutting of brain nerves

Questions 14–22

Classify the following as typical of

- A the reptilian cortex
- B the limbic cortex
- C the neocortex

Write the correct letter, A, B or C, in boxes 14–22 on your answer sheet.

- 14 giving up short-term happiness for future gains
- 15 maintaining the bodily functions necessary for life
- 16 experiencing the pain of losing another
- 17 forming communities and social groups
- 18 making a decision and carrying it out
- 19 guarding areas of land
- 20 developing explanations for things
- 21 looking after one’s young
- 22 responding quickly to sudden movement and noise

Questions 23–26

Complete the sentences below.

Write NO MORE THAN TWO WORDS from the passage for each answer.

Write your answers in boxes 23–26 on your answer sheet.

- 23 A person with only a functioning reptilian cortex is known as
- 24 in humans is associated with limbic disruption.
- 25 An industrial accident caused Phineas Gage to lose part of his
- 26 After his accident, co-workers noticed an imbalance between Gage’s and higher-order thinking.

Appendix C6: Second language (English) proficiency test score sheet



Name:

Date:

Time:

**Marker
use only
Score**

True, False or Not Given	1		
	2		
	3		
	4		
	5		
	6		
	7		
A the reptilian cortex	14		
	15		
B the limbic cortex	16		
	17		
	18		
C the neocortex	19		
	20		
A, B or C	21		
	22		
Write NO MORE THAN TWO WORDS from the passage for each answer	23		
	24		
	25		
	26		

Raw score

Band score

Appendix C7: Treatment text, enhanced and unenhanced

TEXT
E

Instructions:

Time allowed, 20 minutes

Please read the text.

Pay attention to the text.

When finished reading, turn the paper over.

CHAPTER THREE: REUNION

NEITHER ONE of them moved as they faced each other. Noah hadn't said anything, and for a second Daisy thought **he** didn't recognize **her**. Noah used to be **hers**. Suddenly Daisy felt guilty about showing up this way, without warning, and it made it harder. Daisy had thought that **she** would know what to say. But no. Everything that came into Daisy's head seemed inappropriate, somehow lacking. As Daisy stared at **him**, it was noticeable how little **he'd** changed since **she'd** last seen **him**. Noah looked good, Daisy thought. With **his** shirt tucked loosely into old faded jeans, Daisy could see the same broad shoulders as always remembered, tapering down to narrow hips than **hers** and a flat stomach. Noah was tanned, too, as if **he'd** worked outside all summer, and, though **his** hair was a little thinner and lighter than **she** had remembered **him**, **he** looked the same as **he** had when **she'd** known **him** last. Daisy took a deep breath and smiled. "Hello, Noah. It's good to see you again." **He** looked at **her** with amazement in **his** eyes. Then, after shaking **his** head slightly, **he** slowly began to smile. "You too," **he** stammered. Noah brought **his** hand to **his** chin, and Daisy noticed **he** hadn't shaved. "It's really you, isn't it? I can't believe it. **She** heard the shock in **his** voice as **he** spoke, and surprising **her** it all came together--being here, seeing **him**. **She** felt something twitch inside, something deep and old, something that made **her** dizzy for just a second. Daisy caught herself fighting for control. Daisy hadn't expected this to happen, didn't want it to happen. Daisy was engaged now. **She** hadn't come here for this. Yet. Yet the feeling went on despite **her**, and for a brief moment Daisy felt fifteen again. Felt as **she** hadn't in years, as if all **her** dreams could still come true. Felt as though **she'd** finally come home. Without another word they came together, as if it were the most natural thing in the world and Noah put **his** arms around **her**, drawing **her** close. They held each other tightly; both of them letting the fourteen years of separation dissolve in the deepening twilight. They stayed like that

for a long time before Daisy finally pulled back to look at **him**. Up close, **she** could see the changes **she** hadn't noticed at first. **His** face had lost the softness of youth, not like **hers**. The faint lines around **his** eyes had deepened. There was a new edge to **him**; **he** seemed less innocent, more cautious, and yet the way **he** was holding **her** made **her** realize how much **she'd** missed **him**. Daisy's eyes brimmed with tears as they finally released each other. **Hers** tearing up. Daisy laughed nervously while wiping the corners of those nice green eyes. "Are you okay?" **he** asked, a thousand other questions on **his** face. "I'm sorry, I didn't mean to cry. "It's okay," **he** said, smiling. "I still can't believe it's you. How did you find me?" Daisy stepped back, trying to compose herself, wiping away the last of **her** tears. "I saw the story on the house in the Raleigh paper a couple of weeks ago, and I had to come and see you again." Noah smiled broadly. "I'm glad you did." **He** stepped back. "You look fantastic. You're even prettier now than you were then." Daisy felt the blood in **her** face. Just like fourteen years ago. "Thank you. You look great, too." And **he** did no doubt about it. "So what have you been up to? Why are you here?" **His** questions brought **her** back to the present, making **her** realize what could happen if **she** wasn't careful. Don't let this get out of hand, Daisy told herself; the longer it goes on, the harder it's going to be. And **she** didn't want it to get any harder. **She** turned away and took a deep breath, wondering how to say **hers**, what **she** had wanted to say all day and when **she** finally started, Daisy's voice was quiet. "Noah, before you get the wrong idea, I did want to see you again, but there's more to it than just that." Daisy paused for a second. "I came here for a reason. There's something I have to tell you." "What is it?" Daisy looked away and didn't answer for a moment, surprised that **she** couldn't tell **him** just yet. In the silence, Noah felt a sinking feeling in **his** stomach. Whatever it was, it was bad. "I don't know how to say it. I thought I did at first, but now I'm not so sure. The air was suddenly rattled by the sharp cry of a raccoon, and Jessie came out

