University of Southampton

Faculty of Arts and Humanities

Department of Languages, Cultures and Linguistics

The Role of Processing Instruction in the Acquisition of English Restrictive Relative Clauses by L1 Saudi Arabic Speakers

by

Faraj Ahmed Alhamami

Thesis for the degree of Doctor of Philosophy (PhD) in Applied Linguistics

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Abstract

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An Investigation into the Role of Processing Instruction on the Acquisition of Relative Clauses by Arabic-speaking Second Language Learners of English

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Recent literature has extensively examined the acquisition of English restrictive relative clauses (RRCs), indicating that Arabic learners encounter particular difficulties (Zagood 2012; Shaheen, 2013; Alroudhan 2016; Abumelhah, 2016). English and Arabic differ in their use of overt versus covert relative markers and agreement features. However, instruction in English rarely emphasises the form-focused and processing aspects of relative clause constructions. This study draws on insights from current generative second language acquisition research on the linguistic properties of English RRCs to examine the effectiveness of Processing Instruction (PI) in the classroom.

VanPatten's Input Processing (IP) model (VanPatten and Oikkenon, 1996; VanPatten, 2004; VanPatten and Williams, 2007) addresses the acquisition of morphosyntax by exploring how linguistic form and cognitive processing interact during comprehension, proposing that L2 morphosyntactic difficulties may arise from learners' allocation of attention to input. To mitigate these difficulties, VanPatten (2004) describes PI as comprising two types of structured input activities: referential activities, which require learners to focus on a particular form and its meaning, and affective activities, which present multiple examples of the target form while directing learners' attention to the overall meaning of the sentences. Until now, these two PI activity types have typically been combined into a single instructional approach, and few empirical studies have separately examined their distinct

effects. Consequently, this experimental study aims to isolate and compares the effects of referential and affective PI activities on the acquisition of English RRCs by beginner Saudi speakers of English.

Four experimental groups and a control group are included in the study. It begins by identifying the specific difficulties faced by L2 learners in acquiring English RRCs and by pinpointing features believed to involve re-assembly difficulties, such as syntactic constraints on the use of the definite article when a noun phrase is modified by a relative clause. Three research instruments are employed to assess participants' performance: a Grammaticality Judgment Task, a Picture-Cued Task, and a Translation Task, all of which are administered as pre-tests, immediate post-tests and delayed post-tests (seven weeks later). A quantitative approach is used, comparing scores from the pre-tests, post-tests and delayed post-tests to measure learners' development. The data are analysed using descriptive statistics, repeated measures ANOVAs and t-tests.

Initial results indicate that only the referential activities condition produced improvement in learners' accurate use of English RRCs, including a sustained long-term effect that was not observed for the affective activities, Traditional Instruction or the control group. Subsequent findings indicate that an ERA intervention also leads to improvement across all four conditions examined: a definite RRC with an overt complementiser; a definite RRC with a null complementiser; an indefinite RRC with an overt complementiser; and an indefinite RRC with a null complementiser. ERA also produces a sustained long-term effect. Therefore, this study suggests that in such challenging contexts, ERA instruction – and especially its referential activities component – is the type of instruction recommended to help learners decrease the L1 crosslinguistic influence, thereby developing the target L2 knowledge. Moreover, an important implication is that claims of previous PI studies about the main factors driving its effectiveness require a more nuanced explanation. The findings of the present study thus contribute to both theoretical understanding and empirical knowledge, particularly in the areas of Processing Instruction and generative SLA research. Finally, the study adopts the Modular Online Growth and Use of Language (MOGUL) model, part of the Modular Cognition Framework (MCF), a language development model to bridge the gap between PI and GenSLA research. MCF also accounts to tease apart modular and extra-modular types of L2 knowledge.

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I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

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Definitions and Abbreviations

(IP)	Input Processing Theory
(PI)	Processing Instruction"
(SIA)	Structured Input Activities
(FMC)	Form-Meaning Connection
(L1)	First Language
(L2)	Second Language
(L1A)	First Language Acquisition
(SlA)	Second Language Acquisition
(L2ers)	Second Language Learners
(ERA)	Referential + Affective
(RA)	Referential-Only
(EA)	Affective-Only
(TI)	Traditional Instruction
(CG)	Control Group
(GJT)	Grammaticality Judgement Task
(PCT)	Picture-Cue Task
(GenSLA)	Generative Second Language Acquisition
(UG)	Universal Grammar
(ILG)	Interlanguage Grammar
(RRCs)	Restrictive Relative Clauses
(MCF)	Modular Cognitive Framework
(MOGUL)	Modular On-Line Growth and Use Of Language
(CS)	Conceptual System
(Afs)	Affective Structures
(Pops)	Perceptual Output Structure
(PS)	Phonological Structures
(FT/FA)	Full Transfer/ Full Access
(FRH)	Feature Reassembly Hypothesis

Chapter One: Introduction

1.1. Introduction

Second language acquisition (SLA) research widely recognizes that input—the language that learners hear or read for communication—is essential for language development (VanPatten, Smith & Benati, 2019). However, when learners are exposed to input, only a portion of it is actually processed and internalized. This processed subset of input is referred to as intake. Sharwood Smith (1993, p.167) describes input as language data that learners could potentially process, whether encountered by chance or provided intentionally. In other words, intake represents the fraction of input that learners successfully assimilate and can use for learning. Processing certain grammatical structures from input can be challenging, and English relative clauses are a prime example. Interpreting English restrictive relative clauses (RRCs) requires learners to overcome multiple processing problems at the input level, making these structures particularly difficult to fully absorb. The present study is grounded in Input Processing (IP) theory (VanPatten, 1996, 2004, 2015a), which examines how learners convert input into intake. In particular, this work explores the acquisition of English restrictive relative clauses by adult learners (Zagood, 2012; Shaheen, 2013; Alroudhan, 2016; Abumelhah, 2016). It contributes to the ongoing discussion about the role of classroom instruction by analyzing how different types of instruction influence learners' cognitive processing of input. Specifically, the study focuses on Processing Instruction (PI), the pedagogical application of VanPatten's IP model, and its effect on how learners process English RRCs input. PI is a type of input-based instructional approach designed to alter learners' default processing strategies so that more input becomes intake. Rather than emphasizing output practice, PI takes a proactive stance by targeting how learners perceive and interpret incoming language, aiming to improve the chances that linguistic features are noticed, processed, and stored in the developing system (VanPatten, 2002). According to

VanPatten's model, learners often have processing problems – default strategies that cause them to miss or misinterpret certain linguistic cues in the input. PI seeks to determine why a specific cue is not naturally linked to its meaning and then address that processing problem. For example, many learners rely on a first-noun strategy, assuming the first noun they encounter in a sentence is the subject or agent. This strategy can be misleading in sentences with relative clauses. PI tackles such issues through two key components: provision of explicit information and Structured Input (SI) activities (Wong, 2004). In PI, learners are first given explicit information about the target structure – including what typical misinterpretation strategy to avoid and what more effective strategy to use instead. Learners then engage in SI activities, which are comprehension-based tasks using specially manipulated input that force them to notice and process the target form correctly. In essence, SI activities require learners to attend to the target grammatical cue in order to get meaning from the task, thereby making a form–meaning connections that might otherwise be ignored. By training learners to process the target form during instruction, PI strives to fundamentally change how learners interpret input, leading to more efficient intake of that feature (VanPatten et al., 2013). A distinctive aspect of Structured Input activities is the use of referential and affective activity types. Referential activities have objectively correct or incorrect responses; learners must pay attention to the target form to understand a sentence and respond accurately. These activities inherently provide immediate feedback because each question has a right answer. For example, a referential activity might ask learners to choose the correct relative pronoun in a sentence:

i) **Referential activity example:**
"Underline the relative pronoun that should complete the sentence:"
Head noun: "THE TEACHER

a. ………… who/whom/whose/which car speaks English and Spanish."

In this example, learners can determine the correct answer only by understanding the sentence and noticing which relative pronoun grammatically fits, thereby strengthening the connection between the form and its meaning. Referential activities aim to push learners to abandon inefficient processing strategies (such as the first-noun strategy) and adopt better ones; a correct response indicates that the learner processed the input appropriately, whereas an incorrect response suggests the learner is still relying on a default (and incorrect) strategy (McNulty, 2012). As Houston (2010) explains, when learners interpret an input sentence correctly, it is evidence that they are using appropriate processing strategies; conversely, consistent errors signal that they have not yet shifted away from their default parsing approach. In short, referential activities play a crucial role in helping learners notice the target form and practice processing it accurately. After referential activities, PI typically introduces affective activities, which engage learners in processing the target form meaningfully without a single correct answer. Affective activities often prompt learners to make judgments or express opinions based on their own experiences, all while being exposed to many instances of the target form (an "input flood"). For example, an affective activity might prompt discussion:

ii) Affective activity:

Discuss with a partner: Is the following statement acceptable in your culture?

b. A person who drives fast.

In this task, any response is acceptable because the focus is on personal meaning; there is no strictly right or wrong answer. The value of affective activities lies in sustaining learners' attention to the target form in a more communicative, open-ended context. Since learners have already linked the form with meaning during the referential activities, they are likely to continue noticing the target structure in these subsequent meaningful encounters (Farley, 2005). Farley (2005, p.87) points out that once learners have initially connected form and meaning through referential activities, they can benefit from seeing the target form in various meaningful contexts and relating it to their own lives. In this way, affective activities help reinforce the target feature by showing it in realistic usage, thereby deepening learners' understanding and retention. It should be noted, however, that although affective activities provide rich exposure, they do not inherently ensure that learners are processing the form in the intended way (McNulty, 2012). Because responses in affective activities are open-ended (e.g. both "yes" or "no" could be acceptable answers to a question), there is no built-in guarantee that a learner has truly understood the target structure or noticed its nuanced role in the sentence. Thus, while affective activities are valuable for contextualized practice and engagement, they must be seen as a complement to referential activities, which lay the necessary groundwork of form–meaning connections. In summary, Processing Instruction combines explicit information with structured input activities to alter how learners process language input. PI's structured input component includes both referential and affective activities: referential activities ensure learners pick out the target form by requiring accurate comprehension, and affective activities provide additional meaningful exposure to the form in use. Most early PI studies, however, treated structured input activities as a single unified treatment – that is, they included both referential and affective activities together and did not isolate their effects. Only a few studies (e.g., Henshaw, 2011; Marsden & Chen, 2011; McNulty, 2012) have attempted to examine the contributions of individual SI activity types. The present research addresses this gap by investigating the separate and combined effects of referential and affective activities, as discussed later in this chapter. Another important theoretical dimension of this study is how it bridges input-processing perspectives with insights from generative second language acquisition (GenSLA) research. Traditionally, instruction targeting grammar often assumes that teaching rules (e.g. "add -s for third person singular verbs in English") leads to learning. VanPatten and colleagues challenge this assumption by arguing that learners do not acquire abstract rules directly from input; instead, learners internalize language in terms of lexical items and morpho-phonological features, which gradually interact to give the appearance of rule-governed behavior (VanPatten & Rothman, 2014). In a generative view of language, what looks like a simple grammatical "rule" is actually the outcome of complex interactions among lexical features, syntactic computations, and principles of Universal Grammar (UG). For example, the English subject-verb agreement rule (adding -s for third-person singular) is not explicitly stored as a rule in the mind. Rather, correct agreement emerges from an interplay of factors: lexical properties of verbs (such as features for person and number), syntactic processes that align subjects with verbs, and feature-checking operations in the grammar (Slomp, 2023, p.21). From this perspective, the goal of instruction should not be to force learners to memorize rules, but to help them process the language in ways that facilitate the natural internalization of these underlying features and patterns. This is exactly the aim of Processing Instruction. PI does not drill explicit rules; instead, it forces learners to process meaningful grammatical forms during comprehension. By doing so, PI targets the cognitive processes behind language intake. The core premise of PI can be summed up as changing how learners process input in order to improve what grammatical information they absorb (VanPatten et al., 2013). In other words, PI asserts that influencing learners' processing strategies will, in turn, positively influence the development of their internal linguistic system. This theoretical stance aligns well with generative SLA frameworks that emphasize the importance of underlying features and internal mechanisms in acquisition, rather than rote learning of surface rules. Input Processing (IP) theory itself articulates several universal strategies that L2 learners use when interpreting input (VanPatten, 2004). These default strategies apply to learners of various first-language backgrounds and reflect how the human parser prioritizes information. For instance, one well-documented strategy is that learners tend to process content words (nouns, verbs) before function words (articles, complementizers, etc.) when trying to understand a sentence. As a result, grammatical markers that are not salient or are not crucial to basic meaning may be overlooked in early stages of processing. In addition, learners commonly rely on the First Noun Principle, assuming the first noun in a sentence is the agent or subject unless there is evidence to the contrary. This strategy works for simple sentences, but it can mislead learners in more complex sentences, such as those with object-relative clauses or passive constructions. IP theory describes learners' processing of input as a filtering mechanism: as learners listen or read, they subconsciously filter and prioritize certain cues, passing along only some information to the central grammar-building system (which generative theorists associate with UG). If a grammatical feature consistently gets filtered out because of a default processing strategy, the learner's internal grammar will have difficulty developing an accurate representation of that feature. Processing Instruction was created as an intervention to address exactly this problem by altering the input processing stage. It attempts to redirect learners' attention to grammatical cues they would otherwise skip, thereby feeding new data into the mental representation-building process. In the present study, the effectiveness of PI is evaluated in comparison to a traditional, output-oriented instructional approach. This traditional instruction (TI) corresponds to typical production-based teaching methods in which learners practice grammar through output exercises such as drills, sentence transformations, and translations. TI is rooted in skill-learning theory, which posits that learning a language structure comes from gradually training production skills through repetitive practice (Lee & Benati, 2009). The assumption in skill-learning theory is that with enough practice, learners automate certain forms, leading to changes in their underlying knowledge—specifically, improvements in the cognitive mechanisms used to perform those language tasks (DeKeyser, 2007, p.99). In a TI paradigm, students might be asked to produce many examples of a relative clause or transform active sentences into relative clauses, focusing on output accuracy. Over time, such output practice is believed to internalize the grammar point so that learners can produce it fluently. Notably, input-oriented and output-oriented instructions may develop different aspects of knowledge: input-based instruction like PI contributes to knowledge that is readily available for comprehension tasks, while output-based instruction contributes to knowledge that is accessible during production tasks (DeKeyser, 2007; Lee & Benati, 2009). Processing Instruction and Traditional Instruction thus reflect two distinct approaches to grammar teaching. PI is input-based and aims to impact both comprehension and production by reshaping how input is processed, whereas TI is output-based and primarily aims to improve production fluency through practice. The seminal study by VanPatten and Cadierno (1993) was the first to directly compare these two approaches. They examined the acquisition of a particular Spanish structure (object pronouns affected by the first-noun strategy) by splitting learners into a PI group and a TI group. Both groups were tested on interpretation (comprehension) and production tasks. The results were striking: the PI group showed significant improvement on both interpreting sentences correctly and producing sentences with the target form, whereas the TI group improved only in production and showed no gains in interpretation.

In other words, PI had a positive effect on learners' ability to understand sentences with the new structure (indicating a change in how they processed input), while TI did not yield such an effect on comprehension – the TI learners had essentially "learned to do a task" (produce the form) without altering how they interpreted the input (VanPatten, 2002, p.771). This finding suggested that PI's influence extended to learners' developing mental representation of the language, not just their ability to perform practiced output. Since that initial study, a wide range of research has investigated PI versus traditional/output instruction across different languages and grammatical targets. For example, PI has been tested on English past tense -ed (Benati, 2005), English third-person singular -s (Bayrak & Soruç, 2017), French causative constructions (VanPatten & Wong, 2004), Italian future tense (Benati, 2001), Spanish ser vs. estar (Cheng, 2004), among others. The results have consistently supported VanPatten & Cadierno's original findings: PI tends to yield gains in both interpretation and production of target forms, whereas traditional production-focused instruction primarily yields gains in production alone.

These convergent findings indicate that PI's effectiveness is not limited to one language or structure but rather can be generalized to a variety of linguistic contexts and features (Benati, 2005). Despite the growing body of evidence for Processing Instruction, there remain areas that are under-researched or where results have been mixed. One such research gap concerns the application of PI to English restrictive relative clauses (RRCs), especially for learners whose first language is typologically different (such as Arabic). Relative clauses are a complex feature of English that involve several potential processing issues (like the position of the clause in the sentence and the role of relativizers such as *who/which/that*). To date, the relative effects of PI on the acquisition of English relative clauses have not been fully explored. Only one study has specifically examined PI with English relative clauses: Alsady (2013) investigated this area, focusing on learners at a low proficiency level. No other published experimental research has compared Processing Instruction and Traditional Instruction for English relative clauses, leaving a significant gap in our understanding of whether PI's advantages extend to this feature. The present research is designed to fill this gap by studying how Saudi Arabic-speaking learners acquire English restrictive relative clauses under different instructional conditions (PI vs. TI vs. other variations). In doing so, this work also addresses specific challenges that English relative clauses pose for these learners, such as mastering the use of the relative pronoun (relative complementizer) in relation to definiteness. A particular difficulty for Arabic speakers learning English relative clauses stems from a difference in how the two languages handle relativization. In English, whether a relative pronoun is used (and which one) depends on the grammatical role of the noun in the relative clause (e.g. subject vs. object) and sometimes the formality (who vs. whom). In contrast, Arabic uses a relative particle (often untranslated in English) that must appear if the head noun is definite but is omitted if the head noun is indefinite. In other words, Arabic grammar links the presence of the relativizer to the definiteness of the noun it refers to (Al-Momani, 2010). This difference means that an Arabic speaker learning English might transfer their L1 strategy and mistakenly overuse or omit English relativizers based on definiteness rather than the syntactic rules of English. For example, Arabic learners might struggle with sentences like "*The book that I bought is new*" versus "*A book Ø I bought is on the table*" (where English does not actually allow dropping that in the second sentence just because "a book" is indefinite—the correct English requires *that* or *a wh*-relative pronoun if it's an essential clause). Such L1 crosslinguistic influence are precisely the kind of processing problem that IP theory highlights: learners approach L2 input with their L1 parsing procedures (VanPatten, 2004), which can lead to systematic errors if the L1 and L2 cues differ. In this study, English RRCs were chosen as the target structure because they perfectly illustrate an input processing principle that may require intervention. They are influenced by multiple IP principles, including the Sentence Location Principle, and the L1 Transfer Principle. For instance, relative clauses in English usually occur in the middle of a sentence (embedded between a main clause), making them less salient to learners' attention. According to the Sentence Location Principle, L2 learners tend to focus on elements at the beginning of a sentence before those in the middle or end (Lee & Benati, 2009). In a sentence like "*The spaghetti [that I ate for dinner] was overcooked*," the relative clause "*that I ate for dinner*" is in a medial position. A learner might pay most attention to "*The spaghetti… was overcooked*" and neglect the relative pronoun "that" and its clause because of its less prominent placement (Lee & Benati, 2009). Additionally, the L1 Transfer Principle (VanPatten, 1996) suggests learners start with their native language processing routines. An