from under the porch, barking gruffly. Both of them turned at the commotion, and Daisy was glad for the distraction. "Is the dog yours?" Daisy asked. Noah nodded, feeling the tightness in **his** stomach. "Actually it's a girl. Jessie's **her** name. But yeah, Jessie's all mine." They both watched as Daisy stretched, then wandered towards the sounds. Daisy's eyes widened just a bit when **she** saw **her** limp away. "What happened to **her** leg?" **Daisy** asked, stalling for time. "Hit by a car a few months back. Doc Harrison, the vet, called me to see if I wanted **her** because the owner didn't any more. After I saw what had happened, I guess I just couldn't let **her** be put down." "You were always nice like that," Daisy said, trying to relax. Daisy looked past **him** towards the house. "You did a wonderful job restoring it. It looks perfect, just like I knew it would someday." **He** turned **his** head in the same direction as **hers** while **he** wondered about the small talk and what **Daisy** was holding back. "Thanks, that's nice of you. It was quite a project, though. I don't know if I would do it again." "Of course you would," Daisy said. **She** knew exactly how **he** felt about this place. But then **she** knew how **he** felt about everything-- or at least **she** had a long time ago. And with that Daisy realized they were strangers now. Maybe he wasn't **hers**. Fourteen years apart was a long time. Too long. "What is it, Daisy?" Noah turned to **her**, but Daisy continued to stare at the house. "I'm being rather silly, aren't I?" Daisy asked, trying to smile. "What do you mean?" "This whole thing. Showing up out of the blue, not knowing what I want to say. You must think I'm crazy." "You're not crazy," Noah said gently. **He** reached for **her** hand, and Daisy let **him** hold it as they stood next to one another. **He** went on: "Even though I don't know why, I can see this is hard for you. Why don't we go for a walk?" "Like we used to?" "Why not? I think we both could use one." **She** hesitated and looked to **his** front door. "Do you need to tell anyone?" **He** shook **his** head. "There's no one to tell. It's just me and Jessie." Even though **she** had asked, **she** had suspected there wouldn't be anyone else, and inside

Daisy didn't know how to feel about that. But it did make what **Daisy** wanted to say a little harder. It would have been easier if there was someone else. They started towards the river and turned onto a path near the bank. Daisy let go of **his** hand and walked on with just enough distance between them so that they couldn't accidentally touch. **He** looked at **her**. Daisy was still pretty, with thick hair and soft eyes, moving so gracefully that it seemed as though **she** were gliding. Daisy wanted a life with Noah, **he** could finally be **hers**.

TEXT
UE

Instructions:
Time allowed, 20 minutes
Please read the text.
Pay attention to the text.
When finished reading, turn the paper over.

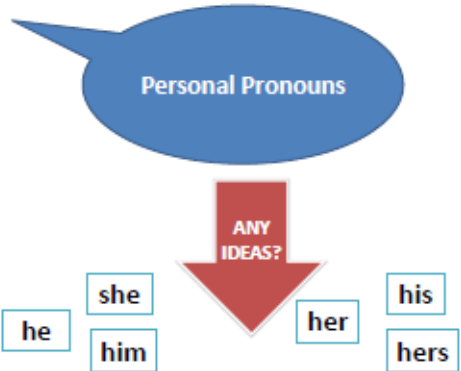
CHAPTER THREE: REUNION

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<p>you will now see a</p> <ul style="list-style-type: none"> ✓ short presentation (5 minutes) ✓ Reading task (15 minutes) <p>this is part of my research</p> <p>please pay close attention, listen and read</p> <p>do not make notes</p>	<p>any questions?</p> <p>please ask now</p>
<p>Explicit Rules Only Presentation</p> <p>(5 minutes)</p> <p>please pay close attention</p>	<p>Objectives</p> <ul style="list-style-type: none"> • You will be presented with an explanation of the rules for the grammar form: <p style="text-align: center;">Pronouns (gender) he/she him/her his/hers</p> <ul style="list-style-type: none"> • Please listen and watch, pay close attention • Please do not make any notes
<p>What are Pronouns?</p> <p>Pronouns take the place of nouns. The word or phrase replaced by a pronoun is called an antecedent.</p>	<p>Example 1</p> <p>When Robert was fixing the car, he cut his hand. (Robert is a noun. He is a pronoun that refers to the antecedent, <i>Robert</i>.)</p>
 <p>Personal Pronouns</p> <p>ANY IDEAS?</p> <p>he she him her his hers</p>	<p>Pronouns include:</p> <p>Include: I, me, my, mine, you, your, yours, he, him, his, she, her, hers, it, its, they, them, their, theirs, we, us, our, ours.</p>

Example 2

1. **He** took **her** place in the game.

Pronouns

What is a pronoun?

A **Pronoun** is a word used instead of a noun.

The noun in whose stead it stands is called its **Antecedent**.

John took Mary's book and gave it to his friend.

In this sentence *book* is the antecedent of the pronoun *it*, and *John* is the antecedent of *his*.

Why do we use a pronoun?

Pronouns should agree with their antecedents in person, gender, and number.

Pronouns of the **Third Person** indicate the person or thing spoken of; they are: *he, his, him, she, her, hers, they, their, theirs, them, it, its*.

Gender of Pronouns. The following pronouns indicate sex or gender; Masculine: *he, his, him*. Feminine: *she, her, hers*. Neuter: *it, its*.

Rules

The following rules govern the gender of pronouns:

Masculine; referred to by *he, his, and him*:

1. Nouns denoting males are always masculine.

Feminine; referred to by *she, her, or hers*:

1. Nouns denoting females are always feminine.

Use of these pronouns

- Nominative → he, she
- Objective → him, her
- Possessive → his, hers

Example 3 and 4 and 5

- **She** went to the shop.
- This book is **his**.
- This handbag is **hers**.

Personal Pronouns

Nominative	Objective	Possessive
I	me	my
you	you	your, yours
he	him	his
she	her	her, hers
it	it	its
we	us	our, ours
they	them	their, their

Activity

- Rickie gets on the plane. He is very excited about his trip.
- **Where are the pronouns?**
- Pronouns = he his
- Rickie = He

*Appendix C9: Example Grammatical Judgement Task
(used in pre-test, immediate post-test, delayed post-test)*

Answer sheet

Name:

Date:
.....

Time:

Instructions

in this test
there are two parts: yes or no and fill in the gap
please read the instructions and fill in where required
try to write down something each time you are asked
and make sure your answers are written clearly

Maximum time

15 minutes

Begin

Part A

Grammatical Judgement (choosing whether it makes sense or not)

**please decide whether these sentences make grammatical sense: Yes (Y) OR No (N).
do they make sense?**

1. My teacher was a man; she always looked after her books.
2. His mum loved him very much.
3. My mum shouted at me yesterday, he was very mad.
4. It was she.
5. Her father wanted her to go to university.
6. She was a small girl with her hair kept quite short.
7. She mum loved him very much.
8. My grandfather shouted at she yesterday.
9. It was his bag and hers had stolen it.
10. His father wanted her to be a doctor when he grew up.