Arabic L1 learner might initially parse English relative clauses using their Arabic strategy—focusing on definiteness—leading to confusion or errors with the English system of overt vs. omitted relative pronouns. These combined principles make English restrictive relative clauses an ideal testing ground for Processing Instruction: if PI can help learners overcome both a universal processing bias (ignoring mid-sentence information) and a transfer-based bias (misinterpreting the role of the relative pronoun due to the L1 crosslinguistic influence), it would demonstrate PI's efficacy on a particularly challenging target. By the same token, if TI (output practice) were used, it would be informative to see whether mere practice of forming relative clauses can address these subtle processing issues or not. In light of the above, the present study has multiple objectives. First, it aims to extend the investigation of PI to a new target structure (English restrictive relative clauses) and a new learner population (Arabic L1 learners), thereby testing whether the benefits of PI generalize beyond the contexts previously studied (mostly Romance-language features and Indo-European L1 backgrounds). In doing so, this research contributes to the broader generalizability of PI. Second, it seeks to isolate the roles of referential and affective activities within PI. Earlier studies of Processing Instruction typically combined these two types of structured input activities, but there is a theoretical interest in knowing whether one type of activity is driving the effectiveness of PI or if it is the combination that is crucial. By designing an experiment with different groups receiving referential activities only, affective activities only, both, or neither, this study provides insight into any unique or additive benefits of each activity type. In other words, it explores whether learners' performance in acquiring relative clauses differs when referential and affective input activities are provided separately versus together. Given that referential activities ensure form-meaning connections (but might be somewhat mechanical) and affective activities create richer context (but might not force form processing), understanding their individual and combined impact is important for refining PI as an instructional approach. Furthermore, this research attempts to bridge pedagogical and generative perspectives on L2 acquisition. There has been a call in the GenSLA literature (e.g., S. Carroll, 1996; Felix, 1986; Gregg, 1996) for a "transition theory" that can explain how input is processed and turned into acquired knowledge, complementing UG-focused "property theories" of language. In other words, generative theorists have articulated what knowledge needs to be acquired (the properties of language, principles and parameters, features, etc.), but the field has struggled to fully explain how learners get from input to having that knowledge. It is widely accepted that second language (L2) development begins with full transfer (L1 transfer) from the first language (L1). This initial state can be gradually restructured as learners receive sufficient input, allowing them to set aside L1-based constraints. within a generative framework, restructuring is prompted precisely when L1 constraints prove incompatible with the L2 grammar. providesHowever, current theories offer limited explanation of how L1 rules are modified or how they interact with L2 rules during development (Sharwood Smith & Truscott, 2006). To advance our understanding of transfer, it is necessary to consider how online processing and interactions between different cognitive modules shape L2 acquisition. Sharwood Smith and Truscott (2006) argue that the Full Transfer Full Access (FTFA) model focuses primarily on the properties of L2 knowledge, without addressing the real-time mechanisms that drive development. In contrast, the Modular Cognitive Framework (MCF) models transfer as a dynamic interaction in which L1 shapes, and gradually yields to, L2 development. FTFA, as proposed by Schwartz and Sprouse (1994, 1996), has been influential in explaining empirical findings and outlining the initial stages of L2 development. However, it treats transfer as a static process—simply the movement of L1 rules into the L2 system. This view overlooks the developmental nature of syntactic acquisition and fails to explain how restructuring occurs over time. One conceptual issue with the notion of "transfer" is that it implies the removal of elements from L1 and their insertion into L2, potentially impoverishing the L1 system. But L1 remains intact. Transfer, therefore, should be understood as the copying of L1 structures into the L2 system, without loss to the original. According to FTFA, L2 development begins with a relexicalized version of L1 grammar—L1 syntactic structures paired with L2 lexical and phonological items (Sharwood Smith & Truscott, 2006). This raises important questions: What triggers the copying process? Is any exposure to L2 input sufficient? FTFA does not address these transitional mechanisms. Moreover, as development proceeds, the interlanguage increasingly departs from its L1 point of origin. The Full Transfer/Full Access proposal does not, by itself, explain this drift or the well-attested optionality in learner grammars—where L1-like and emerging L2 options co-exist (Robertson & Sorace, 1999; Vainikka & Young-Scholten, 1994). By contrast, the Modular Cognitive Framework (MCF) treats L2 change as a competition-and-activation process: learners assemble new, feature-valued representations across the syntactic structure (SS), phonological structure (PS), and the CS–SS interface, with relative activation determining which option surfaces at a given moment. Each module contains a lexical store, and a processor selects, instantiates, or replaces representations based on incoming input. These representations become available in working memory when activated appropriately, allowing learners to gradually restructure their interlanguage system. By incorporating a feature-based analysis (in this case, examining the definiteness feature in English and Arabic relative clauses), the current study connects the practical instructional intervention (PI) with a generative explanation of what learners need to acquire. Admittedly, developing a comprehensive "transition theory" that links input processing to abstract linguistic competence is a complex endeavor, and any attempt is somewhat speculative. Nonetheless, this project takes a step in that direction by asking whether an integrated approach—one that leverages both input-based instruction (to manipulate processing) and UG-based insights can enhance our understanding of how learners acquire difficult grammatical features. In operational terms, this integration is informed by the MCF (Modular Cognitive Framework). it is a model that envisions multiple modules of language cognition (e.g., formal linguistic knowledge vs. processing mechanisms) developing in parallel and interacting. Adopting such a modular view allows us to consider that learners might have separate but related stores of knowledge—one shaped by formal grammatical principles (UG, features, etc.) and another by processing experiences and input frequency. By viewing L2 development through both lenses, the study aims to account for both the formal acquisition of the relative clause features (e.g., assembling the [+definiteness] feature correctly in the L2 grammar) and the functional improvement in processing ability (e.g., overcoming the first-noun and sentence-position biases). In summary, the theoretical framework of this thesis straddles two domains: it uses Processing Instruction to influence how learners process input (a cognitive-functional approach), and it uses generative SLA theories to interpret what learners are acquiring in formal terms. This dual approach is intended to yield a more holistic understanding of the acquisition process for the target structure. Finally, it is important to situate the study in terms of learner proficiency. VanPatten (1996, 2007) conceived Processing Instruction largely with beginner or intermediate learners in mind, under the assumption that advanced learners might already have adjusted their processing strategies. Beginning L2 learners rely heavily on their L1 processing routines when confronted with L2 input, especially when the input becomes difficult to interpret (they effectively "fall back" on what is familiar). As learners become more advanced, they can develop new processing strategies tuned to the L2, reducing their dependence on L1 strategies. In this research, the focus is on lower-proficiency (beginner-level) learners of English, which aligns with PI's design as an intervention for learners who are still in the process of establishing basic form–meaning connections in the L2. By targeting beginners, we expect to clearly observe L1-based processing issues (such as the Arabic definiteness effect or the first-noun preference) and assess the impact of instruction on those issues. Moreover, to keep the instructional treatment and assessment manageable, the study concentrates on four English relative pronouns (who, which, whom, whose). These cover a range of relative clause types (subject and object relatives, possessive relative, etc.) without introducing more complex or less common relativizers. Focusing on this subset allows for a controlled investigation of learners' acquisition of the core relative clause forms and avoids overwhelming low-level learners with the entire spectrum of English relativization strategies. Alsady's (2013) pioneering study on PI with English relative clauses raised several points that the current research builds upon. Her work suggested that PI can be effective for teaching relative clauses to beginners, but it also highlighted certain limitations in the evidence and called for further research. In particular, her discussion underscored the need for: (a) using a variety of measurement instruments to gauge acquisition (rather than relying on a single test), (b) enhancing the validity and generalizability of findings by possibly including different learner populations or contexts, and (c) examining theoretical interpretations of what it means for learners to have "acquired" the target form. The present study responds to these points. It employs multiple elicitation tasks to measure learning (as detailed below), involves learners from an under-represented background (Arabic L1), and incorporates a generative perspective to interpret the results (providing an explanation of the acquisition of the target feature, not just an observation of performance gains). In doing so, this research aims to strengthen the evidence base regarding PI and relative clauses and to clarify what constitutes successful acquisition of this structure for L2 learners. To achieve its objectives, this study implemented a classroom intervention with a comprehensive experimental design. The instruction and testing took place over an extended period (as opposed to just a few hours or days, which was a limitation of some earlier studies). Eighty-six Saudi university students learning English participated as

L2 learners. Learners were divided into five groups, each receiving a different type of instruction or input exposure:

ERA (Combined Referential + Affective) – received Processing Instruction that included both referential and affective structured input activities.

RA (Referential-Only) – received Processing Instruction with only referential activities (no affective activities).

EA (Affective-Only) – received Processing Instruction with only affective activities (no referential activities).

TI (Traditional Instruction) – received traditional output-based instruction on relative clauses (e.g. practice exercises, explanations, production drills) with no structured input practice.

CG (Control Group) – received no specialized instruction on relative clauses (serving as a baseline for natural development and test effects).

All learner groups completed a pre-test, an immediate post-test, and a delayed post-test. By comparing scores from pre-test to post-tests, the study evaluated learning gains within each group. By comparing the instructed groups (ERA, RA, EA, TI) against the Control group, it assessed the effectiveness of each instructional approach relative to having no targeted instruction. The target of instruction and testing covered two key aspects of English restrictive relative clauses: (1) the formation and interpretation of English RC sentences (for example, understanding who is the doer vs. receiver of action in relative clauses, using the correct relativizer, etc.), and (2) the definiteness agreement issue (i.e., ensuring learners do not carry over the Arabic definiteness rule for using a relativizer, but instead follow English rules). The instructional effect on these abilities was measured through three different elicitation tasks: a Grammaticality Judgment Task (GJT), which tested learners' ability to recognize correct versus incorrect relative clause constructions; a Picture-Cued Task (PCT), which tested production by having learners describe pictures using relative clauses; and a Translation task (TRANs), which required learners to translate sentences (ensuring they could connect meaning and form across languages). Using multiple task types allowed the study to capture both explicit knowledge (through grammaticality judgments) and more integrated skills (through meaningful use in context). By lengthening the time between the end of instruction and the delayed post-test, the research also probed the durability of any instructional effects, addressing the concern that very short-term gains might not reflect true acquisition. This study is one of the first to disentangle the components of structured input activities within Processing Instruction, and it also strives to bridge the gap between pedagogical intervention and linguistic theory. In doing so, it seeks to validate previous PI findings while providing new insights. It tests whether VanPatten's IP principles—and by extension, PI as a teaching method—can account for learners' difficulties with English relative clauses that involve both universal processing tendencies and L1-specific features. By incorporating a generative viewpoint, it also examines the outcomes with an eye to what underlying grammatical changes are happening, not just whether test scores improve. Ultimately, the study aims to inform both language teaching practice and SLA theory: if a combination of referential and affective activities proves most beneficial, that would support the argument that both activities are necessary components of effective PI. If, on the other hand, one type of activity is sufficient, this could streamline PI practice and suggest that the other type's contribution is minimal or redundant. Additionally, by observing Arabic-speaking learners, the research extends the applicability of PI findings beyond the mostly Indo-European language contexts studied so far. Demonstrating PI's effectiveness (or lack thereof) with Arabic learners will either strengthen the claim that PI works universally, or highlight important limitations that need to be addressed. Through addressing these questions, the study hopes to shed light on the role of affective activities in PI (which some critics question, since these activities do not force form-processing) and to advance our understanding of what combination of instructional techniques yields optimal outcomes for grammar acquisition.

1.2.Research questions

The current research aimed to offer a meaningful contribution to the field of instructed second language acquisition by examining how pedagogical intervention can support learners in overcoming challenges associated with specific grammatical features. In particular, the study explored how altering learners' input processing mechanisms—via Processing Instruction (PI)—could facilitate the acquisition of English restrictive relative clauses (RRCs). It adds to the limited body of research that has examined PI through the lens of structured input activities—namely referential and affective types—whether implemented individually or in conjunction. Prior studies in this area have yielded inconsistent findings (Henshaw, 2011; Marsden & Chen, 2011; McNulty, 2012), and this study seeks to expand on that discussion.

In terms of pedagogical practice, the research also provides a detailed instructional framework aimed at helping learners master complex aspects of English RRCs. It further illustrates how PI can serve as a mechanism for reducing the crosslinguistic influence of first language. Additionally, this study builds on the foundational work of VanPatten and Cadierno (1993), whose pioneering research on Spanish object pronouns demonstrated the efficacy of PI in promoting learner development. Since that initial work, PI has been successfully adapted for various target structures and across multiple second languages. While the earliest applications of PI focused primarily on learners of Romance languages, this study broadens the scope by examining its applicability to learners from a non-Romance L1 background—specifically, Arabic-speaking learners of English.

Moreover, the research addresses a limitation found in much of the earlier PI literature—namely, the reliance on short-term instructional interventions that span only a few hours over several days. To counter this, the present study implemented an extended instructional period, allowing for more sustained learner engagement and a longer interval between the instructional phase and the administration of delayed post-tests. In line with the above motivations and aims, the present study was designed to address the following research questions (RQs):

RQ 1. Are there any differences between the three groups of learners (Processing instruction, Traditional instruction, and control group) in the improvement of a) comprehension and b) production of the target grammatical feature?

RQ 2. Which type of structured input activities (referential or affective) bring the most improvement in the interpretation and production of English RRCs forms at the sentence level?

RQ 3. Which type of instruction (PI or traditional) is more effective in developing the interlanguage grammar of the target feature and in decreasing L1 cross-linguistic influence as L2-specific representations increased in resting activation under UG-constrained processing?

1.3. Structure of the thesis

This thesis is structured into seven chapters, each contributing a distinct element to the overall investigation.

Chapter One introduces the study by situating it within the broader field of second language acquisition (SLA). It outlines the research context, establishes the theoretical foundations, and presents the rationale that motivates the inquiry. The chapter culminates with a clear articulation of the research questions that guide the subsequent analysis.

Chapter Two presents a focused review of the literature on input-based approaches to SLA, with particular emphasis on VanPatten's Input Processing (IP) model. The chapter examines empirical studies that have compared Processing Instruction (PI) with Traditional Instruction (TI) across a range of languages and grammatical targets. It identifies key findings, methodological trends, and, crucially, existing gaps in the literature—gaps that the present study aims to address.

Chapter Three turns to the acquisition of relative clauses, offering a detailed review of how these structures function in both English and Arabic. It discusses prior research on the learning of relative clauses in an L2 context, foregrounding the specific difficulties these constructions pose for learners. The chapter also explores how factors such as first language crosslinguistic influence and processing constraints may affect the acquisition process. (Throughout this thesis, the terms "second language acquisition," "language development," and "language growth" are used interchangeably for ease of reading.)

Chapter Four outlines the methodological framework of the study. It details the research design, participant profiles, and the instructional treatments implemented—namely, PI with both referential and affective activities, as well as TI-based interventions. The instruments used to measure learning outcomes (such as Grammaticality Judgment Tasks, Picture-Choice Tasks, and Translation tasks) are described in depth, along with the procedures for data collection and the statistical methods employed to analyze the results.

Chapter Five presents the empirical findings of the study. It systematically reports the results of pre-tests and post-tests, providing both descriptive and inferential statistics to evaluate the impact of each instructional approach. The chapter is organized around the research questions, highlighting differences in learner performance across groups and gauging the effectiveness of the treatments.

Chapter Six engages in a critical discussion of the results, interpreting the data in light of the theoretical models introduced earlier. The chapter examines whether the findings support the initial hypotheses and considers how they align with or challenge existing theories(e.g., Input Processing). Particular attention is paid to the differential effects of referential and affective activities, the role of learners' L1 backgrounds, and how the results compare with those of previous studies.

Finally, Chapter Seven brings the thesis to a close. It summarizes the main findings and reflects on their theoretical and pedagogical significance. Limitations of the study—such as those relating to scope, sample size, or methodology—are acknowledged, and avenues for future research are proposed. The chapter concludes by considering how insights from both pedagogical practice and generative theory can be integrated to deepen our understanding of second language development.

Chapter two: The Role of formal instruction in SLA: Knowledge, Input Processing, and Processing Instruction — Theoretical Framework

2.1. Introduction

The primary aim of this study is to investigate learner performance in a second language (L2). This chapter provides a detailed overview of how existing literature differentiates between two widely recognized forms of L2 knowledge: acquired (subconscious) and learned (conscious). These distinctions are frequently framed in terms of the learner's level of consciousness or awareness, with acquired knowledge typically associated with implicit processes and learned knowledge with explicit instruction.

To address this issue, the present thesis adopts the Modular Cognitive Framework (MCF) as its guiding theoretical model. The MCF offers a principled account of how acquired and learned knowledge emerge, operate, and potentially interact within distinct cognitive systems. Specifically, the framework enables a systematic exploration of the developmental trajectories of each knowledge type, the mental architecture responsible for their processing, and the conditions under which cross-system interaction may occur.

2.1.1. Acquired vs. Learned L2 Knowledge

Second-language acquisition (SLA) research commonly distinguishes two qualitatively different types of linguistic knowledge: acquired/implicit (subconscious) knowledge and learned/explicit (conscious) knowledge. Krashen's influential Monitor Model explicitly made this distinction: acquisition is an unconscious process yielding intuitive competence, while learning is a conscious process that produces a monitoring mechanism for error correction (Krashen & Terrell, 1983). This view aligns with the Universal Grammar (UG) perspective that humans have an innate, language-specific faculty; UG theory posits that an abstract language module (often called the Language Acquisition Device) operates unconsciously on input to build grammar Chomsky (2002:85). Consciously learned rules, by contrast, reside outside this module and serve only as monitor during language use. Schwartz (1993) extended these ideas within a modular-framework: she identified two mental knowledge stores. One is the encapsulated language module (akin to Chomsky's competence) that acquires L2 knowledge subconsciously; the other is general cognition that holds consciously learned rules. Acquired competence drives spontaneous, fluent L2 production, whereas learned knowledge underlies controlled, rule-based performance. Crucially, Schwartz took a "no-interface" stance: explicitly learned facts (e.g. grammar rules) cannot penetrate or restructure the innate grammar. In her words, formal instruction "help[s] create another type of knowledge… [but] does not affect competence" (Schwartz, 1993:157). In this view, explicit L2 knowledge and implicit competence remain permanently separate, reflecting their different mental architectures. Cognitive (non-modular) approaches similarly recognize implicit versus explicit knowledge, but attribute both to general learning mechanisms rather than a dedicated UG module. For example, N. Ellis (1994, 2011) describes implicit learning as the unconscious, natural absorption of patterns from input. This kind of learning requires no deliberate intent or awareness of the underlying rule. In contrast, explicit learning involves focused attention and hypothesis testing: the learner intentionally seeks out rules and can verbalize them. In practice, language tasks often engage both simultaneously e.g. a lesson might give explicit rule explanation and allow implicit uptake of other features from examples. According to usage-based perspectives, adult L2 learners face entrenched L1 knowledge, which reduces the flexibility of implicit learning. As a result, adults often rely more on explicit strategies to compensate for their less plastic implicit system (Wang, 2017). Nevertheless, researchers generally agree on one key point: fluency depends on knowledge gained without conscious intent. In this thesis, we call this implicit L2 knowledge – knowledge built outside of awareness, regardless of whether it resides in an innate module or general cognition (Schwartz,1993). By contrast, explicit L2 knowledge can be consciously inspected (e.g. stated as a rule or memorized form) and arises through deliberate learning.

A central debate is whether and how implicit and explicit knowledge interact. Three positions are commonly described:

No-interface: Implicit and explicit knowledge are entirely separate. Explicit instruction can create new metalinguistic knowledge, but cannot alter the underlying implicit grammar. Schwartz (1993) argued forcefully for this view: metalinguistic information (e.g. “This sentence is ungrammatical”) simply remains outside the language module and cannot trigger grammar change (Schwartz,1993). N. Ellis (2005) similarly notes that the two knowledge types have different representations and stresses that “explicit knowledge does not become implicit knowledge” (Ellis, 2007:23).

Weak interface: The two systems are distinct but can influence each other indirectly. Explicit knowledge might guide attention to relevant features in the input, thus supporting implicit learning. For example, if a learner consciously notes a particular form, that may draw their unconscious system to process it more. However, weak-interface advocates do not believe that explicit rules convert into implicit competence.

Strong interface: Repeated practice can proceduralize explicit knowledge into implicit skill. DeKeyser’s experiments (1997, 2017) exemplify this position: learners taught explicit rules for an artificial language could, with enough practice, use those rules automatically and unconsciously. This suggests that declarative (learned) knowledge can become procedural (implicit) through practice. In short, explicit knowledge can be gradually integrated into the implicit system under sustained use.

From a MCF perspective, implicit and explicit L2 knowledge are treated as separate mental systems (Truscott & Sharwood Smith, 2019). MCF posits that implicit linguistic competence develops within dedicated, encapsulated language modules (e.g. the syntactic and phonological systems), operating subconsciously, whereas explicit L2 knowledge (such as conscious grammar rules or metalinguistic knowledge) resides in distinct cognitive systems (e.g. conceptual or "metalinguistic" modules). Because each module has its own representational code and information is encapsulated, knowledge from an explicit system cannot directly alter the representations in the implicit language module. In practical terms, MCF essentially adopts a no-interface stance: consciously learned rules do not convert into unconscious grammatical competence. However, the framework acknowledges that explicit instruction can indirectly aid acquisition by guiding attention and creating optimal input conditions for implicit learning. In other words, while explicit knowledge never penetrates the subconscious language system directly, it can still facilitate the process of implicit learning (e.g. by helping learners notice relevant features in input). (For a fuller discussion of how MCF handles the implicit–explicit interface, see section 2.2.1.2.3.)

2.2. Explicit grammar instruction and SLA

Research in second language acquisition (SLA) has consistently shown that explicit grammar instruction can yield stronger learning outcomes than purely implicit exposure. Both classroom and laboratory studies have found advantages for explicit instruction (e.g., White et al. 1991; VanPatten & Sanz 1995; Hulstijn & DeKeyser 1997; Ellis 1993; White & Ranta 2002; Spada & Tomita 2010). These studies suggest that teaching grammatical rules explicitly can alter learners' underlying L2 knowledge in ways that mere exposure may not. Long's (1983) review of a dozen studies concluded that explicit instruction benefits learners across different ages and proficiency levels, more so than implicit approaches. Similarly, Norris and Ortega's (2000) influential meta-analysis of 45 studies on formal instruction found that focused L2 instruction has a significant positive effect on learning outcomes. They observed that "not only does explicit L2 instruction make a consistently observable difference that is very unlikely to be attributable to chance, but it also seems to make a substantial difference" (Norris & Ortega 2000, p. 193). In their analysis, explicit instruction outperformed implicit instruction by about half a standard deviation on average, for both focus-on-form (integrating form attention into communicative practice) and focus-on-forms (teaching language as a sequence of forms) treatments. They found minimal differences between FonF and FonFS approaches – in other words, whether instruction treated language primarily as communication with incidental focus on form or as a set of discrete forms to be mastered via a syllabus, both benefited from explicit teaching.

Despite these positive findings, Norris and Ortega noted important limitations in the evidence. The roughly 0.5 effect size favoring explicit instruction might be inflated by biases and design flaws in many studies. For instance, some assessment tests were designed in ways that favored explicitly taught knowledge; the instructional treatments varied widely across studies, making comparisons difficult; and notably, about 70% of the studies in their sample examined explicit instruction vs. only 30% on implicit, suggesting a publication bias toward explicit instruction research. Shin (2010) later critiqued Norris and Ortega's meta-analysis even further. Shin argued that, despite the meta-analysis's seminal impact on SLA research, issues of construct validity and methodology undermined its conclusions. Specifically, Shin pointed out oversimplifications in how studies were categorized and statistical shortcomings in the meta-analysis. For example, Norris and Ortega (2000) did not adequately account for variation in sample sizes among studies. They calculated effect sizes using Cohen's *d* without weighting for sample size, whereas using Hedge's adjusted d or a hierarchical linear model would better handle unequal sample sizes. Furthermore, by focusing only on one aspect of form-focused instruction, the meta-analysis overlooked differences between pre-planned vs. spontaneous focus on form and other methodological issues that could favor one type of instruction over another. Shin (2010) and others (e.g., Truscott 2007; Lee & Huang 2008;

Spada & Tomita 2010; Goo et al. 2015; Akin 2019) caution that these factors cast doubt on broad claims that explicit is always superior.

Even with these cautions, the general consensus in the field is that explicit instruction tends to be more effective than implicit exposure alone – at least in the short term – for many linguistic features. Meta-analyses focusing on explicit instruction for grammar still have methodological flaws, due to variability in data and the inherent difficulty of perfectly comparing explicit vs. implicit conditions. Nonetheless, individual studies and theoretical discussions in SLA continue to indicate that explicit teaching can confer advantages that implicit one does not. At the same time, both explicit and implicit instructions show clear benefits over no instruction at all, in both immediate gains and retention over time (Li 2019, pp. 117–119). Given the evidence that some type of explicit focus helps L2 development, researchers have turned to investigate which kinds of explicit instructional techniques are most effective in real classroom settings. In other words, the question is no longer whether form-focused instruction works, but what form of explicit instruction leads to the best outcomes. The rest of this chapter explores the theoretical underpinnings of explicit instruction in SLA, including the role of input, processing strategies, first-language crosslinguistic influence, and a specific pedagogical approach called Processing Instruction.

2.2.1. Role of input

Input is fundamentally important to any theory of language acquisition. All major frameworks of first language acquisition (L1A) and SLA acknowledge the significance of input, though they differ in how they interpret its role. According to behaviorist models, frequent exposure to language stimuli leads to learned responses via conditioning – essentially, input drives acquisition through habit formation (Ellis 2008). In strict behaviorism, the learner's mind is a blank slate shaped solely by the input received, as stimulus-response patterns are reinforced over time. Generative linguistics, on the other hand, posits an innate language capacity (Universal Grammar, UG). In generative theory, environmental input triggers the setting of linguistic parameters within the learner's mind. The input "interacts with UG" to adjust these internal parameters and build the L2 grammar. Importantly, classic UG-based accounts consider only primary linguistic data (natural language utterances) as relevant input – they generally exclude feedback or explicit metalinguistic information from contributing to core acquisition. As Sanz (2005, p. 7) notes, the generative approach provides a compelling explanation for the content of language acquisition (i.e. what knowledge is acquired), but when it comes to the process of acquisition, cognitive information-processing theories are deemed more suitable. In other words, while UG might define what can be learned, it is the processing of input – how learners perceive, notice, and store language data – that cognitive theories seek to explain.

One influential cognitive model highlighting input is the Input–Interaction–Output model proposed by Gass (1997; Mackey & Gass 2015; VanPatten 2017). In this model, the process of language acquisition is conceptualized as a dynamic process: learners receive input, that input is enhanced through interaction, and learners then produce output, which in turn becomes new input in a feedback loop. Interaction (such as negotiating meaning or receiving clarification) helps make input more comprehensible and salient, thereby facilitating intake of new forms. Krashen's (1985) Comprehensible Input Hypothesis (cited in Bahrani 2013) similarly argues that SLA occurs primarily through understanding input that is slightly beyond the learner's current level (often termed "i+1"). In essence, input that is challenging but still comprehensible prompts learners to stretch their interlanguage competence.

Moreover, Gass (1997) emphasizes that while input is necessary, its effectiveness depends on both internal factors (the learner's existing knowledge, attention, memory) and external factors (frequency and quality of input, interaction opportunities). Learners need sufficient exposure to linguistic material in order to formulate mental representations of L2 structures

(Sun 2008, p. 4). This involves comparing new linguistic forms against what the learner already knows, and gradually integrating those forms into their developing system. Gass and Mackey (2015) describe this as an information processing model of SLA. Therefore, for successful processing to occur, learners must actively notice and attend to linguistic forms present in the input. Within this model, input and interaction function jointly to direct learners' attention toward the connections between form and meaning, ensuring new linguistic elements are integrated without conflicting with the learners' existing knowledge of the L2.

In addition to being comprehensible, input must also be processed to become intake. Gass (1991, 1994, 1997) and Mackey & Gass (2015) highlight not just the quantity or understandability of input, but the quality of processing that input. They note that learners encounter input that may contain many features for which they are not ready or which they do not notice. Certain linguistic features are more salient to learners than others due to factors like their prior L1 experience, the frequency of the feature in input, and the amount of attention the learner can allocate. For example, a learner might readily notice a new vocabulary item because it carries clear meaning, but might overlook a subtle grammatical inflection that does not immediately impede comprehension. In her SLA model, Gass (1997) stresses that the extent to which input contributes to acquisition depends on the learner's current proficiency and attentional resources. Input that is too far beyond the learner's level or not attended to will have little impact. This recognition in SLA research has led to numerous studies on input enhancement – ways to manipulate or amplify input to make certain forms more noticeable (e.g., using highlight, bold type, repetition, or simplified input). Such techniques are designed to guide learners' attention toward target grammatical structures embedded in the input

Truscott and Sharwood Smith (2001) introduced the concept of Input Processing (not to be confused with VanPatten's specific model of the same name, discussed later) as the interface between exposure and learning. They describe input processing broadly as the mental operations that occur when learners are exposed to language. Crucially, input processing leads to some of the input being converted into intake, which may subsequently be incorporated into the learner's evolving linguistic system. In this sense, IP represents the initial phase during which the learner's cognitive system filters and organizes incoming linguistic data, determining what gets noticed and remembered. Both behaviorist and generative approaches left this process under-specified: behaviorists assumed input becomes habit through repetition, and generativists assumed UG would handle input automatically. Cognitive SLA theories fill this gap by examining how learners mentally process input in real time.

A more recent perspective on input comes from Jackendoff's theory of modularity proposed by Carroll (1999, 2001). Carroll argues that input should be studied within a comprehensive theory of language processing. She reconceptualized the input-to-intake sequence as a series of transformations through different processing modules (acoustic–auditory, phonological, syntactic, conceptual). In her view, what we call "input" is not a single entity but a chain of processed representations – hence she prefers the term "stimuli" for raw external linguistic events. The details of Carroll's model (and the broader MCF architecture by Sharwood Smith & Truscott) will be discussed in section 2.1.1.2. The key point is that modern approaches consider how input is processed by different cognitive subsystems before it can impact acquisition. Input must pass through perceptual processing (hearing/reading), parsing (syntactic analysis), and conceptual interpretation. At each stage, some information may be lost or filtered out if the learner's processing capacity is limited or if the input feature is not salient.

For the input to have any impact on learning, it must first pass through several stages of linguistic processing rather than directly triggering learning as soon as it is perceived. Once raw sensory stimuli are converted (or "transduced") into a usable form, they are initially handled by language-specific modules in sequence: phonological processing comes first, followed by syntactic parsing, and then conceptual interpretation. According to Carroll's (2001) autonomous induction perspective, it is only when this parsing process fails during real-time interpretation that a learning mechanism is engaged. In other words, the input used for comprehension and the input that drives acquisition travel along the same initial processing path—there are not two distinct routes for "input for comprehension" versus "input for acquisition." Both begin as attempts to understand the incoming language; only if the system encounters a parsing failure does the processing shift into an acquisition mode, which in turn prompts adjustments in the parsing system.

Corder (1967), in his seminal work, noted that not everything in the input actually makes its way into the learner's cognitive processing. Even if learners pay conscious attention to certain information, they might not process it deeply; it can remain unanalyzed and thus have no impact on their performance or development (Truscott & Sharwood Smith, 2011: 499). Schmidt's (1995) concept of noticing is closely tied to how input becomes intake. According to Schmidt's Noticing Hypothesis, learners cannot acquire a linguistic feature unless they have become consciously aware of that feature in the input. Importantly, a learner does not need to fully understand the feature for it to be noticed; noticing simply means consciously registering that something has occurred in the input, rather than deducing an abstract rule or principle from it (Schmidt, 1995: 29).

Pinpointing what learners fail to notice is challenging, and drawing a clear line between noticing and comprehending is even more problematic. The difficulty arises because noticing a surface feature in the input (for example, a particular word ending or pronunciation) is not the same as interpreting that feature and assigning it a grammatical role such as verb or noun. If we want to account for the roles of consciousness and noticing in a cognitive model of input processing, we need a solid theoretical foundation. In practice, this means explaining how conscious awareness is integrated into the cognitive system—clarifying what aspects of language processing can enter consciousness and under what conditions this occurs. One promising framework that addresses these issues is the Modular Cognition Framework (MCF). MCF is a theory-driven model and is arguably one of the most detailed accounts available of how language processing operates within the broader architecture of the mind (Sharwood Smith & Truscott, 2014; Truscott, 2015; 2017). Within this framework, a component formerly known as MOGUL is dedicated specifically to language. MCF (and its MOGUL component) provides a nuanced account that helps disentangle knowledge encapsulated in language-specific modules from knowledge that lies outside these modules (i.e., extra-modular knowledge). In doing so, it offers a comprehensive explanation of how language knowledge grows and how it is put to use.

The decision to adopt MCF as the theoretical framework for this study stems from its capacity to integrate insights from generative second language acquisition (GenSLA) research with those from processing-oriented SLA theories. MCF offers a wide explanatory scope that allows it to accommodate findings from both domains. Notably, this framework shines a spotlight on the contribution of conscious awareness and input mechanisms in a modular cognitive perspective on knowledge representation. It also posits that learners can benefit from metalinguistic knowledge (i.e., explicit knowledge about language rules) to produce language more accurately.

In developing MCF, its proponents shifted away from earlier notions like "consciousness raising" in favor of more precise concepts such as Input Processing. This shift emphasizes how Processing Instruction (PI)—particularly through structured input activities—can manipulate incoming language data in ways that push learners to process target forms and thereby establish correct form–meaning connections (VanPatten, 2009). Furthermore, MCF synthesizes many of the most promising ideas from disparate theoretical schools of SLA, as noted by Sharwood Smith and Truscott (2014, Chapter 4.2). The architects of MCF aim to propose a foundational theoretical model that supports a research program built on principled, empirical testing of falsifiable hypotheses. To lay this groundwork, they have integrated evidence from diverse sources—ranging from behavioral observations to neuroimaging findings—into an integrated explanation of the cognitive mechanisms underlying language processing and how such processing drives language development. After presenting the architecture of MCF, its developers offer reinterpretations of key concepts like noticing and consciousness. Re-examining these notions through the lens of MCF clarifies how PI can increase the likelihood of learners forming appropriate form–meaning connections. In essence, whereas VanPatten's Input Processing framework, which focuses primarily on the nature of the input itself, MCF provides an account of the internal cognitive processes that learners engage in when processing that input.

Therefore, in the following section, I will introduce the theoretical framework of Input Processing (IP) adopted in this study: the MCF model (previously known as the Modular Online Growth and Use of Language, or MOGUL, model) devised by Sharwood Smith and Truscott (2014). The MCF framework will be explained in depth because it offers a theoretical foundation for understanding IP and SLA in this context. MCF addresses both the processing and the acquisition of language in first and second language contexts, and it tackles several issues that were not explored by VanPatten's Input Processing principles, particularly those relevant to PI research. Hence, a detailed investigation of the language architecture outlined by Sharwood Smith and Truscott (2011, 2014) is essential in order to clarify the ways in which processing mechanisms, as conceptualized in their model, facilitate the progression of language acquisition. Within the MCF framework, concepts such as noticing and consciousness are reconceptualized to provide a clearer explanation of the mental processes that occur when learners attend to linguistic input.

2.2.1.1. The Input Processing Model Proposed by VanPatten

One influential set of ideas about input processing comes from VanPatten. The Input Processing (IP) model developed by VanPatten is based on the premise that second language learners possess constrained cognitive resources for managing linguistic input during real-time comprehension. As VanPatten (1994, p. 28) explains that learners do not possess an unlimited capacity of attention; rather, their attentional capacity is fixed and constrained. As a result, the extent to which learners attend to input is inherently limited. Given this restricted capacity for processing, the issue of consciousness can be reframed in terms of what aspects of the input receive attention and which are overlooked. In other words, since it is impossible to focus on every detail within a continuous stream of language, there is competition for attentional resources—certain elements of the input will be noticed and processed, while others will go unnoticed. This perspective emphasizes the importance of understanding which aspects of input capture learners' attention and the reasons behind their selective focus

Using the limited-capacity assumption as a starting point, VanPatten investigates how L2 learners process input to comprehend meaning, especially how they connect linguistic forms to their meanings. He observes that simply encountering a form frequently in input does not guarantee acquisition; what matters more is how learners engage with the input when they do encounter it. For example, if learners consistently ignore a particular verb ending because their attention is elsewhere (say, on the overall sentence meaning), then even massive exposure to that ending may yield little learning. VanPatten (2002, p. 757) emphasizes that how learners process input is more important than the frequency of specific forms in the input. This insight shifts focus from input quantity to input quality: instructors should not only provide input but also guide learners on how to process it, so that critical grammatical forms are actually noticed and used in comprehension. Within VanPatten's framework, input processing is distinguished from other cognitive processes in SLA such as accommodation (integrating new knowledge into one's interlanguage) or output production. IP deals exclusively with the initial phase of taking in input and making form-meaning connections during comprehension. By separating input processing from later stages of acquisition, VanPatten's model seeks to isolate how learners convert input into intake in working memory. In practical terms, this means focusing on comprehension processes rather than practice in production. VanPatten's associated teaching methodology, Processing Instruction (PI), which we will discuss in section 2.2, is built on this idea: it prioritizes structured input activities to push learners to process target forms correctly, before worrying about producing those forms.

Since this model is built on the premise of limited working memory capacity, the role of working memory is a crucial consideration. The fundamental assumption is that learners can only process a finite amount of linguistic information before attentional resources are depleted. Once this threshold is reached, working memory discards excess information to make space for new incoming data (VanPatten, 2005: 268). As a result, learners must allocate attentional resources strategically, leading to the development of processing preferences. These preferences dictate which aspects of input are attended to and prioritized for deeper cognitive processing.

VanPatten and Cadierno (1993: 227) assert that for acquisition to occur, the internal processing mechanisms must focus on linguistic encoding associated with propositional content. For Arabic-speaking learners of English, for example, this principle suggests that learners will initially assign subject status to the first word in a sentence and rely on default L1-based processing strategies when interpreting English input. However, as learners encounter misinterpretations and breakdowns in communication due to these default strategies, they gradually shift toward more effective processing strategies specific to the L2. In the case of English, this means prioritizing reliable cues such as definiteness to interpret sentences correctly. This transition from inefficient L1-based strategies to more effective L2-specific strategies marks a critical point in learners' developing language systems.

Throughout this parsing process, more salient and meaningful linguistic features receive greater cognitive focus, increasing the likelihood of their incorporation into the learner's developing linguistic system. The probability of a given form being noticed and processed is influenced by its communicative value, which depends on two key factors: (1) semantic significance, or whether the form inherently carries meaning, and (2) redundancy, or whether the form is necessary for conveying meaning (VanPatten, 2002). Forms that lack intrinsic meaning and merely reinforce existing information are less likely to attract attention.

A study by Bransdorfer (1989), as cited in Alsdy (2013), illustrates this principle by examining how learners process non-content words in Spanish. Participants were presented with two functional words: the preposition *de* (meaning 'of') and the definite article *la* ('the'). The results showed that learners consistently noticed *de* but not *la*. This discrepancy was attributed to the higher communicative significance of *de* compared to *la*. In Spanish, *de* alters the meaning of a phrase by signaling possession, whereas omitting *la* does not substantially impact meaning. Consequently, learners were more likely to process de while filtering out *la* as redundant. Forms that carry minimal inherent meaning are typically processed only after more meaningful forms have been internalized. The ability to process such non-meaningful forms is closely linked to the availability of cognitive resources, a concept that will be explored in greater depth in the following section.

The Modular Cognition Framework (MCF) emphasizes the centrality of semantic value in the processing of linguistic input beyond the core language module. This is particularly relevant for co-indexation across different representational systems, both within and beyond Universal Grammar (UG). Within MCF, language processing is treated as part of a domain-specific modular system, consisting of distinct modules such as phonology and morphosyntax, each governed by its own principles. However, language system extends beyond these core modules to include extra-modular systems, such as the conceptual system and the auditory system (see Section 2.1.1.2 for a more detailed discussion). This implies that processing linguistic meaning is not only essential for comprehension but also for linking various cognitive representations within memory.

Furthermore, redundancy—where multiple linguistic forms express the same meaning—can be advantageous once core linguistic modules are fully established, as it reinforces language representations. However, if learners consistently prioritize only the most salient linguistic features, they risk neglecting less prominent elements, which may hinder the development of a representation in their linguistic system. This concern is consistent with the principles of Processing Instruction (PI), which emphasize the use of input that increases both the communicative value and frequency of target structures, while minimizing redundant information. By making target structures more meaningful and more frequent in input, PI aims to strengthen the connection between linguistic form and meaning, facilitating more effective language acquisition. Additionally, VanPatten's Input Processing Principles describe how L2 learners assign argument structure during sentence processing. These principles shape learners' cognitive strategies when interpreting linguistic input, ultimately influencing the trajectory of language development. Thus, the relationship between semantic significance, redundancy, and instructional strategies is central to optimizing second language acquisition.

2.2.1.1.1. The Principles of IP and their empirical evidence

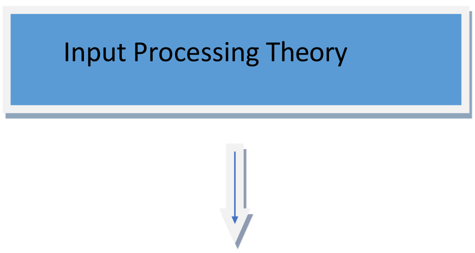
A central concern in SLA research has been understanding why learners attend to only a fraction of the linguistic input available to them. VanPatten's Input Processing (IP) model seeks to answer two fundamental questions in this regard:

(1) To what extent are L2 learners constrained in their ability to attend to and interpret all elements of the input they receive?

(2) What factors cause learners to attend selectively to certain parts of that input?

At the heart of IP is the notion that the human mind functions as a central information processor with a limited capacity. In other words, learners have finite attentional resources and can process only a certain amount of input at any given time. This constraint means that not all incoming language data can be noticed and retained in memory, a phenomenon illustrated by the concept of "intake", the portion of input that is actually processed and stored by learners. VanPatten's studies (1990, 1996) empirically investigated how much attention is required for effective input processing and what parts of input learners tend to retain. These works, alongside cognitive theories of attention (e.g., Slobin, 1985; Schmidt, 1990), underscore that only input which is noticed and recorded in memory has the potential to be acquired. For instance, Schmidt (1990) argued that to acquire a new linguistic form, learners must first attend to it in the input—a process intertwined with attention. Attention involves sub-processes such as alertness (learners' readiness to process new information), orientation (directing attention to a specific stimulus), and detection (selecting and engaging with a particular piece of input). Detection is particularly crucial because it marks the point at which data enter working memory, effectively distinguishing attention from mere exposure. Thus, IP aligns "attending" or "processing" in SLA more closely with detection, as conceptualized by Tomlin and Villa (1994), rather than Schmidt's broader notion of "noticing".

The IP model primarily investigates how second language (L2) learners selectively attend to specific linguistic features during comprehension, while ignoring others. It also explores the underlying factors that influence learners' tendencies to prioritize certain aspects of input over others. A key area of IP research examines the conditions under which L2 learners establish form-meaning connections—that is, the association between a linguistic form (e.g., morphology or syntax) and its communicative function (Alsady, 2013). According to VanPatten (1996), successful acquisition occurs when learners are able to accurately map a given form onto its intended meaning. For instance, in the phrase "plays tennis with Paul," learners must recognize that the -s inflection on "plays" signifies third-person singular and present-tense usage. However, processing challenges arise when learners rely heavily on sentence structure rather than grammatical markers. A common difficulty involves passive constructions, such as "The boy was helped by the girl." Due to default processing strategies, learners often interpret the first noun as the agent, leading them to mistakenly assume that the boy is performing the action rather than receiving it. Such misinterpretations hinder the acquisition of accurate syntactic structures. In essence, the IP model identifies two core sub-processes in language comprehension: (1) establishing form-meaning connections, where learners link linguistic elements to their meanings, and (2) parsing syntactic structures, which involves analyzing sentence components to determine grammatical relationships (see Figure 1).



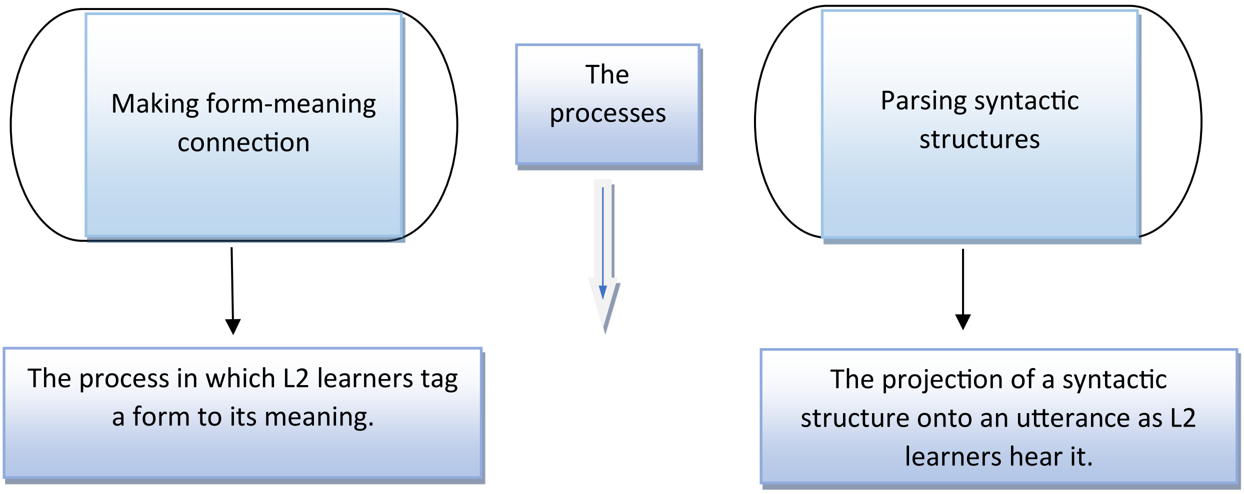


Figure 1. Input Processing Theory (Adapted from Chiuchiø, 2021, p. 7)

VanPatten's IP model posits that L2 learners naturally focus on meaning before form. The Primacy of Meaning Principle encapsulates this idea, stating that learners process input for meaning prior to processing it for form. In practical terms, this means learners are driven to seek communicative messages in the input above all else. During real-time comprehension, they allocate their limited resources to content words (nouns, verbs, adjectives) that carry semantic weight, often at the expense of grammatical forms (inflections, function words) that may be essential for accuracy but less salient in meaning. For example, VanPatten (2004) found that learners heavily focus on vocabulary conveying core ideas and may overlook verb inflections or endings that indicate tense or agreement. This behavior can result in important grammatical details being only partially processed or entirely dropped from working memory, as processing capacities are consumed by decoding meaning from content words. Fundamentally, learners' cognitive systems prioritize understanding over grammatical analysis, a stance verified by Mangubhai (1991) and VanPatten's own experiments (1990) showing that content words are processed before anything else. In line with this, Sharwood-Smith (1993) also observed that meaning-focused input processing leads to deeper learning and better retention than rote attention to form. Such findings reinforce the importance of meaningful engagement: learners linking new words, structures, and discourse markers by first extracting overall meaning from the context. This overarching principle of meaning-before-form is further refined by several sub-principles that collectively explain how learners manage competing demands of meaning and form in the processing of input.