<input type="checkbox"/>
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<input type="checkbox"/>

*Appendix C10: Example Productive Use Task
(used in pre-test, immediate post-test, delayed post-test)*

**Part B
Productive Use Task – Fill-in-the-blank**

fill in the gaps with one of these options:

he she him her his hers

1. I haven't seen my baby brother today. I miss _____.
2. He had to realise soon, it wasn't all about _____ and his job.
3. I decided to vote for _____. He deserved it.
4. My sister works in a hospital. _____ is a nurse.
5. My friend Peter found maths difficult, I felt sorry for _____.
6. Leah is Lucy's best friend; _____ has known her for years.
7. He got married to _____ and they lived happily.
8. Before _____ goes to bed sometimes Jack watches TV.
9. It wasn't _____ to take; we had also paid for it.
10. John and _____ friend Mike had always wanted to go to a good university.
11. _____ plans for the menu are exciting; he will cook rice and chicken.
12. Actually, my capability might even be much less developed than _____.
13. Beth said Linda and _____ could wait to shop later, after lunch.
14. John's mother told _____ to take out the garbage.
15. Matthew told David to wait for _____.
16. Her mother was called Rachel but _____ brother was called Mike.
17. Every man and every boy received _____ dinner.
18. Every man or boy gave _____ offering.
19. When Lisa was born, _____ was a very small baby.
20. The family's running out of money, but that's a secret between his mother and _____.

21. My grandfather was a good man, _____ worked very hard for my mother to go to a good university.
22. I told _____ last week, he will not like it.
23. Some girls lost _____ shoes and purse.
24. I told _____ to go; I didn't want him in my house.
25. My mother was so happy with me; _____ bought me a new dress for my interview.
26. My Mom still has her wedding dress from 31 years ago and my sister has kept _____.
27. Your brother will tell you that you will have to buy your suit where _____ bought _____.
28. _____ birthday was in September, we wanted to make sure she had a good party.
29. She named _____ Bill.
30. He lost his hat, _____ was very annoyed.
31. She lost weight, _____ looked really slim.
32. Paul is doing _____ homework.
33. She gave her friend some money, and asked that _____ gave it back in a months' time.
34. She lost out to her David; she cannot believe she lost out to _____.

end

<p>Grade: Class number: Student number:</p>
--

Answer sheet

Name:

Date:
.....

Instructions

please read the questions and fill in the answers where required
try to write down something each time you are asked
and make sure your answers are written clearly

Maximum time

15 minutes

Begin

Part A: Recall

Please recall as much of the text as you can – what was the text about?

Part B: Question

What was the main idea behind the text?

Part C: True or False

Please choose true or false for the following statements

1. The pet in the story was called Harry.
2. The woman in the story had known the man (Noah) for a long time.
3. Noah had a dog.
4. Noah and the woman in the story were maybe once in love.
5. The two main characters in the story were Noah and Jane.

<p>Grade: Class number: Student number:</p>
--

Answer sheet

Name:

Date:
.....

Time:

Instructions

please read the questions and fill in the answers in English where required
try to write down something each time you are asked
and make sure your answers are written clearly

Maximum time

15 minutes

Did you notice anything about your materials (the paper) when reading the text?

Explain your understanding of gender pronouns (*he, she, him, his, hers*)

When do we use them? What are the rules? Give an example using each.

Examples	Give an example sentence using the pronoun
he	
she	
him	
her	
his	
hers	

Appendix C13: Debrief for all Participants



Lucy Atkinson PhD Research
Study 1

Debrief

Thank you



Thank you for taking part in my 哲学博士
(Zhéxué bóshì) research

- Please remember to read the Information Sheet I left in each of your classrooms if you have any further questions



- Just to remind you:

What will happen to the information?

- Your information will be stored in a locked cupboard.
- You will be anonymous throughout the research and your name will be replaced with a random number
- Information you give will be for research purposes only

Not sure about participating? Or Do I have to take part?

- If you do not want to participate, that is fine
- Simply email me with your class number and student number and ask me to remove your data and I will do so. You do not need to provide a reason

The Research



The research will gain insights into how best to present materials as part of an English learning programme

I hope to make it easier for second language learners in the future to be able to master English as a foreign language

The results of this study are hoped to be presented at conferences involving Teaching English as Foreign Language (TEFL) providers and in psychology/teaching journals



- Once I have written the study, each class will be sent a copy (around October 2014) digitally and by post from the UK
- Nanhai Senior Middle School will also be acknowledged within the PhD research project for taking part



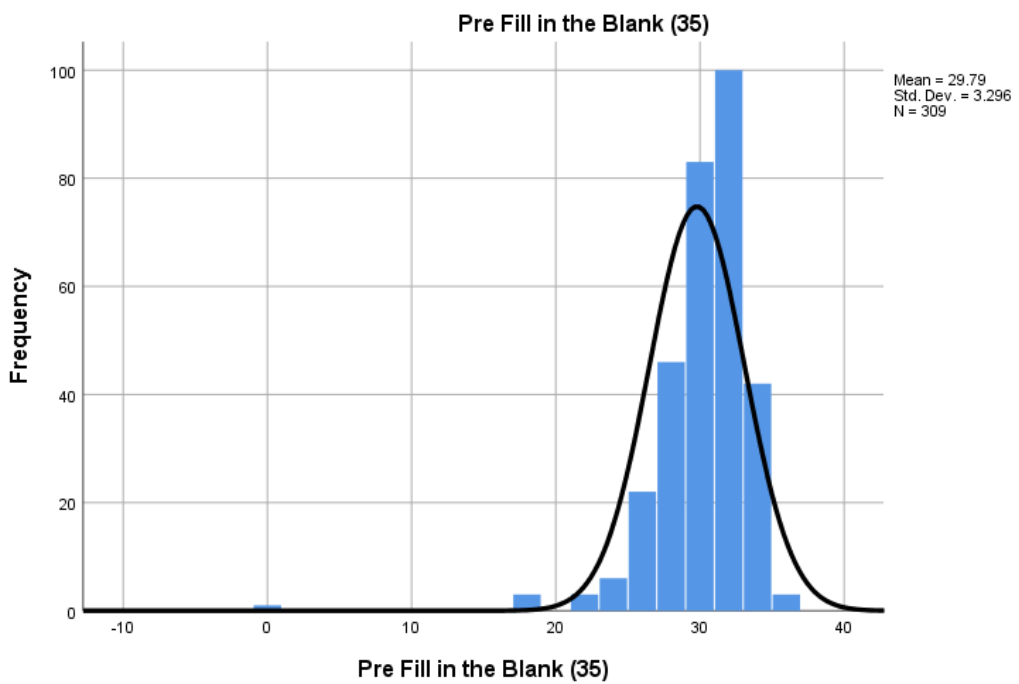
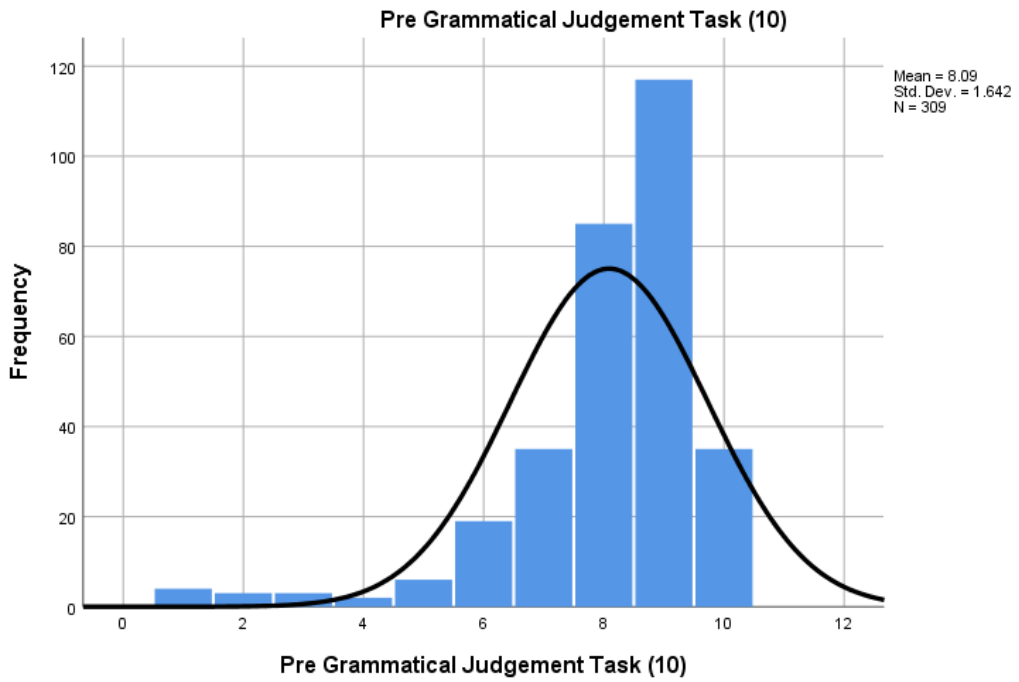
If you have any questions about the research please contact me on:

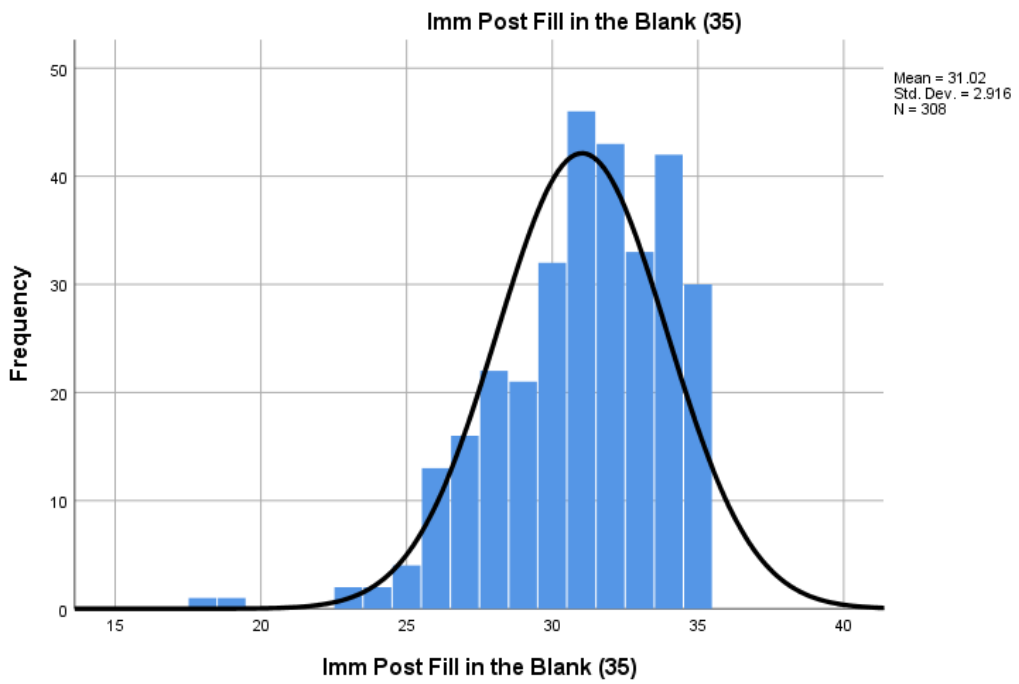
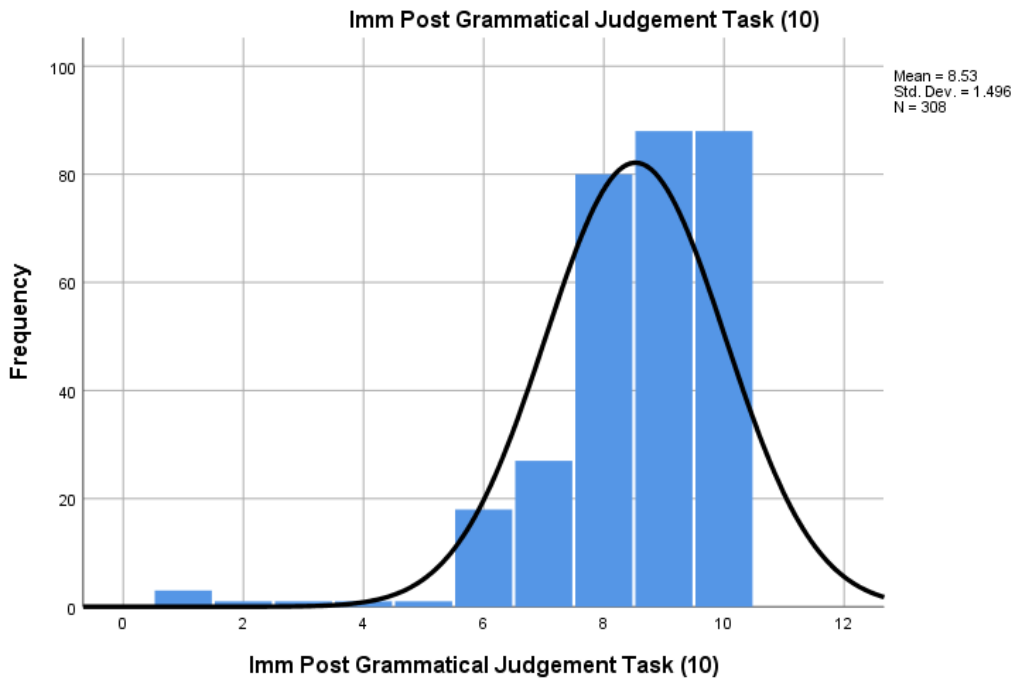
lucy.atkinson@northampton.ac.uk