As part of the Primacy of Meaning Principle, VanPatten (2004, 2007) proposed six subordinate principles that reflect systematic patterns in learners' meaning-oriented processing of input. These sub-principles, summarized here with empirical illustrations, shed light on the interplay of linguistic and cognitive factors in understanding language:

- (1) *The Primacy of Content Words Principle*: Learners prioritize content words (e.g., nouns, verbs) over function words or inflections when processing input. This is often because content words carry substantial meaning and are essential for grasping overall messages. Evidence suggests that when faced with a new sentence or utterance, learners first latch onto words like "tennis" or "Paul" in an example like "She plays tennis with Paul," before noticing the third-person -s on "plays," which signals present tense. This focus on content words aligns with their communicative urgency, helping learners decode the gist of sentences quickly. As Just and Carpenter (1992) note, limited working memory means learners often cannot simultaneously attend to meaning-rich words and all grammatical details, so they logically devote resources to elements that yield the most immediate understanding.

- (2) *The Lexical Preference Principle*: When a grammatical form encodes a meaning that could also be conveyed by a lexical item, learners initially rely on the lexical item and tend to ignore the redundant grammatical marker. For instance, in English, the past tense can be indicated by the verb's -ed inflection or by a time adverb (e.g., yesterday). Empirical evidence (Alsady, 2013) shows that learners lean on the explicit adverb *yesterday* to understand past time, rather than processing the *-ed* ending, because the adverb clearly signals the past without additional parsing. VanPatten (2007) similarly found that learners delay processing such grammatical markers until they have acquired the corresponding lexical cues. Learners can only begin to effectively map and attend to overlapping grammatical indicators once they are familiar with the relevant lexical items.

• (3) *The Meaning-Before-Non-Meaning Principle*: Learners are more likely to process grammatical markers that carry meaning than those that do not. A form's communicative value—how much it contributes to the sentence's meaning—determines its priority in processing. For example, verb inflections like English -*ing* (indicating ongoing action) have clear semantic content (progressiveness), whereas the third-person singular -*s* has no semantic weight (it doesn't change the time or content of the verb). Learners tend to notice and acquire -*ing* earlier since it adds meaning to the utterance, often delaying attention to the semantically empty -*s*. VanPatten's observations reveal that non-meaningful forms (like -s) typically get processed only after the meaningful ones are internalized. Essentially, learners tend to allocate their constrained cognitive resources toward elements of input that convey meaning, postponing the processing of less semantically salient forms until additional resources become available.

• (4) *The Preference for Non-Redundancy Principle*: Learners give precedence to non-redundant meaningful grammatical markers over redundant ones. Redundant markers are those that duplicate information already signaled elsewhere (often lexically). VanPatten (2004b) illustrates this with English verb endings: the progressive -*ing* vs. the third-person -*s*. -*ing* is non-redundant (uniquely indicates continuous aspect), whereas -*s* is redundant in context because the subject noun or pronoun already tells us "who" is doing the action. Learners process -*ing* earlier since it provides new information, but might neglect -*s* initially because it repeats what the subject already indicates. Empirical studies confirm this progression: L2 English learners accurately use -*ing* to express ongoing actions before they consistently apply the -*s* in third person singular present tense. Over time and with growing proficiency, learners will catch up on redundant forms once more cognitive resources become available for fine-grained details.

- (5) *The Availability of Resources Principle*: This principle posits that learners can only process redundant meaningful forms or non-meaningful forms when they have spare processing capacity (resources) after understanding the sentence's overall meaning. In early stages, a beginner's limited working memory and attentional resources are often fully occupied with grasping the basic meaning, leaving little room to notice every grammatical detail. For example, a beginner L2 learner focusing on a sentence's key words might ignore plural -*s* or the exact tense marker until their proficiency increases. VanPatten (2004b) explains that only when processing the sentence's meaning does not exhaust resources can learners attend to less salient features. Over time, as learners become more skilled and their comprehension of sentences becomes more automatic, cognitive resources are freed up. This allows attention to extend to previously overlooked forms, such as redundant endings or function words. In sum, what a learner can process at any moment is constrained by their current proficiency and available cognitive capacity (e.g., working memory, attention span). This also explains why more advanced learners eventually notice subtle grammatical cues that beginners miss.

- (6) *The Sentence Location Principle*: Learners tend to process words in initial sentence positions before those in medial or final positions. In other words, the beginning of a sentence is perceptually salient; learners latch onto it first, often using it as an starting cue for interpreting what follows. Words at the start of a sentence (like subjects or introductory clauses) are typically easier for learners to notice and recall, whereas mid-sentence elements can be overshadowed. This principle aligns with findings in sentence processing: Barcroft and VanPatten (1997) found that learners cope better with information at sentence beginnings, a position of prominence, compared to clauses embedded in the middle. A relevant case is the difficulty learners face with English relative clauses. When a relative clause is center-embedded (placed in the middle of a main clause), it interrupts the main sentence's flow, making it harder to process as a whole. For instance, consider the sentence: "*The girl who works in this restaurant is my cousin*." The relative clause "*who works in this restaurant*" in the middle can hinder comprehension because it separates the main subject "*The girl*" from its verb "*is*". Studies by Kuno (1974) and others suggest that such center embeddings overload working memory (a universal processing challenge) more than clauses at the beginning or end of sentences. The Sentence Location Principle explains why learners often misinterpret passive sentences or complex structures: they assume the first noun or pronoun is the agent due to its prominent initial position. Teachers and materials developers, recognizing this, sometimes modify sentence structures (e.g., simplifying or highlighting end-of-sentence elements) to help learners notice information that usually appears later in sentences.

The First Noun Principle (L1 Transfer Principle): Another core component of IP is the First Noun Principle, which asserts that L2 learners generally interpret the first noun or pronoun they encounter in a sentence as the subject or "doer" of the action. This strategy works well for many active, subject-verb-object sentences in languages like English, but can lead learners astray with passive constructions or languages with flexible word order. For example, beginners may read "*The boy was helped by the girl*" and mistakenly assume the *boy* is the helper (agent) because it's the first noun, when in fact he is the one receiving help (patient). Such misinterpretations can impede acquisition, as learners form incorrect form-meaning connections about who did what in a sentence. VanPatten (2007) notes that if learners carry over their native language's parsing strategies (an L1 Transfer Principle), they will initially use familiar patterns to process L2 sentences. This means an English speaker learning Japanese might first apply English parsing habits (focusing on the first noun), which could be problematic given Japanese often places the subject at the beginning anyway, but with different nuances (e.g., topic markers). Conversely, a Japanese speaker learning English might struggle with passive voice or other constructions that violate their L1 expectations about word order.

However, three sub-principles can override the First Noun bias by providing additional cues for interpretation:

• *Lexical Semantics Principle*: Learners may rely on semantic cues (meaning of words) instead of strictly following word order. If the content of the nouns suggests who is capable of the action, learners can use that information. For instance, given "*The fence was kicked by the horse,*" the meaning of *fence* vs. *horse* signals that only a horse can kick, so "*the horse*" must be the agent, not "*the fence*". This shows learners leveraging world knowledge and verb semantics (animacy of subjects) to correctly interpret sentences, as evidenced by Gass's (1987) findings: Italian learners of English used animacy cues to parse who did what. Essentially, when possible, semantics help learners avoid misinterpreting the first noun as the doer if doing so would conflict with real-world logic.

• *Event Probability Principle*: Learners consider real-world likelihoods of events to guide interpretation. VanPatten (2007) gives the example of the sentence "*the child scolded the mother*." Given typical social roles, learners might find it more plausible that the mother scolded the child. Therefore, they might override the First Noun strategy (which would wrongly assign "*the child*" as agent) and interpret "*the mother*" as the agent because scolding is more commonly done by a parent to a child. This sub-principle shows that learners are not passive processors; they actively weigh context and plausibility. When word order is misleading, their sense of what usually happens in the world (children rarely scold parents) can correct their initial parse. It's a cognitive check against the default of "First Noun Principle."

• *Contextual Constraint Principle*: Learners use the broader context or prior discourse to constrain their interpretation of a sentence's structure. If the preceding context narrows down possible meanings, learners become less reliant on the first noun position for clues. For example, consider a context: "*the man is dead. He was killed by Adam*." In the second sentence, the pronoun "*He*" at the start is naturally understood as the victim (patient) because the prior sentence set the context (we know someone is dead). Here, context guides the learner to correctly interpret "*He*" as the one who was killed, not the killer, despite "*He*" being in the initial position. Alsady (2013) provides this example to illustrate how preceding information helps parse the subsequent sentence accurately. The contextual cues essentially override the First Noun Principle, ensuring learners don't misassign roles in the sentence.

VanPatten's updated (2007) formulation of IP principles solidified the Primacy of Meaning and First Noun principles as central, while acknowledging L1 transfer mainly in how it influences the first noun interpretation. The combined insights from these principles reveal why learners often use suboptimal processing strategies—like overlooking grammatical details or misidentifying subjects—that can hinder L2 development. Processing Instruction (PI) was developed as a pedagogical approach to address these tendencies. PI explicitly targets the ineffective default strategies (e.g., always treating the first noun as agent, or ignoring verb inflections) and trains learners to adopt more effective ones. A cornerstone of PI is the use of Structured Input activities, which are exercises designed to push learners to process form and meaning together correctly. For example, learners might be given sentences where relying on the first noun leads to misunderstandings, thereby encouraging them to pay attention to verb endings or passive voice markers for the true meaning. By doing so, PI helps learners form accurate form-meaning connections—linking grammatical forms to their meanings reliably—and improves their parsing skills to handle complex sentences.

2.2.1.1.2. Form-Meaning Connections and Parsing

A core goal of input processing is helping learners establish correct form–meaning connections – linking a linguistic form (morphological or syntactic) with what it signifies. In discussing form–meaning mapping, it's useful to clarify terms. Form–meaning connections can be divided into two broad categories: "Form" refers to surface features of language (the actual word, morpheme, or structure), and "Meaning" refers to the concept or function that form conveys. For example, the English suffix "-ed" (form) typically indicates past tense (meaning). VanPatten et al. (2004) define a form as a superficial linguistic feature or the surface realization of a deeper, underlying linguistic representation, which includes things like lexemes, inflectional endings, function words (complementizers, determiners), etc. Meaning, in turn, can be concrete or abstract – a referential meaning (like past time, plurality) or a pragmatic/discourse function. VanPatten (2003) characterizes a form–meaning connection as the learner's association between a linguistic form and its corresponding meaning in the real world; for example, understanding that the morpheme –ed indicates past tense.

The challenge in SLA is that learners do not automatically make all form–meaning connections present in the input. They might understand the meaning of a sentence without identifying which form contributed that meaning. Parsing is the cognitive process that assigns structure to a sentence in real time, and it plays a key role here. Parsing involves computing the syntactic relationships between words as the sentence unfolds. When parsing, the learner's brain categorizes each word (as noun, verb, etc.) and attaches it into an emerging syntactic tree. For instance, on hearing a noun phrase, the parser has to decide if it's the subject of the sentence, an object, part of a prepositional phrase, etc., based on cues like word order or case marking. If a determiner (like "the") is encountered, the parser anticipates that a noun will follow, forming a determiner phrase. Essentially, parsing in second language acquisition (SLA) refers to the moment-by-moment analysis of sentence structure during comprehension. As learners engage with spoken or written input in an L2, they must identify the grammatical role of each word (such as noun, verb, or adjective) and gradually construct the sentence's structure as they process it in real time. This real-time computation is crucial for understanding, but it is prone to error if learners apply inappropriate strategies. One common default approach is the "First-Noun Principle," where learners assume that the first noun or pronoun in a sentence is the subject or agent. While this heuristic works in many simple SVO (subject–verb–object) order (as in English), it can mislead learners when the L2 uses different word orders or subtle grammatical cues. For example, the first noun in Spanish sentences is not always a noun or pronoun as shown in the following sentences:

1) Nos faltan varios libros
   us-DAT lack several books
2) We are missing several books

The first item in the Spanish sentence here is "nos", which is an indirect object pronoun and thus not equivalent to the English "we". Therefore, L2 Spanish learners often misinterpret object-first sentences by incorrectly treating the initial object pronoun as the subject, a direct result of over-relying on the "First-Noun Principle". Such misinterpretations illustrate how parsing strategies can create persistent comprehension problems if they are not aligned with the target language's syntax.

In his Input Processing (IP) model, VanPatten originally argued that learners draw on universal processing strategies rather than language-specific (L1) parsing routines when dealing with L2 input. In other words, early-stage learners were thought to use general strategies like the First Noun Principle across all languages, regardless of their L1 background. VanPatten refers to this idea as the universal processing strategies, which posits that certain default parsing habits (such as assigning agenthood to the first noun) are innate or common to all learners. However, this theoretical stance has faced challenges. Empirical studies have questioned whether L2 parsing is truly independent of one's L1. For instance, Isabelli (2008) compared how English-speaking vs. Italian-speaking students interpreted Spanish sentences: the Italian L1 group (whose native word order differs from English) performed better on non-canonical Spanish sentences than the English L1 group, suggesting that the Italians were less trapped by the first-noun principle. Findings like these indicate that L1 parsing habits do influence how learners process L2 sentences, especially in early stages. Acknowledging such evidence, VanPatten later introduced the "L1 Transfer Principle," which holds that learners begin L2 acquisition using their L1's parsing procedures. This recognizes that beginner learners often bring L1-based expectations to L2 processing, which can either help or hinder interpretation depending on how similar the two languages' structures are. By accounting for L1 transfer effects, the IP model addresses a key limitation of its earlier version – namely, the underestimation of the L1's role in shaping initial processing strategies. In sum, VanPatten's stance evolved from viewing parsing strategies as purely universal to a more nuanced view that allows L1 influences to compete with or override the universal default in certain contexts.

Another important distinction in VanPatten's framework is between building implicit linguistic representations and skill development. He emphasizes that acquiring an L2 is fundamentally about developing an internalized, abstract mental representation of grammar – something that happens largely implicitly – as opposed to simply mastering drills or communication skill. VanPatten (2010) argues that language as representation (the mental grammar) and language as skill (fluent use in comprehension or production) are two separate facets of acquisition, and neither can be directly "taught" by instructors. In practical terms, this means that traditional explicit grammar teaching or even speaking practice cannot by themselves impact the subconscious grammatical system that the learner needs. Instead, what instruction can do is manipulate the input and the way learners process that input, so that learners draw the correct form-meaning connections and gradually refine their internal grammar. This is the rationale behind Processing Instruction (PI) – the pedagogical application of the Input Processing (IP) model. PI is explicitly designed to target how learners comprehend input, with the goal of pushing them to process sentences in a more native-like way. Crucially, PI is not about teaching output skills or communicative performance; it does not ask learners to produce the language directly. Rather, it provides structured input activities that force learners to notice and interpret grammatical cues they might otherwise skip over. By doing so, PI aims to enrich the learner's implicit language system. In VanPatten's terms, PI seeks to alter the default processing strategies so that more grammatical detail in the input gets processed and turned into intake (i.e. integrated into the interlanguage system). This focus on input processing as a means to acquisition reflects a more representation-oriented approach to teaching, as opposed to practice-oriented approaches that build fluent skill.

This kind of input data may be compatible with generative theory, which claims that humans possess innate language specific mechanisms responsible for constraining the shape of languages as the processing is considered as the fundamental bridge between data and mechanisms inside the head (VanPatten and Rothman, 2014, p.28). VanPatten (2002) has provided a model of IP to offer the theoretical basis for PI. For a detailed review of the set of principles (see VanPatten's summarized article, 2004b).

To achieve the acquisition within IP framework, L2ers should be taught how to alter these principles used during online comprehension. For this study, two key processing challenges highlighted in this context are the Sentence Location Principle and the L1 Transfer Principle.

Each sheds light on why certain grammatical structures (like relative clauses) are notoriously difficult for L2 learners to interpret correctly in real time:

1. *The Sentence Location Principle* – Learners tend to process elements at the beginning of a sentence more readily (and with higher priority) than those in the middle or the end.

In essence, the initial position in a sentence grabs the learner's attention first, which means that grammatical cues or information appearing later may be overlooked or processed with delay. This principle helps explain why learners struggle with complex constructions such as English relative clauses. For example, in the following sentence (3), an L2 English learner might fixate on "The student" and the main verb "is" and neglect the embedded clause "whom you met yesterday." Important details that come after the subject (in this case, the fact that the you is the one doing the meeting) are at risk of being missed or misanalyzed because they are not in the sentence-initial spotlight.

3) "The student whom you met yesterday is my classmate,"

In effect, the learner's parser may attach the wrong meanings to the wrong parts of the sentence due to this initial-position bias. Over time, this can delay the acquisition of structures like relative clauses, passives, or other sentences where crucial grammatical markers (e.g. a relative pronoun or a passive agent "by-phrase") occur later in the sentence rather than right up front. The Sentence Location Principle underscores a general processing limitation: learners have limited attentional resources and tend to allocate them to the beginning of an utterance, potentially at the expense of fully processing later-arriving linguistic material. A more mature parser (like that of a native speaker) would more evenly distribute attention or use expectations to hold places for later input, but L2 learners in early stages often lack this ability.

2. *L1 Transfer Principle* – Learners initially rely on their first-language parsing procedures when processing L2 input.

This means that the strategies or cues a learner's brain found useful in decoding L1 sentences will be unconsciously applied to L2 sentences – at least until the learner gains enough experience to adjust them. While the IP model maintains that some default strategies (like the First-Noun Principle) may be universal, the L1 Transfer Principle acknowledges that an L1 can impose its own parsing patterns onto L2 processing. This cross-language interference is especially evident when the L1 and L2 have divergent grammatical signals. A case in point is the processing of English relative clauses by Arabic-speaking learners. In English, a relative clause marker (such as the complementizer "that" or the pronoun "who") can be used with both definite and indefinite antecedent nouns. For instance, one can say, "*I met the teacher who lives next door*" or "*I met a teacher who lives next door*." By contrast, in Arabic the equivalent relative pronoun (e.g. *illi*) can only be used if the antecedent noun is definite; an indefinite head noun typically would not take an overt relative pronoun. An Arabic speaker, therefore, relies on a definiteness cue to recognize a relative clause in their native parsing routine. When this learner encounters English, they might initially be confused by sentences where an indefinite noun "*a teacher*" is followed by a relative clause, or they might fail to process a relative clause if the expected definiteness cue is absent. In other words, the learner's L1-based expectation that "relative clauses only follow the article *the*, not *a*/an" can lead to misanalysis of English sentences that violate that expectation. More generally, the L1 Transfer Principle can manifest in many ways: learners may overlook L2 grammatical markers that are unimportant in L1, or they may misinterpret L2 structures by imposing L1 word-order patterns. This creates significant challenges in acquiring L2-specific structures. Only by gradually noticing where L2 patterns differ from L1 (often through targeted input or feedback) can learners overcome these crosslinguistic-driven parsing errors.

Given these processing tendencies and their potential to impede acquisition, VanPatten (2002, 2004) advocates Processing Instruction (PI) as a pedagogical intervention to help learners overcome such hurdles. The core idea is to alter how learners process input, thereby improving what they internalize from that input. PI uses specially designed activities (so-called structured input activities) that force learners to pay attention to grammatical forms and positions they would normally skate over. For example, if a learner habitually relies on the First-Noun Principle, a PI activity might present sentences in which interpreting the first noun as the agent leads to absurd or incorrect interpretations, thereby pushing the learner to seek other cues (like verb endings or case markers) to understand who-does-what. VanPatten's goal with PI is to "push learners away from less than optimal processing and toward processing along a better path so as to enable intake for acquisition". In other words, PI attempts to recondition the parser: learners practice processing sentences correctly (e.g. noticing a passive voice or a non-initial cue) in a controlled input setting until this becomes more automatic. Notably, because PI is about comprehension processing, it tackles the development of the implicit system rather than immediate communicative output. Studies have shown that PI can lead to significant gains in learners' interpretation of target structures, which often translate into improved underlying knowledge that eventually reflects in usage (e.g., VanPatten & Cadierno, 1993; Benati, 2005; Marsden, 2006; Benati & Lee, 2010; Farley, 2001, 2004). By modifying learners' default parsing strategies – for instance, by tempering the First-Noun Principle or reducing blind reliance on L1 cues – PI facilitates more accurate form-meaning connections. This in turn helps turn input into intake, fuelling the acquisition of grammatical structures that learners previously failed to grasp. While PI is not a panacea and works best in conjunction with a broader instructional approach, it provides a clear, theory-driven method to address the specific processing bottlenecks identified by the IP model. Through PI, the very act of comprehending language becomes the practice that builds the language system: learners learn to parse in more target-like ways, which VanPatten argues is a necessary step for true acquisition of the L2 grammar.

2.2.1.2. Modular Cognitive Framework

Although communicative, meaning-focused approaches currently dominate language teaching, recent years have seen generative linguistic concepts being integrated with cognitive perspectives on SLA. For example, it's widely accepted that learners go through developmental stages and that interlanguage systems have an internal consistency, ideas stemming from generative research (Sanz 2005, p. 7). Generative linguistics (with its UG) and cognitive processing theories are not mutually exclusive – in fact, modern frameworks attempt to merge them. The Modular Cognitive Framework (MCF) developed by Sharwood Smith and Truscott (2004, 2005, 2014) is one such integrative approach. MCF (also referred to in their work as the MOGUL framework – Modular Online Growth and Use of Language) blends generative ideas of an innate language module with cognitive, usage-based ideas of processing.

Whong (2007) notes that generative linguistics aligns with cognitive views by incorporating findings from psycholinguistics. A prime example of integration is Sharwood Smith & Truscott's MCF, which they describe in a series of works (2004, 2005, 2014). MCF posits that the mind is modular: there is a domain-specific language module distinct from other cognitive systems. Within the language module are sub-modules for different aspects of language – notably a phonological module and a syntactic module (Truscott & Sharwood Smith, 2011, p. 508). These correspond roughly to the mental lexicon/phonology and the grammar in generative terms.

The architecture of MCF can be visualized as layers or interfaces between modules. The phonological (sound) and syntactic modules are considered "core" linguistic subsystems. They are interconnected by an interface that allows phonological representations to be mapped to syntactic structures. Additionally, these core modules interface with external systems that are not exclusively linguistic but are necessary for language use: the auditory system, visual system, and conceptual system. The auditory system processes incoming sound. It supplies the phonological module with auditory input (e.g., the waveform of speech). It also handles non-linguistic sounds, as it's a general perceptual module for hearing. In MCF, auditory processing is the first step in turning external speech into an internal phonological representation (often called a perceptual representation or POpS, see below). The visual system is similarly connected, mainly relevant for reading (written input) and for sign languages. Visual input (text or signs) gets channeled into the phonological module (for reading, one often recodes text into an internal phonological form) or directly to conceptual representations (for understanding symbols). The articulatory system is responsible for speech production. It takes instructions from the phonological and syntactic modules to produce output (speaking, writing, signing). The conceptual system (CS) encodes meaning – essentially it's where semantic and pragmatic processing occurs. It interfaces with the syntactic module so that meanings (conceptual structures) can be linked to syntactic structures (words, sentences). The conceptual system is not language-specific; it's part of general cognition (handling ideas, world knowledge) but in language use, it's the target where linguistic form maps to meaning.

One key principle of MCF is that core linguistic information is encapsulated but interfaces allow integration. The conceptual system is separate from the language module, which is why one can think conceptually without language or why conceptual knowledge can be consciously accessed and verbalized. By contrast, many operations in the phonological/syntactic modules happen subconsciously (we don't choose the phonological rules that apply; they just happen). Because CS is outside the core language module, it is available to conscious thought, whereas the inner workings of the language sub-modules are typically not directly accessible to consciousness. MCF also includes an affective system (AfS) linked to these modules, containing affective (emotional) associations with representations (Truscott & Sharwood Smith, 2011, pp. 511–512). For example, certain words or sounds might carry emotional weight or reactions, and these are stored in affective structures connected to the cognitive representations. The diagram in Figure 2 provides a concise representation of the various components of MCF.

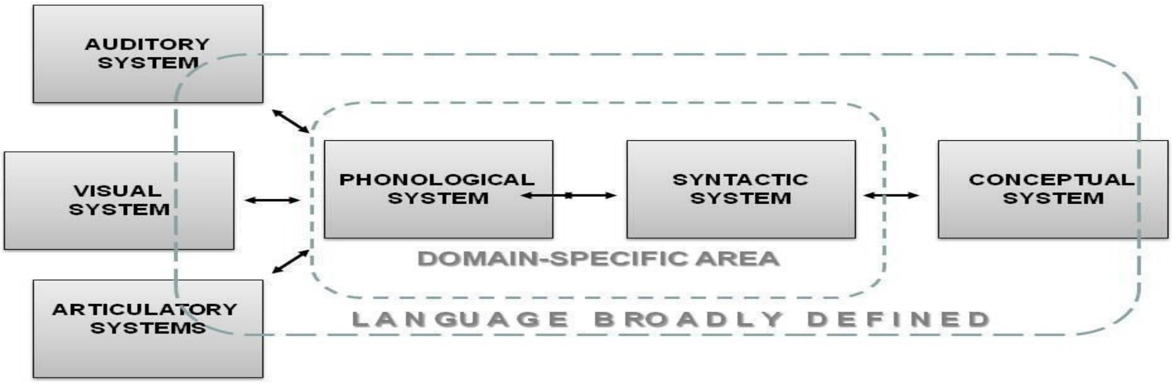


Figure 2: The Mogul architecture after Sharwood Smith & Truscott (2014: 17)

In Figure 2., the inner rectangular frame represents the domain-specific language system. The outer rectangular frame represents language in the broader sense, consisting of perceptual systems (i.e. auditory, visual and articulatory systems) that have language-related information, but also contain non-linguistic information. Language-related knowledge can not only be found in the language faculty, but in almost all modules of the architecture. Language covers a number of different types of knowledge and skills, with the language module, indeed, having the main role to play in language development (Sharwood Smith & Truscott, 2014).

The perceptual output structure (POpS) functions as a key module representing the final stage of processing within systems dedicated to individual sensory modalities. Each modality-specific system is responsible for managing input from a particular sensory system, as illustrated in Figure 3 (Truscott & Sharwood Smith, 2011, p. 509). These modules are linked through interfaces that enable coordination and alignment in response to sensory input. It is particularly evident that both affective structure systems and sensory-perceptual output mechanisms demonstrate higher level of activation, highlighting the critical role of sensory input and emotional states in shaping behavioral responses. This heightened activation likely reflects their foundational role in the evolutionary development of human cognition and response systems (Truscott & Sharwood Smith, 2011, pp. 511–512). It is important to acknowledge that this conceptualization implies separate stores for each of the five, and maybe more, senses.

The MCF framework is made up of processor-store pairs and interfaces connecting stores. Each pair function as a module by serving a specific purpose, according to innate constraints. The processors create new representations on their stores by merging existing representations. For instance, the syntax processor embodies syntactic principles of universal grammar to form syntactic representations of the input it gets. The stores are chunks of long-term memory that contain both the primitives associated with the module and all the previous representations created by the processor utilizing those primitives. As illustrated in Figure 3 of the basic MOGUL architecture.

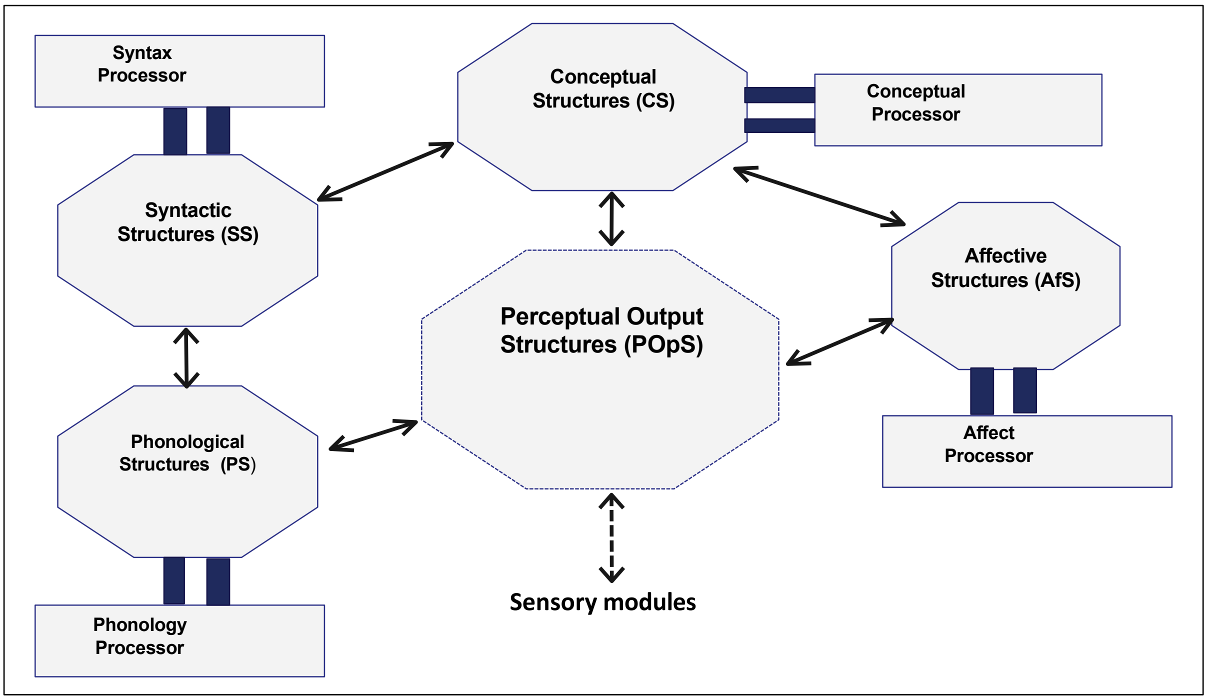


Figure 3: The MOGUL architecture, by Truscott & Sharwood Smith (2014: 419)

Perceptual output structures (POpS) are at the heart of the system, they represent the final products of the sensory modules. The figure above shows them as a single unit, but they are actually separate modules with their own processor and store structure. One of these modules is auditory structures (AS), which is comprised of an auditory processor and a memory store containing previous auditory representations along with the primitives of the store. POpS are gaining special significance because its perceptual representations acts as input to other modules and are the main objects of consciousness.

The linguistic parts of the system are phonological structures (PS) and syntactic structures (SS), which include processors that embody phonological and syntactic principles and the stores of representations they handle. The framework allows for specific linguistic theories to fill in the exact nature of the principles and the representations. Thus, PS and SS can be considered as the 'language module', because they both serve the function of language processing and are separate from other modules.

Conceptual structures (CS) are characterized by a modal representation and processing. The perceptual output structures provide the main input for this processing. The affective module (AfS) includes representations of each of the feelings and a specialized processor for handling these representations. The primitives consist of both positive and negative value representations, known as basic elements of emotions (e.g. Barrett and Russell, 1999; Ortony et al., 1988; Smith and Ellsworth, 1985). Emotions have a significant impact on thinking and behavior, as they are interconnected and influential in the AfS system. Interfaces connect elements in different modules that have high activation levels, allowing for their processing and forming a consistent representation. As stated by Sharwood Smith (2013: 33) that the internal interfaces connecting phonology and syntax exhibit a high degree of integration. Certain elements show a strong correspondence—for instance, a phonological 'word' closely parallels, though does not exactly replicate, a corresponding syntactic category. In contrast, the areas connected through what are termed external interfaces tend to display a lower level of interconnectivity.

In summary, the Modular Cognitive Framework paints SLA as a process occurring in a complex architecture: input stimuli pass through perceptual processors (yielding POpS), which feed into a language module that interacts with a conceptual module to produce understanding, all while being influenced by an affective module and constrained by working memory. What does this mean for second language acquisition specifically (SLA within MCF)? The next subsection will discuss how L2 acquisition is viewed in this modular system, especially in terms of how existing L1 representations affect new L2 representations and how noticing/consciousness play a part.

2.2.1.2.1. SLA within MCF

Within the MCF perspective, the process of acquiring an L2 is unique because, unlike an infant learning their first language, the L2 learner's mind already contains a fully developed L1 system. This pre-existing language in cognition fundamentally alters the learning landscape for L2. The key distinction, then, between L1 and L2 acquisition is the presence of an established L1 representation that L2 has to contend with. Developmentally, this implies that learning an L2 might become easier with time and practice (as learners adjust their system), not necessarily because the learning mechanism itself changes, but because the competition with L1 gradually shifts as L2 representations grow stronger (Elman 1997, p. 70). In simpler terms, early in L2 acquisition, the L1 heavily dominates processing; as L2 proficiency increases, the learner's cognitive system can allocate resources more efficiently to L2, and using the L2 may even facilitate further learning (practice effect).

At the initial stages, learners tend to interpret second language forms through their first language filters, utilizing prior knowledge as a scaffold for understanding. Sharwood Smith (2013) notes that when an L2 form enters the system, the mind tries to interpret it using existing categories – which are L1 categories if no L2-specific ones exist yet. For example, consider Saudi Arabic learners of English, as in the study context. In Arabic, relative clauses do not require a relative pronoun if the antecedent is indefinite. When these learners encounter English relative clauses, their initial mental processing might map the English sentence onto their Arabic pattern, effectively "skipping" the relative pronoun if the antecedent is indefinite. This can lead them to accept sentences like "*This is a man takes his responsibilities seriously*" instead of "*This is a man who takes his responsibilities seriously*". From an MCF view, this happens because the L1 value (in this case, [± require relative pronoun] tied to definiteness) co-exists with the new L2 information in the cognitive architecture. The L1 setting has a much higher activation level – it's been strengthened through times of use and is the default "winner" in processing competition. Thus, early L2 representations are weak and easily overshadowed by entrenched L1 representations for the same feature. The result: learners judge an ungrammatical English sentence as acceptable because their L1-based processing.

MCF describes this in terms of activation levels. Each representation (say, a particular grammatical construction or feature value) has a resting level of activation based on frequency and repeated experiences. L1 representations have very high resting activation; new L2 representations start with low activation. When both L1 and L2 representations are present for a given feature, the L1 is likely to "win" because its activation easily crosses the threshold for use, whereas the L2's does not. However, with continued exposure and practice in the L2, the new representations gradually increase in strength. Given enough time and input, the L2 feature can reach a point where it competes on more equal footing with the L1 feature. At that stage, learners might still default to L1 under pressure, but they are capable of the L2-like processing more reliably. Eventually, the L2 representation may even surpass the L1 in activation when operating in an L2 context, meaning the learner consistently uses the L2-appropriate processing (this would be akin to high proficiency).

To illustrate, Sharwood Smith & Truscott talk about cross-linguistic influence in terms of representations in memory stores. L1 and L2 information co-exist in the multistore architecture, and learning is competitive. In the relative clause example, initially the L1 representation ("it's okay to omit 'who' for an indefinite antecedent") is so active that it prevents the L2 representation ("always need a relative pronoun in English") from taking hold. Over time, as the learner sees many English relative clauses with "who/that", the L2 representation's activation grows. The learner might start noticing when the relative pronoun is missing and that it sounds odd in English. With sufficient reinforcement, the L2 rule gains dominance for processing English sentences. MCF would describe this as the L2 representation's activation crossing a threshold so that it becomes the default for that context. Importantly, this process doesn't require any switching off of the L1—L1 values remain in the mental architecture, they're just not triggered when using L2 if the L2 values have become stronger for that context. But until that happens, early-stage learners often need time and lots of input for L2 patterns to become robust.

An implication of MCF is that frequency of exposure is crucial to raise the activation levels of L2 items. The resting activation level of a representation increases with repeated successful activation (i.e. processing that structure correctly). So the more learners encounter and correctly interpret a target L2 form, the more likely it will be readily available next time. Over time, certain activation patterns stabilize, making some form–meaning connections more likely to fire than others. Essentially, the learner's system attunes to frequent L2 patterns, eventually favoring them over L1 patterns when in L2 mode. One more factor to consider is the role of explicit (metalinguistic) knowledge in MCF. MCF allows that explicit rules (declarative knowledge about language) can be stored in the conceptual system and even accessed automatically during processing with practice. For instance, a learner might explicitly know "In English, you need 'who' in that sentence," which can help them notice the absence of "who". Initially they apply this knowledge with conscious effort, but gradually it can influence their parsing implicitly.

In conclusion, within the Modular Cognitive Framework, SLA is seen as contending with cognitive inertia: the learner's L1 is deeply rooted, so the L2 must gather enough strength (through meaningful input and use) to change the overall system. Initially, L2 forms are weak and easily overshadowed, causing lots of L1-driven errors. With time, practice, and likely some explicit guidance, the L2 representations can strengthen and eventually even override L1-based processing in the appropriate contexts. This view underscores why sustained exposure and practice are critical, and it also justifies techniques like Processing Instruction that attempt to accelerate the strengthening of form–meaning connections by forcing learners to process grammar that their L1 would otherwise lead them to ignore. Essentially, such instruction gives the new L2 features a fighting chance in the cognitive competition against the L1.

2.2.1.2.2. Noticing and Consciousness within MCF

MCF acknowledges that input can be processed without reaching conscious awareness. In practical terms, this occurs when an auditory or visual representation of an input does not cross the activation threshold required for consciousness. The input is registered in the perceptual system but remains unnoticed, quickly fading from the perceptual workspace (POpS) before it can impact other modules. Only limited processing can happen on such a weak representation, consistent with findings that subliminal input yields minimal learning effects. By contrast, once an input's activation exceeds the threshold, the individual becomes consciously aware of the overall perceptual representation (for instance, hearing an utterance and being broadly aware of it) (Truscott & Sharwood Smith, 2011: 520). At this awareness-of-input level, however, the person has not yet focused on any particular detail of the stimulus. The entire utterance is in consciousness, but no specific feature stands out as noteworthy. Importantly, this global awareness carries no explicit information about form – the linguistic details (e.g. word order or endings) are only implicit in the perceptual representation. In MCF, the language processor can still handle implicit details at this stage (e.g. the syntax module can parse word order automatically if the relevant representations exist in memory) even if the learner isn't consciously focusing on them. In other words, mere awareness of input may allow some modular processing to occur in the background, but it typically does not lead to any enduring learning or explicit insight by itself. This distinction sets the stage for noticing, which MCF defines as a higher level of awareness where specific features of the input are singled out for attention.

Noticing in MCF is characterized by a shift in attention to a particular part of the perceptual input, triggered when that part achieves a sufficiently high activation on the perceptual output stage (POpS). Technically, it involves constructing a "follow-up POpS representation" that contains only a subset of the original representation – the portion deemed relevant or interesting. In effect, the mind zooms in on one feature of the input (for example, a specific word, sound, or grammatical feature), elevating it in consciousness. This happens when the processor treats that fragment as an instance of a particular form, causing its activation to spike into awareness (Truscott & Sharwood Smith, 2011: 520). In MCF terms, the noticed feature is now highlighted in the global workspace, whereas the rest of the input remains as background awareness.

A crucial mechanism enabling noticing is co-indexing. Co-indexing refers to linking the activated perceptual representation with corresponding representations in other modules (e.g. phonological, syntactic, or conceptual memory) via shared indexes. When a learner notices a form, it means the perceptual trace of that form has successfully connected to an existing representation in their linguistic system. For example, noticing the -s at the end of a verb (as the English third person singular marker) entails that the auditory representation of "-s" is co-indexed with the learner's known grammatical feature set for present tense, third-person singular. This linkage is what identifies the input segment as an instantiation of a familiar category (here, a subject-verb agreement morpheme) rather than just meaningless noise. If such a form–function connection is made, the learner becomes consciously aware of that specific feature and its significance. MCF posits that without prior representations to latch onto, noticing cannot occur: if the input's critical feature doesn't register strongly (e.g. the sound is too fleeting or below perception threshold) or if the learner's system has no established representation for it, then no follow-up POpS representation will be built. In that case, the input stays at most as unfocused awareness and soon dissipates, yielding no "noticed" event. This highlights a limitation in second language settings: truly novel L2 features (for which a learner lacks any conceptual or linguistic reference) may be hard to notice until some representation is formed through exposure. MCF's emphasis on co-indexing thus underlines that noticing is not the creation of a new representation out of thin air, but rather the recognition of incoming data as an example of something the mind already partly knows (Truscott & Sharwood Smith, 2011, p.159). It's a process of mapping input to existing knowledge structures in real time.

When noticing occurs, that isolated representation on POpS enjoys a boosted activation level, sufficient for it to enter consciousness clearly. The learner experiences this as noticing a particular form, which aligns with the idea of "attention to form" in language input processing. Cognitive accounts like Schmidt's original Noticing Hypothesis described this as the learner's conscious registration of a feature's occurrence. MCF's model provides a concrete explanation of how such registration happens in the mind – via a strengthened perceptual trace and cross-module indexing – rather than treating "noticing" as a vague black box event. The benefit of this focused awareness is that the noticed item can now be processed more deeply or held longer in the workspace, increasing the chance that it influences learning. As Truscott & Sharwood Smith (2011) note, a noticed form with high activation is more likely to lead to changes in the learner's information stores – essentially, it creates the conditions under which learning can occur. This is essentially what is meant by converting raw input into "intake" for the system: the input has been taken in by the cognitive system in a way that it can affect development.

MCF's account of noticing ties into a re-interpretation of Schmidt's Noticing Hypothesis. Schmidt (1990, 1995) argued that conscious awareness of linguistic features in input is necessary for them to be learned, though he distinguished mere noticing from full understanding. In Schmidt's terms, noticing is "the conscious registration of the occurrence of some event," not the conscious understanding of a rule. While this hypothesis has been influential, it left open the question of why awareness should be necessary and how consciousness interacts with the cognitive system that learns language. MCF directly addresses this by specifying the internal conditions under which input becomes conscious.

As Truscott & Sharwood Smith (Truscott & Sharwood Smith, 2011, p.159) put it, any theory of noticing and consciousness must explain “how consciousness fits into the cognitive system, including what can become conscious and under what conditions”. The MCF framework offers just such an explanation by detailing the roles of activation levels and POpS interfaces in making certain representations conscious.