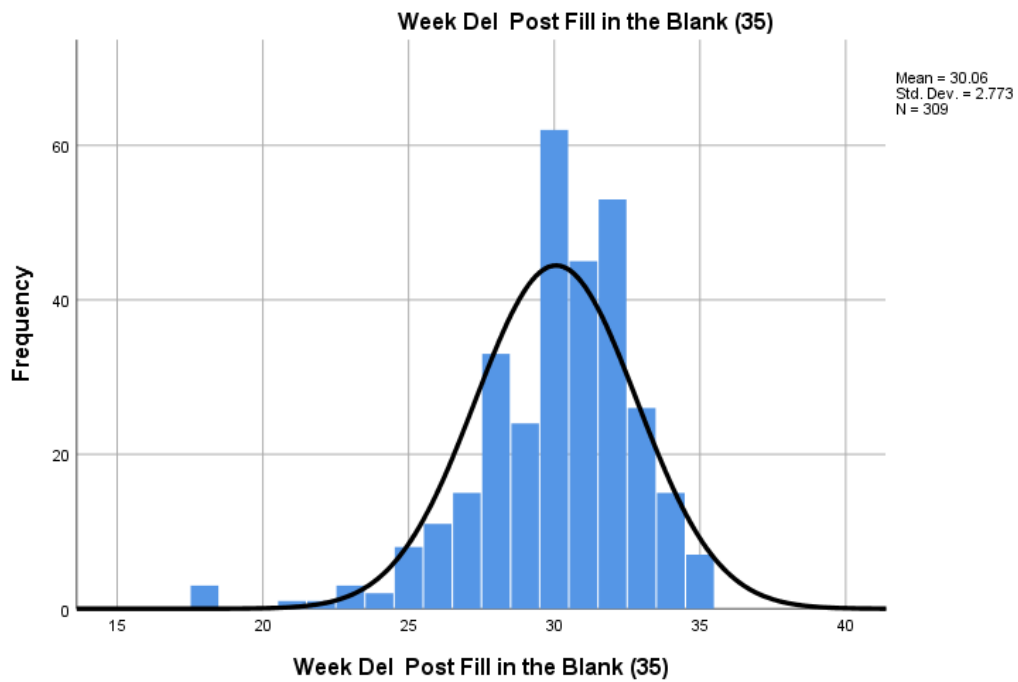
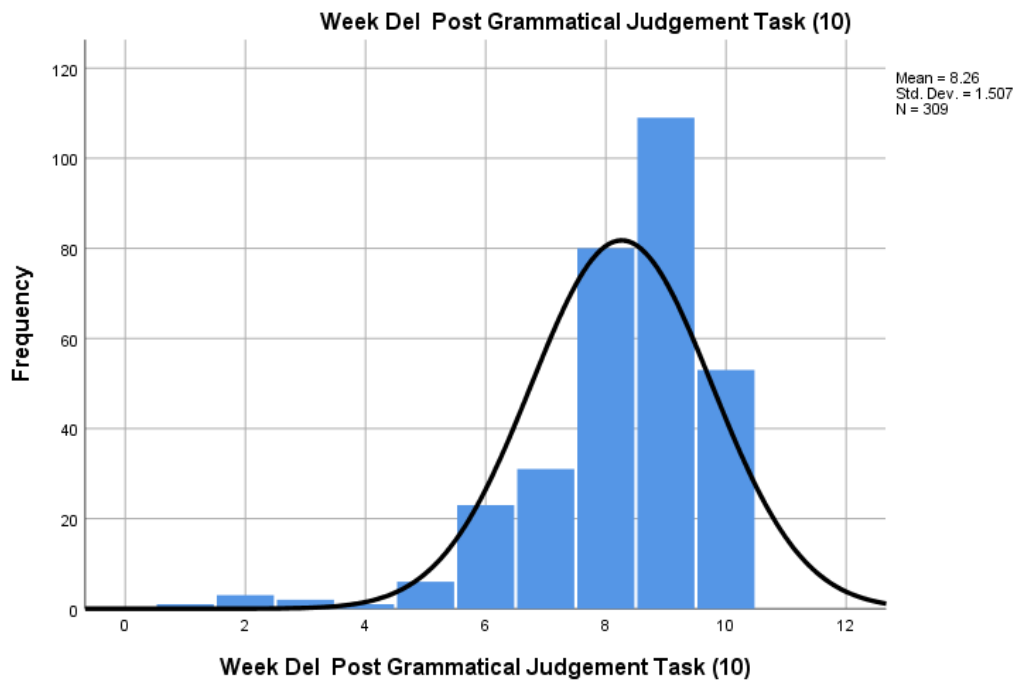
Chinese mobile number:
13570945343

WeChat:
Lucyatkinson16

Appendix C14: Histogram Evidence of Pre, Immediate and Delayed Post-tests (GJT and Productive-use Task) to check for Normal Distribution







	Kolmogorov-Smirnov			Shapiro-Wilk		
		df	Sig.		df	Sig.
Pre-Fill in the Blank (35)	.174	308	.000	.806	308	.000
Imm Post Fill in the Blank (35)	.119	308	.000	.954	308	.000
Week Del Post Fill in the Blank (35)	.163	308	.000	.928	308	.000

Appendix D: Experiment 2 Documents

Appendix D1: Information sheet

INFORMATION SHEET



Thank you for showing an interest in my study, which forms part of my PhD research and is concerned with finding ways to improve teaching and learning of English for second language learners. I am a current PhD student in the Division of Psychology, School of Social Sciences at the University of Northampton. I have approached you because you are a second language learner of English and I am interested in how differences among second language learners influence their learning. It would be great if you would agree to take part.

Study Title: The Impact of Modality on Input Enhancement and Grammatical Rules on Intake and Comprehension

Purpose of the research/study:

This research is to find out about different study conditions differences when input enhancement is used (enhancing a specific grammatical learning pattern by textual enhancement or audio enhancement).

Who the researchers are:

The research team consists of me, a postgraduate researcher in the Division of Psychology in the School of Social Sciences at the University of Northampton and my two supervisors: Catherine Fritz (catherine.fritz@northampton.ac.uk) and Steve Kilpatrick (steve.kilpatrick@northampton.ac.uk).

What the study involves:

The proposed study assesses the effectiveness of textual enhancement. This is where a grammar point in the text is enhanced or highlighted and then you may be asked to recall or complete a short test on that grammar form later. This study is not a test of how well you can read or have learnt English. It is a comparison of different ways of presenting and working with materials in English.

What will happen to my data?

The data without any personally identifying information will be used as part of a research project and may be used in subsequent scientific publications.

What will happen to the information?