Within MCF, the Noticing Hypothesis (NH) is essentially upheld but with important qualifications. The framework agrees that noticing (in the sense of a focused, conscious apprehension of a feature) is a pivotal step for the learner to consciously process a linguistic form. However, MCF refines what “converting input to intake” means. According to Truscott & Sharwood Smith (2011), noticing (what they term “noticing-understanding” in their hierarchy) is “necessary and sufficient for converting input to intake” only for certain kinds of learning (p.159). In particular, they argue the NH is highly relevant to the development of knowledge outside the core language module, but less directly applicable to the growth of the internal language module itself. The rationale is that the language module (the unconscious grammar processor) can often extract and learn from input features automatically at the awareness level, without the learner explicitly noticing each one. For example, if an English learner hears many sentences, their syntax module might gradually pick up word order patterns implicitly, even if they never consciously think “ah, adjectives come before nouns.” In MCF, the implicit linguistic system can capitalize on input regularities as long as the input representations make it into the perceptual store (i.e. the person heard or saw them). By contrast, explicit or extramodular learning (like learning a grammatical rule in a declarative form) generally does require noticing. The conceptual-semantic system doesn’t automatically crunch linguistic patterns the way the dedicated language module does, so for a learner to form an explicit rule or metalinguistic generalization, they first have to consciously notice the relevant feature. In short, MCF suggests Schmidt's Noticing Hypothesis is very applicable to building conscious, declarative knowledge about language, but it should not be taken as a blanket requirement for all types of acquisition, especially not the subtle, implicit tuning of the core grammar.

Furthermore, MCF emphasizes that noticing is identifying input as something meaningful rather than generating new knowledge on the spot. It "is not about awareness of additional representations" magically popping into existence, "but about recognising new information in the input as an instance of a particular form" that the learner's mind can already represent to some degree (Truscott & Sharwood Smith, 2011). This perspective shifts the Noticing Hypothesis from implying that nothing is learned unless attended to, to a view where noticing reflects the interface between incoming data and existing mental categories. It explains why simply providing learners with input they are not ready to interpret yields little gain – if they cannot relate the input to something in their current system, they literally cannot notice it in the MCF sense. Thus, the MCF interpretation aligns with the idea that developmental readiness and prior knowledge constrain what can be noticed. It also implies that some learning (particularly at early stages) might occur gradually and implicitly until enough of a pattern is established for the learner to finally notice it in a conscious way.

Noticing a feature is one thing; understanding it or integrating it into one's knowledge is another. MCF delineates an additional step beyond noticing, sometimes called "conscious understanding". After a learner notices a linguistic form, further processing can occur, especially if the conceptual system gets involved to interpret the significance of that form. For instance, having noticed the -s ending, the learner might then realize "Oh, that -s means third-person singular present tense." This realization involves linking the noticed form to a concept or rule in the Conceptual Store (CS), producing a new conceptual representation (a piece of explicit linguistic knowledge). In MCF terms, this is an additional CS–POpS processing: the conceptual processor generates a representation of the meaning or rule associated with the noticed item, and if this conceptual representation also reaches a high activation, it too becomes conscious. The result is the learner not only notices the form, but also understands something about it (e.g. can articulate a metalinguistic rule or notice the meaning conveyed). This is how metalinguistic awareness emerges within the framework – the learner forms a conscious insight about language, which is typically accessible as an explicit memory (for example, the knowledge that "in English you add -s for he/she/it in present tense").

However, MCF draws a clear boundary between this explicit, conscious knowledge and the actual subconscious language system. While noticing coupled with conscious reflection can create explicit linguistic knowledge, such as rules and grammatical descriptions, these explicit representations reside outside the core language module. They are stored in conceptual or metalinguistic memory, not in the procedural memory of the syntax or phonology modules. As a consequence, gaining conscious knowledge of a rule does not immediately transform the implicit grammar. The MCF model underscores that the internal grammar (the "language module") operates with its own representations (phonological, syntactic structures, etc.) to which we have no direct conscious access. We cannot directly feel or inspect the workings of our syntax module; we only become aware of perceptual outputs (e.g. hearing ourselves produce a sentence or thinking of a word). Thus, even though a learner might consciously know a grammatical rule (an outcome of noticing and subsequent conceptual processing), that knowledge is essentially a separate cognitive artifact – useful for monitoring or discussing language, but not automatically injected into the fast, unconscious computations of language use. Scholars describe this as a dual representation of knowledge: the learner has one representation in the implicit system (often incomplete or under development) and another in explicit memory for the same linguistic feature (Whong, 2007: 148).

From this perspective, the role of noticing is somewhat paradoxical: it is crucial for building conscious understanding and explicit memory of L2 forms, which can aid learning (by keeping learners attentive, allowing them to rehearse or apply rules deliberately, etc.), but noticing by itself does not guarantee the conversion of that metalinguistic knowledge into implicit skill. MCF explicitly notes that creating explicit knowledge "does not lead to a growth of the language module" on its own. The growth of the language module (i.e. genuine acquisition in the sense of automatic, fluent usage) still depends on the gradual strengthening and reorganization of representations within the module's subsystems – a process which may be facilitated by noticing but also requires practice and input frequency. In fact, the presence of conscious awareness is taken as an indicator that a high level of processing has occurred, often under optimal conditions (focused attention, high activation) for memory formation. Thus, while metalinguistic knowledge gained from noticing is a by-product that can inform teaching and learning strategies (and is valued in explicit instruction contexts), the actual implicit learning mechanism might continue largely behind the scenes. Over time, what is initially explicit may become implicit through repeated exposure and use – but MCF would attribute that to continued processing and reinforcement, not a one-off epiphany.

Within an MCF framework, the interplay of noticing and consciousness yields several implications for second language acquisition. First, it suggests that learners do not absolutely have to notice every feature to learn – some degree of learning can occur implicitly as long as the input is processed by the language module (which can happen even with minimal awareness). This challenges a strict interpretation of the original Noticing Hypothesis and resonates with criticism that not all L2 development stems from conscious attention. MCF framework reinforces that clear, sustained awareness (noticing) greatly optimizes learning conditions. Noticing ensures that a form is not only detected but also connected to the learner's existing linguistic framework, which makes subsequent processing more efficient and retention more likely. In SLA practice, this validates pedagogical techniques that try to draw learners' attention to target forms (Processing instruction, focus on form, etc.), as those can trigger the kind of follow-up representation and high activation that MCF associates with effective intake.

However, MCF also tempers expectations about what consciousness can do. One limitation is that awareness is constrained by the learner's current state of knowledge. If an L2 feature is entirely new or extremely subtle, the learner might simply be incapable of noticing it in the way required for explicit learning. The co-indexing mechanism implies that without some pre-existing knowledge (even from L1 or general cognition), a new linguistic element may slip by unnoticed. This explains familiar SLA phenomena such as certain grammatical markers being persistently overlooked by learners until a later stage. MCF would predict that frequent exposure can gradually raise the activation levels and possibly form preliminary representations so that eventually the learner can notice the feature. In that sense, noticing might often be a lagging indicator of acquisition – it occurs only after the unconscious system has absorbed enough for the conscious mind to recognize the pattern. Another limitation is that even when noticing does occur and the learner gains explicit insight, this does not immediately translate into fluent usage or deep acquisition. Learners and teachers alike observe that one can know a rule and still violate it in practice. MCF provides a cognitive explanation: the explicit knowledge resides in a different store than the one driving real-time language production, so there is a disconnect. Overcoming that gap requires practice that gradually aligns the implicit system with the explicit knowledge – a process often requiring considerable time.

In summary, Noticing and consciousness in MCF are seen as important catalysts in SLA that contribute primarily to the formation of explicit, conscious linguistic knowledge and to optimizing learning conditions, but they are not supreme forces that directly cause acquisition of implicit competence in one step. The Modular Cognitive Framework thus presents a nuanced view: conscious noticing is neither irrelevant nor a guaranteed solution, but one element in a complex cognitive system. It illuminates how a learner might become aware of new language features (through POpS activation and co-indexing) and why this awareness matters (it enables reflection and memory formation), while also clarifying the bounds of this awareness (the underlying modular system still runs largely outside of conscious control). Such a perspective is valuable in guiding second language research and pedagogy – it encourages us to foster noticing and awareness in learners, but also to understand their supporting role alongside the slow, subconscious construction of a new language system.

2.2.1.2.3. Implicit and Explicit Knowledge within MCF

In this study, I align implicit and explicit L2 knowledge with the generative distinction between acquired and learned knowledge, respectively. In the current thesis, I will use implicit/explicit in this sense. The next subsection outlines what I term modular second-language knowledge, contrasted later with extra-modular knowledge.

2.2.1.2.3.1.Modular L2 Knowledge

For MCF, linguistic representation is both modular and extra-modular (Alkhalaf, 2018). Knowledge within the module—specifically in SS and PS—is implicit. On the view of an innate language faculty, such knowledge grows without deliberate, focused attention: the module functions as a specialized, UG-constrained processor whose operations run as default routines. Change in this system is driven by how the module maps incoming information—more precisely, internal input originating in Conceptual Structure (CS) and Perceptual Output Structures (POpS)—onto its existing representations (Sharwood Smith & Truscott, 2014).

Modular knowledge is encoded as elementary and co-indexed representations in both syntactic and phonological systems, and as composite links at their interface systems, forming processing chains that connect the language module with other cognitive subsystems. It is also reflected in the constrained (but manipulable) primitives of the syntactic and phonological processors that govern how items are created, selected, and stored in SS/PS.

In this view, the language system stores knowledge in two tightly coordinated workspaces: Syntactic Structure (SS), which handles grammatical relations, and Phonological Structure (PS), which handles sound patterns. Within SS and PS, information is encoded as small building blocks and as co-indexed links that mark when two elements refer to the same entity. These structures do not operate in isolation; at the interfaces, SS and PS connect to other cognitive systems such as Conceptual Structure (for meanings and intentions) creating processing chains that carry a message from thought to syntax to sound in production, and in reverse during comprehension. The operations that retain these items are limited by a set of basic primitives in the syntactic and phonological processors. Those primitives are constrained by the architecture of the language faculty yet still flexible enough to generate many well-formed patterns, which is why the system can be productive without being arbitrary (Sharwood Smith & Truscott, 2014; Alkhalaf, 2018).

For example, consider the sentence “The lion that the zookeeper fed roared loudly.” Developing an accurate representation for this sentence, which contains an object-relative clause, requires constructing and activating multiple linked representations across the processing chain. When the sentence is first processed by the syntactic system, it might initially be parsed as a simpler *subject-relative* structure (treating “the lion” as the agent performing the action in the relative clause). This occurs because the syntactic processor tends to generate a quick, default analysis that often works for less complex sentences. A *subject-relative* interpretation is a likely default here since its surface structure directly matches a straightforward underlying structure (in other words, the first noun encountered is assumed to be the doer of the action), unlike the more complex *object-relative* structure required by this sentence.

The initial syntactic representation is then paired with a corresponding conceptual representation (CS) to assign meaning to the participants in the clause. However, this resulting conceptual representation fails to capture the true meaning of the sentence—for instance, it would mistakenly imply that the lion is the one doing the feeding. This interpretation clashes with real-world knowledge, so the syntactic parse cannot progress further. In effect, the system has not yet built the correct *object-relative* representation because the initial syntactic analysis led to a conceptual mismatch.

At this point, additional non-linguistic input can change the outcome and guide the system toward the correct interpretation. For instance, a visual context (imagine actually seeing the zookeeper feeding the lion) could provide extra information about who is doing what. Another source of support might be prior conceptual knowledge—such as the commonsense understanding that a lion cannot feed a zookeeper, but rather the zookeeper feeds the lion. As the input is processed in real time, various language modules in the mind work together to activate a conceptual representation that makes it clear that the lion is not the one doing the feeding. Such additional information effectively disrupts the SS–CS interface's attempt to align a *subject-relative* interpretation between the syntactic and conceptual systems.

If these supplemental cues are too weak to override the initial co-indexed SS–CS representation (the incorrect *subject-relative* reading), then the syntactic system will fail to construct the correct *object-relative* representation. On the other hand, if the non-linguistic cues are strong enough and not outweighed by the initial interpretation, the states of the syntactic store (SS) and the conceptual system (CS) must be reconciled by making adjustments in the syntactic analysis. The activation levels of certain syntactic components in

SS are altered to better match the conceptual evidence provided by context and world knowledge. This process cancels the initially selected *subject-relative* structure, since the follow-up processing prevents the syntactic module from continuing to enforce that first (incorrect) representation. As a result, the syntactic module produces a revised analysis—namely, the proper *object-relative* representation for the sentence.

Once this new syntactic representation is in place, the interface system activates a matching conceptual representation that correctly reflects the situation (with the zookeeper as the feeder and the lion as the one being fed). It then links this conceptual representation to the new syntactic representation, co-indexing the two into a more complex, integrated structure. This correctly interpreted *object-relative* structure is likely to be retained in the store of the SS and stay linked to the corresponding CS representation, which means that this paired representation will be more readily available for the language module in future processing. In summary, the language system uses its implicit knowledge and any available context to move from a default (but wrong) interpretation to a more nuanced and accurate representation of a complex sentence.

Because of modular encapsulation, CS does not directly affect SS. Even so, semantic pressures can reach SS indirectly via the interfaces by aligning activation levels across SS and CS. In practice, CS will accept or reject candidate syntactic parses according to how well they encode the intended message; accurate SS representations are then stabilized and retained for later use. Hence, despite encapsulation within the syntactic store, indirect conceptual influence via the interfaces is sufficient to advance particular SS items.

Within MCF, the encapsulated language processors in SS/PS do not admit direct, top-down revision by the Conceptual System (CS). However, CS supplies the intentions, attentional priorities, and task goals that structure the internal input presented to SS/PS at the interfaces.

Consequently, metalinguistic knowledge held in CS can guide which parses are pursued and sustained, and—through repeated, goal-oriented practice—can stabilize those SS/PS options that consistently succeed. The next subsection situates this extra-modular knowledge in CS, characterizes its explicit–implicit dynamics in terms of resting activation, and explains how skill acquisition mechanisms make such knowledge rapidly deployable without violating modular encapsulation (Sharwood Smith & Truscott, 2014; DeKeyser, 2010, 2017). Thus, any lasting change in SS/PS arises via repeated acceptance of interface-compatible analyses, not by CS editing the stores directly (Sharwood Smith & Truscott, 2014).

2.2.1.2.3.2. Extra-modular L2 Knowledge

We now identify where explicit knowledge resides (CS) and how practice converts it into fast, cue-driven routines that bias interface selection without breaching encapsulation (DeKeyser, 2017). Building metalinguistic knowledge draws on attentional resources because the Conceptual System (CS) is not a free-running, language-specialized engine; it sits outside the language module and lacks innate machinery for acquisition. Here, *metalinguistic knowledge* denotes what learners deliberately study and reflect on—whether independently or through formal instruction (Sharwood Smith & Truscott, 2014). Within CS, these representations can be characterized as extra-modular explicit or extra-modular implicit, depending on their resting activation.

In CS, learners store representations about how particular structures work (rules, generalizations, exemplars). Each representation's activation increases and decreases with use.

- When a representation has been used often, it stabilizes at a high resting activation and functions as extra-modular implicit knowledge: it is readily available, requires little conscious effort, and its accompanying rule explanations tend to fall to low activation because they are no longer needed for routine processing.

- By contrast, a recently learned or used representation sits at low resting activation and remains extra-modular explicit: invoking it typically co-activates additional explanatory material (definitions, conditions of use) because the knowledge has not yet been proceduralized.

From the perspective of skill acquisition theory, the transition of extra-modular knowledge from explicit to implicit formats is contingent upon deliberate and sustained practice (DeKeyser, 2010). Through repeated, goal-oriented use, declarative knowledge—initially represented as verbalized rules or descriptions—gradually transforms into proceduralized routines that are automatic and readily deployable in communicative tasks (DeKeyser, 2017). Once proceduralized, these constructions are accessed efficiently from long-term memory, imposing minimal demands on working memory and thereby facilitating fluent language comprehension and production.

Prior to this stage of automatization, however, learners must actively maintain metalinguistic representations in working memory and consciously manipulate them during language use. This reliance on explicit processing tends to slow down performance and often results in effortful or hesitant output, even when learners are able to accurately articulate the underlying rule (Criado, 2016).

2.3. Effects of L1 Influence and Classroom Input on L2 Development

This section examines two major factors affecting L2 learning: the role of the first language (L1) and the types of input learners receive. We review transfer hypotheses (Full Transfer/Full Access, Partial Transfer, No Transfer) and then describe a dynamic, processing-based view of L1 influence. We adopt Sharwood Smith & Truscott's Modular Cognitive Framework (MCF) perspective (Sharwood Smith & Truscott, 2014), which sees L1 effects as arising from competition between high-activation L1 patterns and emerging L2 patterns during processing. We call this view cross-linguistic influence rather than "transfer," to emphasize gradual change. The second topic is classroom input: the impact of instructed learning, including explicit grammar teaching and metalinguistic explanations. We summarize research on the effectiveness of grammar instruction and metalinguistic input, and consider how input frequency and processing shape L2 development.

2.3.1. L1 Transfer and Cross-Linguistic Influence

L2 acquisition has long been seen as influenced by L1. Three classic views of the initial L2 state are: Full Transfer/Full Access (FTFA), Minimal Trees (Partial Transfer), and No Transfer. The FTFA hypothesis (Schwartz & Sprouse) holds that the learner's entire L1 grammar (both lexical and functional categories) is copied into the L2 initial grammar. In contrast, Minimal Trees (Vainikka & YoungScholten) argues that only the lexical part of the grammar and its tree structures transfer at the start, while functional projections (like tense, agreement, complementizers) must be rebuilt through L2 input. The No Transfer view (Flynn & Martohardjono) denies any L1 grammar carries over; learners begin with only Universal Grammar and build L2 grammar afresh.

The Modular Cognitive Framework (MCF) offers a more dynamic, processing-oriented view of L1 influence. Under MCF, the language module is shared by L1 and L2. Every representation in syntax, phonology, and semantics has an activation level that reflects how often and recently it's been used. L1 patterns have high resting activation (because they've been used for years), while new L2 patterns start with low activation. In real-time comprehension and production, L1 structures often "win" competition early on, so initial L2 output looks much like L1. As learners encounter L2 input, L2-specific representations gain activation and gradually overtake L1 patterns. This view predicts a transitional period of optionality, where learners sometimes use L1-like structures and sometimes L2-accurate ones until the L2 forms stabilize. Importantly, crosslinguistic influence under MCF is not a mysterious "copy" of L1 grammar into a separate L2 system; it's simply the normal outcome of bilingual processing in a unified system (Sharwood Smith & Truscott, 2006, p. 203).

In MCF terms, L2 knowledge is divided into three types. Modular L2 is the syntactic/ phonological grammar built in the language module; this develops mostly automatically from input. Extra-modular L2 resides in the conceptual module (our conscious thought). Extra-modular implicit knowledge is learned consciously (e.g. a grammar rule noticed in class) but has become automatized enough to use without thinking. Explicit knowledge is declarative (you can state rules, like "plural adds -s"). Sharwood Smith & Truscott note that fluent communication depends on implicit knowledge, while metalinguistic (explicit) knowledge is accessed slower (Sharwood Smith & Truscott, 2014). In crosslinguistic influence, L1 mainly biases the implicit syntactic system: learners initially parse and produce L2 using L1 parameter settings (e.g. head-direction, movement rules) until L2 input shifts these parameters. The extra-modular knowledge (conscious understanding, strategies) can also influence performance – for instance, learners might consciously apply L1-like strategies when they lack full L2 knowledge – but this is a separate effect from the automatic crosslinguistic influence in the language module.

2.3.2. Input in the classroom.

The L2 learners of English in the current thesis acquire most L2 knowledge through formal instruction. Research on instructed SLA asks how classroom teaching affects learner interlanguage. Many studies compare explicit grammar instruction (rule explanation, focus on forms) versus more implicit approaches (meaning-focused tasks with occasional focus on form). A key finding is that grammar instruction improves learners' performance on controlled tasks, but evidence for its effect on spontaneous use is mixed (as detailed in section 2.2). These findings suggest that classroom teaching helps learners acquire the target grammar to some extent, but it may not fully accelerate the natural developmental sequence.

For example, Pienemann's "teachability" hypothesis argues that instruction is most effective when it targets the next stage of development, aligning with internal readiness (Pienemann & Lenzing, 2015). Some research indicates that instruction can speed up progression along the natural order of acquisition, but it rarely creates leaps that violate that order (Spada & Lightbown, 1999 cited in Al-wossabi, 2023, p. 101).

Formal instruction often includes direct focus-on-form(s) (explicit grammar lessons) or focus-on-form (noticing forms as they appear in communicative practice). Meta-analyses suggest that combining explicit and implicit focus tends to yield the best results (Norris & Ortega 2000). Explicit rule teaching plus practice often outperforms purely implicit methods, especially on metalinguistic tests. However, we should note that tests themselves can bias results: elicited tests favor explicit knowledge, while naturalistic tasks rely more on implicit knowledge (e.g., Truscott 2007; Lee & Huang 2008; Spada & Tomita 2010; Goo et al. 2015; Akin 2019).

A central goal of classroom teaching is to provide metalinguistic input – explanations of how English structures work. This builds declarative knowledge: learners learn terms and rules consciously. As Ellis (2004) defines it, explicit knowledge is the verbalizable understanding of L2 forms and functions. Such knowledge is useful in that it helps learners notice and understand grammar during learning. For example, an explicit rule can explain why "The ball was kicked by Ali" means Ali did the kicking, aiding comprehension. Learners can then use these concepts (in their conscious, conceptual system) to parse input. In MCF terms, metalinguistic knowledge resides outside the core grammar and is accessed via the conceptual interface. It can raise the activation of correct structures, thus indirectly aiding acquisition. However, simply knowing rules does not automatically make speaking fluent; explicit knowledge tends to be slow unless practiced extensively (Dekeyser's skill-learning view) or proceduralized over time. In short, metalinguistic input enriches extra-modular knowledge and can support comprehension, but the implicit language system ultimately drives fluent use. Learners often rely on conscious strategies to compensate when their automatic grammar is weak (for instance, mentally translating from L1 when stuck), but this is separate from the core cross-linguistic influence in their language processor.