The information given will be stored in a locked filing cabinet. The identity of each participant (you) will remain anonymous throughout the research process and in the report. We will do this by assigning a number for your data. From then on you will be known only by your number. This is so your response cannot be traced back to you and your identity is protected. Once the research is completed, the identifying information will be destroyed. When we write any report of the study, it will not be possible to identify you or anyone else who participated in the study. The information you give will be for research purposes only.

Most importantly, I hope that from this study we will gain insights into how best to present materials as part of an English learning programme. Therefore, we hope to make it easier for second language learners in the future to be able to master English as a foreign language. The results of this study are hoped to be presented at conferences involving Teaching English as Foreign Language (TEFL) providers and in psychology/teaching journals.

Not sure about participating? Or Do I have to take part?

If you do not want to participate, that is fine; you have the right not to participate. You can also stop at any time if you do not want to finish the study i.e. without any penalty; just let us know if you want to stop. If you decide after finishing that you did not want to participate, that's alright, too; simply email me with your participant number and ask me to remove your data and I will do so. You do not need to provide a reason.

Contact the Researcher:

Lucy Atkinson

Phone 07737449354

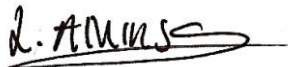
Email lucy.atkinson@northampton.ac.uk

l.e.atkinson2@gmail.com

If you have any queries about the study, please feel free to contact myself or my academic supervisors, Catherine Fritz (Catherine.fritz@northampton.ac.uk) or Steve Kilpatrick (steve.kilpatrick@northampton.ac.uk).

Thank you for your interest and support. If you would like to participate in the research, please complete and return the consent form and the contact details form in the envelope provided.

Lucy Atkinson



Postgraduate Researcher, Division of Psychology
School of Social Sciences
University of Northampton
Park Campus
Boughton Green Road
Northampton
NN2 7AL

Consent Form

Project title:

The Impact of Modality on Input Enhancement and Grammatical Rules on Intake and Comprehension

Please read the following and tick the boxes if the answer is 'yes'

- a. I have read and had explained to me by Lucy Atkinson, the Information Sheet relating to this project.

Initial name:

Yes	No
-----	----

- b. 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.

Initial name:

Yes	No
-----	----

- c. I understand that my participation is entirely voluntary and that I have the right to withdraw from the project for up to a month.

Initial name:

Yes	No
-----	----

- d. I have received a copy of this Consent Form and of the accompanying Information Sheet.

Initial name:

Yes	No
-----	----

If you are unable to tick yes to any of the above or would simply like to discuss the project further before giving your consent to participate then please speak to Lucy Atkinson, lucy.atkinson@northampton.ac.uk.

Name:

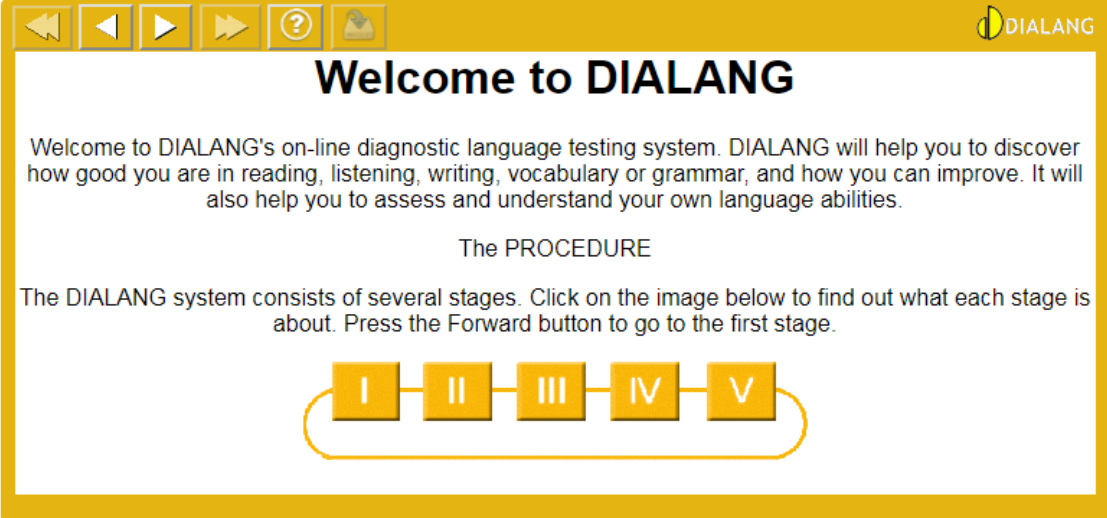
Signed:

Date:

I will contact you within a week regarding the rooms and times. All sessions will take place in Grendon Park Campus, University of Northampton

Appendix D3: Second Language English Proficiency Test by Dialang

Taken from: <https://dialangweb.lancaster.ac.uk/setals>





Welcome to DIALANG

Welcome to DIALANG's on-line diagnostic language testing system. DIALANG will help you to discover how good you are in reading, listening, writing, vocabulary or grammar, and how you can improve. It will also help you to assess and understand your own language abilities.

The PROCEDURE

The DIALANG system consists of several stages. Click on the image below to find out what each stage is about. Press the Forward button to go to the first stage.



12,000
We have over 12,000 students, from over 100 countries, within one of the safest campuses in the UK

97%
97% of Lancaster students go into work or further study within six months of graduating

Lancaster University > DIALANG



About DIALANG

Reasons to use DIALANG

Frequently asked questions

Tests and results

Technical information

DIALANG and cookies

Contact us

Experimental item types

DIALANG Status = OK

Information About DIALANG (previously at www.dialang.org)

Updated 22 March 2017

DIALANG WEB VERSION

We are closing the old DIALANG service, the one that required download and installation.

There is now a new improved web-based version of DIALANG available. All you need now is a web-browser (so DIALANG now works on many different operating systems). [Click here for more information](#) and how to access it.

About DIALANG

DIALANG is a language diagnosis system developed by many European higher education institutions. It reports your level of skill against the Common European Framework (CEF) for language learning. DIALANG is not an exam. DIALANG does not issue certificates.

DIALANG's skills are reading, writing, listening, grammar and vocabulary

DIALANG's languages are Danish, Dutch, English, Finnish, French, German, Greek, Icelandic, Irish-gaelic, Italian, Norwegian, Portuguese, Spanish and Swedish. DIALANG has instructions and tests in all these languages.

DIALANG Background

DIALANG was developed by many European universities with assistance from Europe.

At the end of the work, the prototype DIALANG software was made public, and this (converted to web access) is what is running today.

DIALANG now has no employees and no money.

Lancaster University (UK) is running the technology of DIALANG "pro bono". When there is a problem, our technicians fix it in their free time without payment.

Lancaster University is currently working to try to find a sustainable future for DIALANG.

DIALANG Google Group

There is a Google group for users of DIALANG. [Please click here for details.](#)

Script for the native speaker who enhanced the bolded items recorded through a Dictaphone

Chapter 2

Treats of Oliver Twist's growth, education, and board

For the next eight or ten months, Oliver was the victim of a systematic course of treachery and deception. **He** was brought up by hand. The hungry and destitute situation of the infant orphan was duly reported by the workhouse authorities to the parish authorities. The parish authorities inquired with dignity of the workhouse authorities, whether there was no female then domiciled in 'the house' who was in a situation to impart to Oliver Twist, the consolation and nourishment of which **he** stood in need. The workhouse authorities replied with humility, that there was not. Upon this, the parish authorities magnanimously and humanely resolved, that Oliver should be 'farmed,' or, in other words, that **he** should be dispatched to a branch-workhouse some three miles off, where twenty or thirty other juvenile offenders against the poor-laws, rolled about the floor all day, without the inconvenience of too much food or too much clothing, under the parental superintendence of an elderly female, who received the culprits at and for the consideration of sevenpence-halfpenny per small head per week. Sevenpence-halfpenny's worth per week is a good round diet for a child; a great deal may be got for sevenpence-halfpenny, quite enough to overload its stomach, and make it uncomfortable. The elderly female was a woman of wisdom and experience; **she** knew what was good for children; and **she** had a very accurate perception of what was good for herself. So, **she** appropriated the greater part of the weekly stipend to **her** own use, and consigned the rising parochial generation to even a shorter allowance than was originally provided for them. Thereby finding in the lowest depth a deeper still; and proving herself a very great experimental philosopher.

Everybody knows the story of another experimental philosopher who had a great theory about a horse being able to live without eating, and who demonstrated it so well, that **he** had got **his** own horse down to a straw a day, and would unquestionably have rendered **him** a very spirited and rampacious animal on nothing at all, if **he** had not died, four-and-twenty hours before **he** was to have had **his** first comfortable bait of air. Unfortunately for, the experimental philosophy of the female to whose protecting care Oliver Twist was delivered over, a similar result usually attended the operation of **her** system; for at the very moment when the child had contrived to exist upon the smallest possible portion of the weakest possible food, it did perversely happen in eight and a half cases out of ten, either that it sickened from want and cold, or fell into the fire from neglect, or got half-smothered by accident; in any one of which cases, the miserable little being was usually summoned into another world, and there gathered to the fathers it had never known in this.

'Goodness gracious! Is that you, Mr. Bumble, sir?' said Mrs. Mann, thrusting **her** head out of the window in well-affected ecstasies of joy. '(Susan, take Oliver and them two brats upstairs, and wash 'em directly.)—My heart alive! Mr. Bumble, how glad I am to see you, sure-ly!'

Now, Mr. Bumble was a fat man, and a choleric; so, instead of responding to this open-hearted salutation in a kindred spirit, **he** gave the little wicket a tremendous shake, and then bestowed upon it a kick which could have emanated from no leg but a beadle's.

'Lor, only think,' said Mrs. Mann, running out,—for the three boys had been removed by this time,—'only think of that! That I should have forgotten that the gate was bolted on the inside, on account of them dear children! Walk in sir; walk in, pray, Mr. Bumble, do, sir.'

Although this invitation was accompanied with a curtsey that might have softened the heart of a churchwarden, it by no means mollified the beadle.

'Do you think this respectful or proper conduct, Mrs. Mann,' inquired Mr. Bumble, grasping **his** cane, 'to keep the parish officers a waiting at your garden-gate when they come here upon parochial business with the parochial orphans? Are you aweer, Mrs. Mann, that you are, as I may say, a parochial delegate, and a stipendiary?'

'I'm sure Mr. Bumble, that I was only a telling one or two of the dear children as is so fond of you, that it was you a coming,' replied Mrs. Mann with great humility.

Mr. Bumble had a great idea of **his** oratorical powers and **his** importance. **He** had displayed the one, and vindicated the other. **He** relaxed.

'Well, well, Mrs. Mann,' **he** replied in a calmer tone; 'it may be as you say; it may be. Lead the way in, Mrs. Mann, for I come on business, and have something to say.'

Mrs. Mann ushered the beadle into a small parlour with a brick floor; placed a seat for **him**; and officiously deposited **his** cocked hat and cane on the table before **him**. Mr. Bumble wiped from **his** forehead the perspiration which **his** walk had engendered, glanced complacently at the cocked hat, and smiled. Yes, **he** smiled. Beadles are but men: and Mr. Bumble smiled.

'Now don't you be offended at what I'm a going to say,' observed Mrs. Mann, with captivating sweetness. 'You've had a long walk, you know, or I wouldn't mention it. Now, will you take a little drop of somethink, Mr. Bumble?'

'Not a drop. Nor a drop,' said Mr. Bumble, waving **his** right hand in a dignified, but placid manner.

'I think you will,' said Mrs. Mann, who had noticed the tone of the refusal, and the gesture that had accompanied it. 'Just a leetle drop, with a little cold water, and a lump of sugar.'

Mr. Bumble coughed.

'Now, just a leetle drop,' said Mrs. Mann persuasively.

'What is it?' inquired the beadle.

'Why, it's what I'm obliged to keep a little of in the house, to put into the blessed infants' Daffy, when they ain't well, Mr. Bumble,' replied Mrs. Mann as **she** opened a corner cupboard, and took down a bottle and glass. 'It's gin. I'll not deceive you, Mr. B. It's gin.'

'Do you give the children Daffy, Mrs. Mann?' inquired Bumble, following with **his** eyes the interesting process of mixing.

'Ah, bless 'em, that I do, dear as it is,' replied the nurse. 'I couldn't see 'em suffer before my very eyes, you know sir.'

'No'; said Mr. Bumble approvingly; 'no, you could not. You are a humane woman, Mrs. Mann.' (Here **she** set down the glass.) 'I shall take a early opportunity of mentioning it to the board, Mrs. Mann.' (**He** drew it towards **him**.) 'You feel as a mother, Mrs. Mann.' (**He** stirred the gin-and-water.) 'I—I drink your health with cheerfulness, Mrs. Mann'; and **he** swallowed half of it.

'And now about business,' said the beadle, taking out a leathern pocket-book. 'The child that was half-baptized Oliver Twist, is nine year old to-day.'

'Bless **him**!' interposed Mrs. Mann, inflaming **her** left eye with the corner of **her** apron.

'And notwithstanding an offered reward of ten pound, which was afterwards increased to twenty pound. Notwithstanding the most superlative, and, I may say, supernat'ral exertions on the part of this parish,' said Bumble, 'we have never been able to discover who is **his** father, or what was **his** mother's settlement, name, or condition.'