The frequency of language forms in the input often correlates with ease of learning. For example, very common verb forms or structures tend to be acquired earlier. However, Sharwood Smith & Truscott (2014) caution that external frequency (how often a form appears in texts) is only a rough guide to internal frequency (how often the learner has processed it). In MCF terms, what matters is how repeated processing raises an item's activation level. Early on, each encounter with a new form sharply boosts its activation; but as a form becomes well-known, additional encounters have diminishing effect (the learning curve flattens). In other words, frequent input builds knowledge quickly at first, but once a structure is learned, more input yields smaller gains.

Overall, in this thesis I assume that adult L2 learners retain access to UG-type constraints but that access is indirect and efficiency-limited after the critical period: the encapsulated SS/PS processors still operate with UG-constrained primitives, yet parameter re-setting is slower and more fragile than in child L1 (Lenneberg, 1967; White, 2003). This aligns with FT/FA in granting continued availability of UG (Schwartz & Sprouse, 1996), while acknowledging evidence of persistent optionality and shallow computation in some adult outcomes (Clahsen & Felser, 2006), which critics take to suggest reduced access (Bley-Vroman, 1990). Within MCF, instruction does not directly modify SS/PS representations; instead, it enriches extra-modular (CS-based) explicit knowledge and biases the interfaces, increasing the likelihood that UG-compatible L2 parses are selected and strengthened through repeated processing (Sharwood Smith & Truscott, 2014; DeKeyser, 2017). In short, UG remains available but must be recruited via input-driven selection, and the pedagogical role of instruction is to engineer the right internal input so that adult learners' UG-constrained processors stabilize L2-appropriate options despite maturational constraints.

2.4. Processing Instruction

Processing Instruction (PI) is an input-focused teaching approach designed by VanPatten (1996) to help learners process grammatical forms in the input more effectively. Unlike traditional instruction, which often emphasizes output practice, PI is grounded in the idea that many learner difficulties come from misprocessing input, not from inability to produce language. Therefore, PI targets learners' input processing strategies (as discussed in section 2.1.1.1) and seeks to alter them so that learners start attending to grammatical forms they previously ignored or misinterpreted.

At its core, Processing Instruction consists of two main components: explicit information and structured input practice. VanPatten and Cadierno (1993), in the seminal PI study, provided learners with a brief explanation of the target form and how it is used (explicit information), then gave a series of input-based activities where learners must comprehend sentences and make meaningful responses, in tasks engineered such that *correct interpretation requires processing the target form*.

2.4.1. Theoretical Foundations of Processing Instruction

2.4.1.1. Constituent Elements of Processing Instruction

There are four fundamental components included in a typical PI package:

1) *Metalinguistic Information Pertaining to the Target Feature*. This is fairly straightforward – most instructional approaches include this. PI's use of explicit explanation is informed by the idea that adult learners benefit from understanding the rule (at least superficially) because it can help them notice relevant forms in input. While some SLA methods (like pure immersion or some versions of input

flood) might withhold explicit rules, PI chooses to give learners a heads-up. This explicit info itself doesn't guarantee learning, but it orients the learners to what to look for. Therefore, learners receive a concise explanation of what the feature means and how it is typically used in the L2 grammar. For example, if teaching English relative clauses, the instructor explains that English relative pronouns do not have to agree in definiteness with their referent.

2) *Explicit information about the processing problem*. Learners are informed of the default strategy they might be using (often based on L1) that is problematic for this feature. For instance, they might be told, "Arabic speakers tend to rely on the definiteness in relative clauses and may skip over English relative pronouns, misinterpreting sentences. In English, however, the relative pronouns are not dependent on the definiteness of the head noun; so not crucial to understand the sentence." This component is exclusive to PI – it directly addresses the inefficient strategy and tells learners to be aware of it.

3) *Referential activities.* These are input tasks where learners must pay attention to the form to get meaning (there is a right or wrong answer, hence "referential" – the tasks have specific referents/correct interpretations). For example, learners might see written sentences or hear sentences and have to choose which picture corresponds, or indicate who did what, etc. The key is that the only way to succeed is to process the target form. If the learner ignores the form, they will likely misinterpret the sentence and choose incorrectly. Referential activities have a clear feedback mechanism – a learner's response can be objectively judged as correct or incorrect, which provides immediate evidence of whether they processed the form correctly.

4) *Affective activities.* These are meaning-based tasks as well, but they don't have one correct answer; instead, they often involve expressing an opinion or preference using

the input, or making interpretations that are personal (hence "affective," engaging learners' interests or feelings). While they still require attention to the form, the responses are open-ended or learner-centered. For example, learners might be given several statements with the target form and asked to judge which ones they agree with or to respond true/false about themselves. Affective activities aim to keep learners processing the form in a meaningful context, but without the pressure of right/wrong answers each time. They also increase engagement and help learners see the form in communicatively relevant contexts.

VanPatten (1996, 2002) and others (e.g., Wong 2004a) note that components (2) to (4) are unique to the PI approach. Many instructional methods provide explicit grammar explanations (component 1), but PI's innovation is explicitly tackling the default processing strategies and then only giving practice that forces learners to use optimal strategies (via structured input activities). There is no traditional output practice in the initial phase of PI. The idea is to first recondition how learners process input; production can come later once intake has improved.

To clarify further how PI works, let's outline the core components of PI in practice (as above) and then discuss their rationale and evidence:

- *Explicit information (Grammar explanation):* This aligns with providing a rule description, often including examples. For instance, for Arabic-speaking learners of English: explain that, unlike in Arabic, the use of relative pronouns in English is not determined by the definiteness of the head noun. Instead, English relative pronouns are selected based on the animacy of the head noun. If the head noun is animate, the relative pronoun who must be used (e.g., the man who helped me), whereas if the head noun is inanimate, which is appropriate (e.g., the book which I borrowed). This explanation prepares learners for the grammatical structures they will subsequently practice.

- *Processing problem alert*: This is a distinctive PI element. By addressing, for example, the First Noun Principle directly ("learners tend to interpret the first noun they see/hear as the subject" – which is often a correct strategy in English but not in languages with flexible word order or object pronouns, etc.), the instructor essentially says to learners: "Be careful! Your usual way of understanding sentences might trick you here." VanPatten (2004, 2007, 2009) has noted that one criticism of PI was it doesn't fully account for how intake is integrated into the system (we will get to that in critiques), but he maintained that drawing learners' attention to processing issues is key. For example: "Arabic speakers may be influenced by their L1, where the use of relative pronouns can be omitted, especially when the head noun is indefinite. In English, however, relative pronouns are required regardless of definiteness, and their choice depends on the animacy of the head noun. For instance, in This is a man who helped me, who is used because man is animate. But in This is a book which helped me, which is used because book is inanimate. Learners might incorrectly omit the relative pronoun or use *which* for an animate noun, producing ungrammatical sentences like (this is a man which helped me). This type of instruction draws attention to L1 crosslinguistic influence issues and helps learners avoid default L1-based parsing strategies gradually. According to VanPatten, highlighting these habitual errors can prime learners to adopt more target-like processing routines—a kind of metacognitive intervention.
- *Structured Input (SI) activities*: These come in various formats but share a common trait: they provide input in which correct interpretation depends on noticing and understanding the target grammatical form. For Arabic-speaking learners of English,

this might involve identifying correct meanings in sentences containing relative clauses. For example, learners might see two pictures: one shows a man helping a boy, and the other shows a boy helping a man. They hear the sentence This is the man who helped the boy and must choose the picture that matches. To succeed, they must recognize that who refers back to the man, indicating that he is the subject of the relative clause. If they rely solely on word order or ignore the role of the relative pronoun—possibly influenced by L1 strategies where such pronouns can be omitted—they may misinterpret the sentence. With feedback, learners come to see that understanding the meaning of the sentence requires attention to the relative pronoun. The activity is designed so that correct comprehension hinges on processing the form, making it a clear example of what Loschky and Bley-Vroman (1993) call task-essentialness: the grammatical form is necessary to complete the task accurately. Processing Instruction (PI) leverages such input to push learners toward more accurate and efficient form-meaning connections.

VanPatten (2002: p. 765) describes Structured Input as "input that is manipulated in particular ways so that learners become dependent on form and structure to get meaning". In other words, SI purposely removes other cues or adds pressure so that learners can't fall back on their usual strategies; they must use the form. For example, one way to do this is by using sentences where relying on lexical semantics or context alone isn't enough and can be misleading. The quote further explains that SI "privileges the form or structure in the input so that learners have a better chance of attending to it"– essentially, it heightens the salience of the target form by design. This could be by flooding input with multiple uses of the form, or by contrastive use that changes meaning.

It's important to note that "structured" in SI means these are not free-flowing communicative activities; they are structured in the sense that the input is controlled and the tasks are set, not spontaneous conversation. The reason is to direct attention narrowly. Learners are not engaging in open-ended dialogue (which might be too much information to process at once); they are engaged in focused listening/reading where one piece of grammar is consistently targeted. VanPatten (1996) points out that during SI activities, learners are still dealing with meaning – so it's communicative in the sense of meaning-based – but the communication is constrained to ensure focus. He stresses that learners in SI are not practicing producing language freely, but they are interpreting language that has meaning (thus it's not simply mechanical form drills; the forms carry information that the learner must use).

Research has shown that properly implemented PI can be effective. VanPatten & Cadierno (1993) found that a group receiving PI made significant gains in interpretation and also in production tasks, outperforming a group that received traditional production-oriented instruction on the same grammar feature. This was notable because PI didn't include production practice, yet PI learners improved in output—suggesting that getting the intake right had knock-on benefits for developing explicit and implicit knowledge that translated into better production as well.

Subsequent studies (Benati 2001; Cheng 2002; Farley 2004; among many) have generally supported PI's efficacy. A consistent finding is that PI improves learners' interpretation ability significantly, often more than or equal to traditional instruction, and sometimes yields similar improvements in production. Where differences show up, it's usually that traditional instruction might help production a bit more (especially immediately after instruction) but PI learners catch up later. And PI learners often have an edge in interpretation and in long-term retention.

2.4.1.2. Referential Versus Affective Activities

Structured Input (SI) activities, as developed within the framework of Processing Instruction (PI), are designed to manipulate input so that learners are more likely to make accurate form-meaning connections. VanPatten (2002, 2015) and other proponents emphasize that SI activities aim not to encourage rule memorization, but to promote the acquisition of grammatical features through meaningful exposure. SI is deliberately structured so that learners are pushed to notice how specific forms contribute to sentence interpretation. Within this approach, two types of activities are typically employed: referential and affective. While often grouped under the umbrella term structured input, they differ significantly in both structure and purpose (Benati, 2001, 2004).

Referential activities require learners to extract a correct meaning from input by paying attention to a target grammatical form. These tasks typically include a clear right or wrong answer—such as identifying who did what to whom, selecting the correct image based on a sentence, or following instructions based on input. Learners cannot succeed at the task without accurately interpreting the form, making the activity task-essential (Loschky & Bley-Vroman, 1993). Feedback in these activities tends to be explicit, letting learners know whether their interpretations were accurate, thereby reinforcing correct form-meaning connections.

Affective activities, in contrast, are meaning-based but open-ended. Learners respond to input in a way that is personally relevant, such as agreeing or disagreeing with a statement, choosing which sentence reflects their opinion, or relating a sentence to their own experience. While these activities still require processing the target form to derive meaning, they do not demand a single correct answer. Instead, they enhance engagement and encourage deeper semantic processing by connecting language to personal and emotional responses. Feedback here is less rigid and often comes through internal validation (e.g., the learner's understanding of their own preferences or experiences), which may foster retention through increased emotional salience and motivation (Wong, 2004a; Sanz & Morgan-Short, 2004).

A concise comparison of these distinctions is provided in Table 1 (adapted from Benati, 2001, 2004):

Table 1. The main distinctions between these referential and affective activities

Referential Activities	*Affective Activities*
Target forms are contrasted with similar features	*Target forms are not contrasted with similar features*
Feedback is explicit and task-driven	*No single correct answer; feedback is often implicit*
Provides both positive and negative evidence	*Offers only positive evidence*
Focused more on form accuracy	*Focused more on meaning and personal relevance*
Less communicative	*More communicative and learner-centered*

Although both activity types are often combined in instructional settings, a number of studies have attempted to isolate their effects to better understand their individual contributions to L2 development.

Marsden and Chen (2011) conducted one of the most systematic comparisons of these activity types using the English past tense -ed as the target feature. They employed a computer-based program that delivered instruction and immediate feedback to participants. Four groups were tested: Referential (R), Affective (A), Referential + Affective (RA), and a Control Group (CG). The RA group received more exposure overall, combining all items from the R group and half from the A group (232 items total), whereas the other two experimental groups received 153 items each. This unequal exposure complicates interpretation, as the RA group had significantly more opportunities to process the target form. Their findings indicated that only the groups exposed to referential activities (R and RA) showed improvements in form processing across two of three outcome measures. The Affective-only group performed no better than the Control, leading Marsden and Chen to argue that affective activities alone may not bring about change in learners' processing systems. However, a key limitation of their study was that outcome measures primarily assessed explicit knowledge (e.g., written gap-fills and grammaticality judgment tasks), rather than implicit processing, which PI primarily aims to affect (VanPatten, 2015). Therefore, while referential activities appear essential, the study could not conclusively determine whether affective activities support implicit development or long-term retention.

Henshaw (2012) also examined the distinction between referential and affective SI activities, this time focusing on the Spanish subjunctive. Her study controlled for the number of items seen across three groups (R, A, RA) to ensure a more balanced comparison than in Marsden and Chen's study. She found that only the RA and R groups demonstrated meaningful improvement, particularly when learners were required to distinguish between subjunctive and indicative moods. Henshaw followed VanPatten's (2003) instructional guidelines, such as the principle of introducing one thing at a time, to reduce cognitive overload and improve form-focused processing. Learners completed a series of computer-based tasks, receiving feedback every six items. However, the test items included multiple tenses, moods, and distractors—up to six choices per item—which may have strained working memory and reduced focus on the target form, particularly for lower-proficiency learners (Sweller, 2017; Lee & VanPatten, 2003).

Robayna (2020) conducted a more recent study testing the effects of referential and affective activities on English-speaking learners of Spanish. Participants were randomly assigned to four groups (R, A, RA, Control) and completed a sentence interpretation task and a self-paced reading task. The results echoed earlier findings: only the groups that received referential input (R and RA) showed measurable gains in online processing. The RA group demonstrated the greatest improvement and maintained gains over a one-week delay. Affective-only participants again showed no significant progress. Interestingly, only the R group showed altered reading patterns in grammaticality judgments—suggesting that referential input was sufficient to modify processing routines for morphosyntactic features such as word order and verb morphology. However, Robayna's study had its own limitations.

The delayed post-test was administered only a week after instruction, raising questions about the long-term effects of either activity type. Moreover, the small sample size reduces the generalizability of the findings. Nonetheless, the results support the conclusion that referential activities are necessary—perhaps even sufficient—for inducing changes in input processing, while affective activities may serve a supplementary role, enhancing engagement or reinforcing learning only when paired with referential tasks.

From a pedagogical perspective, referential activities appear to play a primary role in helping learners link form and meaning in a way that alters their underlying processing routines. Affective activities may contribute by increasing learner involvement, supporting motivation, and situating grammar in more personally meaningful contexts. These benefits align with transfer-appropriate processing theory, which suggests that learning is more durable when practice conditions resemble real-life use (Barcroft, 2004). Open-ended affective tasks may therefore promote better transfer to spontaneous language use, even if they don't on their own alter the processing system.

VanPatten (2002, 2015) emphasizes that both activity types fall under the SI umbrella because both involve deliberate structuring of input to promote noticing. While referential tasks do so by requiring accurate comprehension, affective tasks do so by engaging the learner's attention to form through meaningful interaction. Their complementary strengths justify their inclusion in PI designs.

In sum, empirical evidence to date suggests that referential activities are essential for initiating changes in L2 input processing, while affective activities may provide additional support when used alongside referential ones. Future studies will need to address existing methodological limitations—including equalizing exposure across groups, including interpretation-based outcome measures, and conducting longer-term follow-ups—to fully understand how each activity type contributes to different dimensions of L2 learning.

2.4.1.3. Constraints on the Impact of Activity Type: Referential vs. Affective Tasks

A critical review of the empirical literature reveals ongoing uncertainty regarding the role and efficacy of affective activities within Processing Instruction (PI). Despite the widespread inclusion of both referential and affective SI activities in instructional design, it remains unclear whether affective tasks independently contribute to changes in input processing or merely serve a supportive function.

Contradictions across studies raise fundamental questions about the effectiveness of affective tasks. For instance, Fernández (2008) contends that affective activities do not facilitate L2 learners' progress and may be ill-suited for digital instructional contexts, arguing instead for the superior effectiveness of computer-mediated referential input. Similarly, Robayna's (2020) findings suggest that only referential activities resulted in measurable changes to learners' processing of morphosyntactic structures. In her study, participants exposed exclusively to affective activities failed to exhibit any significant improvement in either online processing tasks or delayed measures. These findings imply that affective activities, in isolation, may lack the task-essentialness (Loschky & Bley-Vroman, 1993) required to drive reconfiguration of the input processing system.

Conversely, Henshaw (2012) reports that affective activities can support learning—although her study's design did not isolate the timing and sequencing of each activity type. Thus, while affective input may have correlated with learning outcomes, it is difficult to determine whether it was causally responsible or merely coincidental to other instructional elements.

Methodologically, much of the research on affective activities is limited by measurement issues. For example, although Marsden and Chen (2011) intended to assess the effects of activity type on implicit knowledge, their outcome measures—including grammaticality judgment tests and written gap-fills—largely tapped explicit knowledge. This discrepancy undermines their claim that affective tasks are ineffective for processing change. As Doughty (2004) notes, assessing implicit knowledge is particularly challenging but essential for evaluating PI's central claim—that it targets the development of automatic, underlying grammatical representations rather than conscious rule knowledge.

This point is echoed by VanPatten (2015), who emphasizes that PI is concerned not with rule memorization but with fostering accurate form-meaning connections during real-time comprehension. He argues that "PI assists in developing underlying knowledge that can be tapped during the development of skill" (p. 98). From this standpoint, interpretation-based tasks are more aligned with the goals of PI than tasks testing declarative rule knowledge. Therefore, studies that lack appropriate interpretation measures—especially those testing only post-hoc recall or grammaticality judgments—may not validly assess the effectiveness of affective activities.

Another layer of complexity involves the design and implementation of affective tasks themselves. Open-ended tasks can increase learner engagement, emotional investment, and contextual relevance (Wong, 2004a), but they also introduce risks: comprehension errors may go unnoticed without close monitoring, and learners may bypass processing the target form altogether if the task does not enforce it. Poorly designed affective tasks may thus fall short of the task-essentialness criterion that drives effective form-meaning mapping. However, as Lee and VanPatten (2003) suggest, affective activities can be restructured to maintain processing demands while still allowing for personalization and meaningful engagement.

In practice, teacher-reported data (e.g., Benati, 2001; VanPatten, 2004) suggest that affective activities may play a valuable role in reinforcing form-meaning connections after initial exposure through referential tasks. They may help bridge the gap between controlled input and real-world communicative usage by facilitating deeper semantic processing and transfer-appropriate learning (Barcroft, 2004). Yet, without rigorous empirical validation—especially through interpretation-based and delayed outcome measures—claims about their necessity remain speculative.

In conclusion, although referential activities have consistently demonstrated their ability to alter input processing, the role of affective activities remains inconclusive. The mixed results across studies reflect both theoretical concerns (task-essentialness and form-meaning mapping) and methodological limitations (unequal exposure, flawed measurement tools, and insufficient attention to implicit knowledge). Further research must isolate the effects of affective input under more controlled conditions, using outcome measures that align with the implicit processing goals of PI. Only then can the field move toward a clearer understanding of whether affective activities substantively contribute to restructuring the input processing system—or simply enrich the learning environment.

2.4.2. Critique of Processing Instruction

Processing Instruction (PI), grounded in the Input Processing (IP) model developed by VanPatten, has gained considerable recognition as a pedagogical approach that emphasizes comprehension over production. However, despite its success in shaping instructional practice, it has faced substantial criticism regarding its theoretical completeness. One of the central concerns raised by scholars is that IP lacks a detailed account of how input is integrated into the developing linguistic system—specifically, how accommodation and restructuring processes occur over time (VanPatten, 2004, 2007, 2009). As a result, critics such as Carroll (2004), Collentine (2004), and Harrington (2004) argue that IP does not function as a comprehensive model of second language development, particularly due to its limited capacity to explain the mechanisms through which form-meaning connections are internalized and modified.

Although VanPatten (2002) acknowledges that IP may not present a complete theory of acquisition, he contends that the model is still predictive and explanatory in identifying which grammatical forms are likely to pose challenges during processing. From this perspective, the utility of IP lies in its instructional applicability, not in offering a fully elaborated theory of interlanguage development. Numerous empirical studies have since confirmed the efficacy of PI when implemented according to its design principles, both in traditional classrooms and in computer-mediated environments (e.g., Chiuchiù & Benati, 2020; Dracos & Henry, 2018; Issa & Morgan-Short, 2019; Lee & Doherty, 2019; Lee et al., 2020).

Nevertheless, early empirical challenges to PI's foundational claims emerged soon after its introduction. DeKeyser and Sokalski (1996) conducted two experiments that sought to test the reliability of VanPatten and Cadierno’s (1993) original findings. Their research, the instructional treatment involved either input-focused or output-focused practice, with both groups moving from mechanical drills to more meaningful, communicative tasks, grounded in skill acquisition theory, compared input- and output-based instruction across two grammatical targets: Spanish object pronouns and the conditional tense. While the input group outperformed the output group in immediate interpretation of object pronouns, the output group excelled in production. However, these differences did not persist in delayed testing. Notably, the output group outperformed the input group in both tasks for the conditional tense in the short term, though the advantage did not hold over time.