Mrs. Mann raised **her** hands in astonishment; but added, after a moment's reflection, 'How comes **he** to have any name at all, then?'

The beadle drew himself up with great pride, and said, 'I invented it.'

'You, Mr. Bumble!'

'I, Mrs. Mann. We name our fondlings in alphabetical order. The last was a S,—Swubble, I named **him**. This was a T,—Twist, I named **him**. The next one comes will be Unwin, and the next Vilkins. I have got names ready made to the end of the alphabet, and all the way through it again, when we come to Z.'

'Why, you're quite a literary character, sir!' said Mrs. Mann.

'Well, well,' said the beadle, evidently gratified with the compliment; 'perhaps I may be. Perhaps I may be, Mrs. Mann.' **He** finished the gin-and-water, and added, 'Oliver being now too old to remain here, the board have determined to have **him** back into the house. I have come out myself to take **him** there. So let me see **him** at once.'

'I'll fetch **him** directly,' said Mrs. Mann, leaving the room for that purpose. Oliver, having had by this time as much of the outer coat of dirt which encrusted **his** face and hands, removed, as could be scrubbed off in one washing, was led into the room by **his** benevolent protectress.

'Make a bow to the gentleman, Oliver,' said Mrs. Mann.

Oliver made a bow, which was divided between the beadle on the chair, and the cocked hat on the table.

'Will you go along with me, Oliver?' said Mr. Bumble, in a majestic voice.

Oliver was about to say that **he** would go along with anybody with great readiness, when, glancing upward, **he** caught sight of Mrs. Mann, who had got behind the beadle's chair, and was shaking **her** fist at **him** with a furious countenance. **He** took the hint at once, for the fist had been too often impressed upon **his** body not to be deeply impressed upon **his** recollection.

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Unenhanced Text

Chapter 2

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Appendix D5: Explicit Rules only presentation (see Appendix A5 also)

Explicit Rules Only
Presentation

(10 minutes)

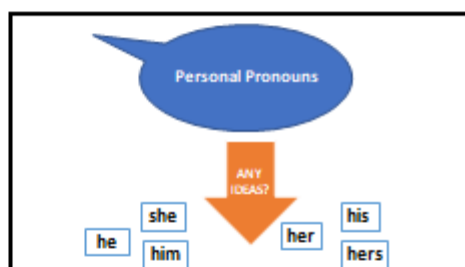
please pay close attention

Objectives

- You will be presented with an explanation of the rules for the grammatical form:
Pronouns (gender)
he/she him/her his/hers
- Please listen and watch, pay close attention
- Please do not make any notes

What are Pronouns?

Pronouns take the place of nouns.
The word or phrase replaced by a pronoun is called an **antecedent**.



Pronouns include:

Include: I, me, my, mine, you, your, yours, he, him, his, she, her, hers, it, its, they, them, their, theirs, we, us, our, ours.

Example 2

1.He took **her** place in the game.

Pronouns

What is a pronoun?

A **Pronoun** is a word used instead of a noun.

The noun in whose stead it stands is called its **Antecedent**.

John took Mary's book and gave it to his friend.

In this sentence *book* is the antecedent of the pronoun *it*, and *John* is the antecedent of *his*.

Why do we use a pronoun?

Pronouns should **agree** with their antecedents in **person, gender, and number**.

Pronouns of the **Third Person** indicate the person or thing spoken of; they are: *he, his, him, she, her, hers, they, their, theirs, them, it, its*.

Gender of Pronouns. The following pronouns indicate sex or gender; Masculine: *he, his, him*. Feminine: *she, her, hers*. Neuter: *it, its*.

Rules

The following rules govern the gender of pronouns:

Masculine; referred to by *he, his, and him*:

1. Nouns denoting males are always masculine.

Feminine; referred to by *she, her, or hers*:

1. Nouns denoting females are always feminine.

Use of these pronouns

- Nominative → he, she
- Objective → him, her
- Possessive → his, hers

Example 3 and 4 and 5

- She went to the shop.
- This book is his.
- This handbag is hers.

Personal Pronouns

Nominative	Objective	Possessive
I	me	my
you	you	your, yours
he	him	his
she	her	her, hers
it	it	its
we	us	our, ours
they	them	their, theirs

Activity

- Rickie gets on the plane. He is very excited about his trip.
- **Where are the pronouns?**
- Pronouns = he his
- Rickie = He



Thank you for completing the presentation of the Gender Pronouns

If you have any questions about the research please contact me on:

lucy.atkinson@northampton.ac.uk

We Chat:
Lucyatkinson16

Appendix D6: Debrief for all Participants




**THE UNIVERSITY OF
NORTHAMPTON**

Lucy Atkinson PhD Research
Study 2

Debrief

If you have any questions about the research please contact me on:
lucy.atkinson@northampton.ac.uk


Wechat
Lucyatkinson16



Thank you

Thank you for taking part in my 哲学博士
(Zhéxué bóshì) research

- Please remember to read the Information Sheet 1 provided to you at the beginning on the study if you have any further questions




Just to remind you:

What will happen to the information?

- Your information will be stored in a locked cupboard.
- You will be anonymous throughout the research and your name will be replaced with a random number
- Information you give will be for research purposes only

Not sure about participating? Or Do I have to take part?

- If you do not want to participate, that is fine
- Simply email me with your student number and ask me to remove your data and I will do so. You do not need to provide a reason



The Research

The research will gain insights into how best to present materials as part of an English learning programme

I hope to make it easier for second language learners in the future to be able to master English as a foreign language

The results of this study are hoped to be presented at conferences involving Teaching English as Foreign Language (TEFL) providers and in psychology/teaching journals

Appendix D7: Multiple Choice Task
Appendix D8: 2. Grammatical Judgement Task
Appendix D9: Productive Use Task

1. Multiple Choice Task	2. Grammatical Judgement Task	3. Productive Use Task
<p>Learners choose the most appropriate word from the four choices provided.</p> <p><i>I took my sister to her doctor. The doctor said _____ was developing symptoms of depression.</i></p> <p style="margin-left: 40px;">he she him her</p>	<p>Learners choose whether the statements are grammatical correct or not.</p> <p><i>That is the girl I told you about. Him is extremely knowledgeable in science.</i></p> <p style="margin-left: 40px;">Grammatical Ungrammatical Not sure</p>	<p>Learners use gender pronouns correctly in a sentence.</p> <p>Using the gender pronouns, he/him/she/her, create a sentence.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

Appendix D10: Histogram Evidence of Pre, Immediate and Delayed Post-tests (GJT, MCT and Productive-use Task) to check for Normal Distribution