It is crucial to note, however, that DeKeyser and Sokalski’s work was not a conceptual replication of VanPatten and Cadierno (1993). Their treatment design diverged substantially, as they did not aim to modify processing strategies—a core feature of PI—but rather to test input versus output modalities. As such, their results do not invalidate the claims made by VanPatten and Cadierno but rather explore a different research question.

Similar methodological concerns arise in Salaberry's (1997) critique. Although Salaberry compared input and output instruction on Spanish object pronouns and found no significant differences between groups, he also did not replicate the PI treatment or utilize interpretation-based measures aligned with PI's goals. His outcome tasks (sentence translation and narrative production) focused on output, and thus were not designed to capture changes in input processing. As such, comparisons to the original PI findings are limited in scope and validity.

Collentine (1998) offered another empirical challenge by comparing PI with output-based instruction on the Spanish subjunctive in adjectival clauses. Both groups improved, but PI did not show clear superiority. However, VanPatten (2002) later critiqued the study design, noting that the tasks placed heavy cognitive demands on learners, requiring them to hold multiple pieces of linguistic and pictorial information in working memory—conditions that may have undermined the effectiveness of PI's focus on processing limited input in real time. While Morgan-Short and Bowden (2006) argued that Collentine's materials were similar in spirit to other PI studies, this debate underscores the need for careful alignment of task design with theoretical assumptions when comparing instructional approaches.

What unites these early critiques—whether from DeKeyser, Salaberry, or Collentine—is that they do not meet the criteria of conceptual replication. As VanPatten (2002, p. 779) explains, conceptual replication requires adherence to the original treatment methodology, with controlled variations in one dimension to test generalizability. Because these studies altered both materials and instructional goals, they do not offer grounds for rejecting the core claims of PI, even if they contribute to the broader conversation on input vs. output-based instruction.

Importantly, constructive criticism of PI has led to refinements in both theory and methodology. For example, the First Noun Principle, one of the processing principles proposed by VanPatten (1993), has been criticized for its Anglocentric bias and lack of applicability across languages with different syntactic properties. However, VanPatten (2002, p. 758) acknowledged this limitation and revised the principle to reflect the role of alternate cues (e.g., animacy, case marking) in determining argument structure in non-English contexts. This openness to revision reflects the evolving nature of the IP model and its responsiveness to empirical challenges.

Over time, the applicability of PI has been extended to a wide range of grammatical structures and languages, including Italian, French, Japanese, and Arabic (Benati, 2001, 2005, 2007; Hikima, 2010; VanPatten & Uludag, 2011). This expansion of empirical scope has helped demonstrate the robustness of PI across typologically diverse systems. Moreover, VanPatten (2004) has integrated the concept of noticing (in the sense of detecting input, not necessarily conscious awareness) into PI, aligning it with broader theoretical constructs in SLA. Although some of these theoretical refinements remain in need of further empirical validation, PI continues to offer a practical and testable model for form-focused instruction based on real-time comprehension.

In sum, while PI may not offer a comprehensive model of grammar acquisition or restructuring, it provides a theoretically motivated and empirically supported approach to grammar instruction. Its focus on input, interpretive tasks, and the gradual reconfiguration of processing routines distinguishes it from traditional rule-based instruction. Critiques of PI—especially those that misalign with its theoretical underpinnings—should be viewed not as refutations, but as opportunities to clarify its scope, refine its principles, and continue empirical testing in new instructional and linguistic contexts.

2.4.3. Role of task essentialness

Contemporary theories of second language (L2) development have increasingly emphasized the centrality of processing mechanisms in the acquisition of grammatical structures. The ability to map linguistic forms onto meanings during real-time comprehension is now considered a prerequisite for acquisition, a position reinforced by the Input Processing (IP) model (VanPatten, 2015b). This model argues that learners must allocate attention to relevant linguistic cues and integrate them meaningfully with their existing mental representations. Psycholinguistic evidence suggests that early and intermediate L2 learners often rely on lexical or discourse-level cues—such as temporal adverbs—rather than morphosyntactic markers when interpreting tense. This preference for salient lexical items over inflectional morphology has been consistently observed in empirical studies (Cameron, 2011; Dracos & Henry, 2018; Ellis & Sagarra, 2010b; Sagarra, 2007; VanPatten & Keating, 2007).

VanPatten's Lexical Preference Principle posits that learners tend to default to lexical indicators of meaning whenever possible, especially in the early stages of acquisition. For example, in the sentence "*Yo visité a mi familia la semana pasada"* (*I visited my family last week*), L2 learners are more likely to process *la semana pasada* to infer past tense, rather than attending to the verb ending *-é* in *visité*. This processing tendency is further supported by models of cue competition and learned attention, which suggest that highly salient lexical cues often suppress the processing of less prominent grammatical forms (Ellis & Sagarra, 2010a, 2010b). Consequently, persistent difficulties with verbal morphology are not merely instructional failures, but reflect the cognitive architecture and attentional biases of the learner (see also Lardiere, 1998).

In light of these insights, instructional approaches that force learners to rely on morphosyntactic cues—rather than defaulting to lexical indicators—are increasingly viewed as essential. Research on focus-on-form instruction (Norris & Ortega, 2000) indicates that learners are more likely to form accurate form-meaning connections when the grammatical structure is task-essential, that is, necessary to complete the activity successfully. Among such approaches, Structured Input (SI)—a key component of Processing Instruction (PI)—has been distinguished for its explicit theoretical grounding and empirical validation (VanPatten & Cadierno, 1993; Wong, 2004).

SI tasks are carefully constructed to render the processing of grammatical forms indispensable. For instance, learners might be asked to interpret a Spanish sentence such as *Visité a mi familia* (*I visited my family*), and decide whether the event refers to the past or present. If the task excludes supporting adverbials like *ayer* (*yesterday*), learners are forced to rely on verbal morphology to succeed. This design compels attention to the target form, making the interpretation of the sentence contingent on accurate morphological processing. Feedback on performance further reinforces the correct form-meaning mapping, creating a feedback loop that targets comprehension rather than production (Shintani, 2015).

It is important to distinguish SI activities from other input-based approaches, such as Enriched Input (Marsden, 2006) or input enhancement (Russell, 2012). These interventions increase the salience of grammatical forms, but they do not necessarily make those forms essential to task completion. In contrast, SI requires learners to interpret meaning through grammatical cues alone, aligning more closely with the psycholinguistic constraints identified in IP research.

Although PI is not the only model of task-essential instruction, it remains the most explicitly theorized and widely tested (Lee, 2015). Cadierno's (1995) comparative study of PI and traditional instruction (TI) provides a striking example of its effectiveness. Her study focused on the acquisition of Spanish preterite forms. While the TI group engaged in output-based production exercises, the PI group did not produce the target forms at all during instruction.

Nonetheless, one month after the treatment, the PI group not only outperformed the TI group on comprehension tasks but also showed equal gains in production. These results suggest that comprehension-based training led to restructured input processing, which in turn influenced production ability. This undermines the assumption—common in skill acquisition theory—that input-only instruction fails to transfer to productive skills.

Subsequent studies have confirmed these findings across a range of grammatical targets and learner populations. Research by Benati (2001, 2005), Henry (2015), VanPatten and Oikkenon (1996), and others has demonstrated that learners exposed to PI show improved interpretation and production outcomes, even when their instruction focuses exclusively on comprehension. These effects are attributed not to rote practice or output rehearsal, but to deeper changes in the way learners process linguistic input.

In summary, PI—through its use of SI activities—provides robust support for the view that task-essential, input-based training can modify learners' comprehension processes. By compelling learners to rely on morphosyntactic information rather than lexical heuristics, PI aligns both theoretically and empirically with the findings of psycholinguistic research. This approach not only addresses the attentional constraints identified in L2 processing but also offers a principled and replicable method for grammar instruction that affects both comprehension and production.

2.4.4. Long-term effects

A central concern in evaluating any instructional method is not just its immediate efficacy but its durability over time. Processing Instruction (PI), as a pedagogical approach rooted in input-processing theory, has consistently demonstrated robust short-term gains in helping learners form accurate form-meaning connections. However, the extent to which these benefits persist in the long term remains an essential question for both researchers and practitioners.

Most PI studies adopt a pre-test/post-test design, which serves multiple functions. Pre-tests act as a diagnostic tool to exclude learners who already possess substantial knowledge of the target form (typically above 60% accuracy), ensuring that instructional effects are not masked by prior competence (VanPatten, 2004; DeKeyser & Prieto Botana, 2014). Furthermore, pre-testing allows researchers to establish equivalence across experimental groups, thereby isolating the effects of the instructional treatment itself.

Immediate post-tests, typically administered at the end of the instructional phase, capture short-term learning gains when learner performance is presumed to peak. Delayed post-tests, however, serve a crucial role in evaluating the durability of PI's effects, particularly its claim to restructure learners' processing routines for sustained accuracy (VanPatten, 2004). Yet, research examining PI's long-term impacts has been somewhat limited in scope.

The majority of studies investigating PI's retention effects have tested learners within a short timeframe—often two to six weeks after instruction (e.g., Farley, 2004; Benati, 2001; Cheng, 2002, 2004; Toth, 2006; Keating & Farley, 2008; VanPatten et al., 2009; Marsden & Chen, 2011). Notably, while these studies confirm that PI-induced gains tend to persist in the short term, they provide limited insight into longer-term retention.

A rare exception is VanPatten and Fernández (2004), who administered an eight-month delayed post-test for Spanish OVS (object-verb-subject) structures taught via PI. Importantly, they used identical materials from VanPatten and Cadierno's (1993) seminal study to ensure methodological continuity. Results demonstrated that while learners' accuracy declined somewhat over time, their performance remained significantly above pre-test levels, suggesting that PI effects endure, even with considerable time gaps and without further instructional reinforcement. This finding is notable, as it supports the view that PI can generate relatively stable changes in learners' processing systems, albeit with some expected attrition.

However, this pattern of partial retention aligns with insights from skill acquisition theory, which argues that without continued practice, learners' performance—particularly in production tasks—may regress over time (DeKeyser, 2007). In VanPatten and Fernández's study, interpretation skills remained relatively resilient, while production skills showed a steeper decline. This suggests that while comprehension processes may stabilize after PI, productive accuracy still depends on ongoing use and reinforcement.

Similar conclusions emerged from Agiasophiti's (2013) study on German case marking. Ninety-nine English-speaking school-aged learners were assigned to PI with input enhancement, unenhanced PI, or a control group. After 12–14 weeks, both PI groups sustained improvements in interpreting and producing case markers, and notably, typographical input enhancement did not confer additional long-term benefits, implying that the core PI treatment was sufficiently robust. These findings highlight PI's effectiveness in promoting retention of complex morphosyntactic features, even without supplemental instructional enhancements.

Likewise, Kasprowicz and Marsden (2017) investigated the First Noun Principle's impact on learners' understanding of German definite article case marking. Young English-speaking learners received different combinations of explicit instruction and input-based practice, either focusing on task-essential form-meaning mapping or on mere form noticing. Both instructional groups maintained their gains across immediate and nine-week delayed post-tests, affirming the potential for input-based instruction to foster sustained improvements in both comprehension and production.

Despite these promising results, scholars remain cautious about overgeneralizing PI's long-term efficacy. As Doughty (2003) observed, post-tests at the sentence level might not fully capture whether learners have internalized implicit knowledge or are relying on residual explicit strategies. Marsden's (2006) study comparing PI to Enriched Input (EnI) further raised concerns that superficial learning gains might not reflect deeper processing changes, especially if learners continue to rely on salient lexical cues rather than developing sensitivity to morphological markers.

Moreover, research consistently shows that external exposure to the target structure after instruction can critically affect retention. For example, in classroom contexts, learners often encounter the target forms again through natural curriculum progression, which can reinforce learning. In contrast, experimental studies with no subsequent exposure may reveal sharper declines, not necessarily because PI is ineffective, but because of insufficient opportunities to recycle and consolidate knowledge (Lee & Benati, 2007).

A potential solution to bolster long-term retention is to incorporate spaced repetition and recycling of target forms within instruction. Evidence suggests that revisiting grammatical structures periodically after the initial PI treatment can strengthen form-meaning connections and mitigate skill decay over time (Shintani, Li, & Ellis, 2013). Furthermore, it has been hypothesized that PI may confer indirect benefits by sensitizing learners to the relevance of grammatical cues in the input, potentially accelerating the acquisition of related forms. For example, learners who develop attention to Spanish object pronouns through PI might more readily notice other clitics in subsequent input, even without explicit instruction—a phenomenon that merits further empirical exploration.

It is also worth considering that not all grammatical structures are equally amenable to long-lasting retention through a single PI session. Complex forms, such as French causative constructions (*Je fais réparer ma voiture*), may require multiple PI treatments or supplementary input to ensure durable acquisition, particularly if they are infrequent in post-instructional input.

In conclusion, existing research provides compelling support for PI's ability to produce enduring changes in L2 processing, especially in comprehension. Although some decline in performance is common over time, learners exposed to PI consistently outperform those with no instruction or with alternative methods, even months after the initial treatment. These findings underscore the value of PI as a foundation for developing stable processing routines, while also highlighting the importance of ongoing exposure and practice to fully integrate these gains into the learner's interlanguage system. Future research should continue to explore how PI can be optimized for long-term retention, perhaps by combining it with other pedagogical strategies that promote continued noticing and practice over time.

Chapter Three: Second Language Acquisition of English RCs

3.1. Introduction

English relative clauses (RCs) are subordinate clauses that modify a noun phrase (NP), providing additional information about a person or thing denoted by that NP. They are structurally complex, involving embedding of a clause within a noun phrase and often requiring movement operations of the NP. According to Marefat and Rahmany (2009), RCs are syntactically intricate constructions characterized by NP movement and embedding within a larger sentence. A substantial body of research has highlighted that RCs exhibit exceptional linguistic properties due to this movement from a subject or object position. In fact, acquiring relative clause structures has been identified as one of the most challenging areas for second language (L2) learners (Xiaorong, 2007; Algady, 2013). These difficulties arise from the complex syntax of RCs and the differences in how languages realize such structures, making RCs a persistent source of error and developmental delay in L2 acquisition.

This chapter examines the acquisition of English restrictive relative clauses (RRCs) by adult learners whose first language (L1) is Arabic. It first outlines the linguistic properties of English RCs and their typical features, then presents a cross-linguistic description comparing English and Arabic RRCs to pinpoint structural differences that may impede acquisition. Next, it reviews empirical studies on how L1 Arabic speakers learn English RRCs, focusing on common error patterns and developmental sequences. It also discusses relevant generative second language acquisition (GenSLA) theories and recent studies within that framework, to understand whether and how learners overcome initial L1 influence. Finally, the chapter synthesizes the contrastive observations and theoretical insights into a set of predicted difficulties for Arabic-speaking learners, providing a foundation for the current study’s approach and highlighting the need for targeted instructional interventions to address these difficulties.

3.2. Relativization in English

3.2.1. Description of Relative Clauses in English

In English, a relative clause functions as a modifier within a noun phrase (traditionally labeled a determiner phrase, DP, in generative grammar). It adds descriptive or identifying information about the noun (the head of the NP) that it modifies. For example, in the noun phrase “the city where I was born,” the clause “where I was born” is a relative clause giving more information about “the city.” Because a relative clause forms part of a noun phrase, it is considered an embedded or subordinate clause within the larger sentence structure. In syntactic terms, an English RC can be analyzed as a Complementizer Phrase (CP) embedded inside a noun phrase (DP). This CP is linked to the head noun it modifies, often via a relative pronoun or complementizer that introduces the clause and marks the site of embedding (Rizzi, 1990).

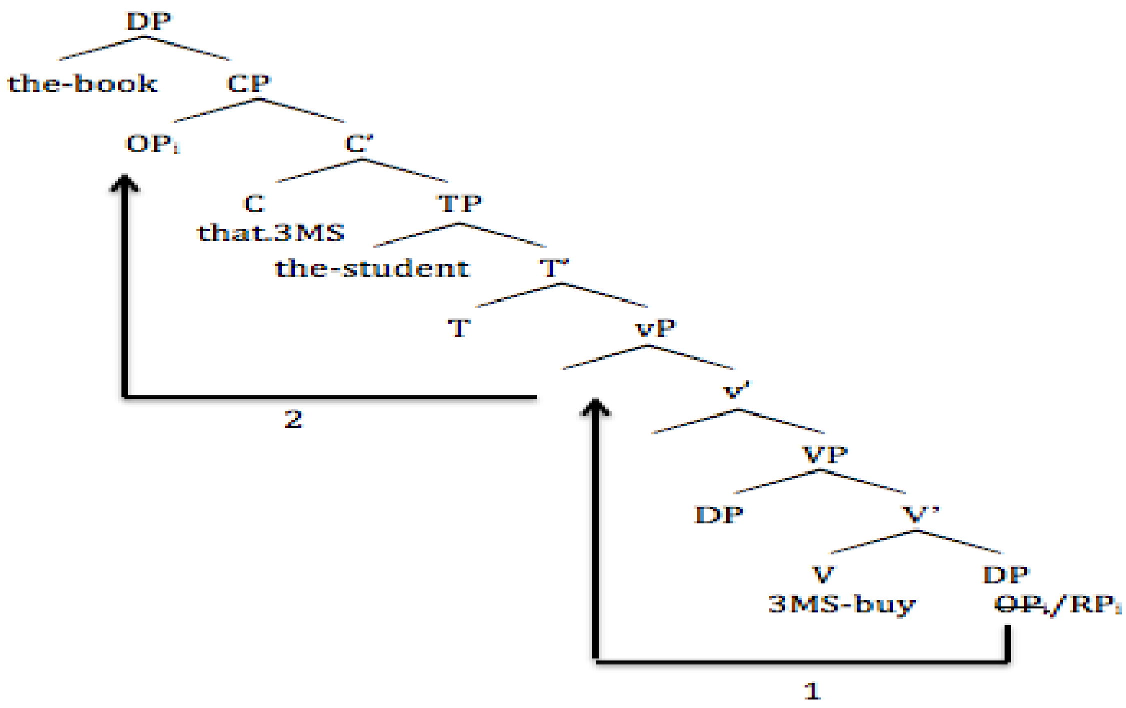


Figure 4. (Adapted from Algady, 2013, p.120)

English RCs typically follow the noun they modify, acting as a post-nominal modifier.

Consider the example:

1. The apple [that my brother bought].

Here "the apple" is the head noun (within the matrix clause) and the bracketed clause "that my brother bought" is a relative clause providing information about the apple. The RC is embedded in the larger sentence but is subordinate to the main clause ("The apple [...]"). English RCs are an integral part of the noun phrase they modify, and together the head noun plus RC form a larger DP constituent. Because of this embedded structure, relative clauses are sometimes described as complex NP constructions, and mastering their form and interpretation is a non-trivial aspect of syntax for language learners (Carnie, 2013; De Vries, 2002).

English relative clauses are introduced normally by relative markers, such as *that, which, whichever, who, whoever, whom, whomever, whose*. Thus, relative sentences are consisted of two parts: the matrix clause (antecedent) and the relative clause. For example:

2. This is the student who studies syntax.

In (2), the student is the antecedent and is also the subject of the clause while who studies syntax is the relative clause which identifies the antecedent "student". As stated by Biber et al (1999) “relative clauses are always missing a constituent, which corresponds in meaning to the head noun. The structural location of this missing constituent is referred to as the “gap” (p.608).

3. a. The story that I read ___ was exciting.

   b. The story I read ___ was exciting.

The head of the NP in (3 a) is the story; the relative pronoun that refers to the story and the gap occurs in the direct object position, after the verb read. Accordingly, the underlying meaning of the RC is that “I read the story‟. Both sentences (3 a) and (3 b) are grammatical in English but differ in the existence of the relative pronoun.

Lock (2002, p. 55) proposes that both L1 and L2 learners face challenges in acquiring the structure of RCs in English. This is evidenced by difficulties encountered by L2 learners in determining the placement of relative clauses and selecting appropriate relative pronouns as illustrated below:

a) The position of relative clause in which the RC is placed inside the noun expression, normally after the head noun as in (4):

4. The book [that I borrowed from the library] was on the table.

b) The correct choice of relative pronouns which based on whether the head noun is a human or not and whether the relative pronoun functions as a subject, object or a prepositional object.

3.2.2. Identification of Relative Clauses

There are certain clear criteria that distinguish relative clauses in English. Stageberg (1971) outlines two main characteristics that make an English RC recognizable:

- Presence of a relativizer: A relative clause is usually introduced by a relative marker (also called a relativizer) such as who, which, that, whom, whose, or a zero marker (Ø) in some cases. This marker signals the beginning of the RC and often corresponds to the head noun (e.g., who or that referring back to "the boy").

- Grammatical role within the main clause: The element that the relative pronoun refers to (often called the gap or trace in the RC) fulfills a syntactic function in the main (matrix) clause. In other words, the head noun + RC construction plays a role such as subject, direct object, object of a preposition, possessor, etc., in the larger sentence.

To illustrate, consider the following examples:

a. The boy *who passes the exam* is my brother. – Here, the RC "*who passes the exam*" modifies "the boy", and "the boy *who passes the exam*" as a whole functions as the subject of the sentence.
b. The boy *whom you invited* was very kind. – The RC "*whom you invited*" modifies "the boy," and the entire NP is the subject, while within the RC, "whom" functions as the object of the verb "invited."
c. It was my friend *to whom* I spoke. – The clause "*to whom* I spoke" is a relative clause modifying "my friend." In the matrix clause this construction is in a predicate (after was), and within the RC, "whom" serves as the object of the preposition "to."

d. The man *whose father died in the accident* got a job. – "Wh*ose father died in the accident*" is the RC modifying "the man." The pronoun whose indicates a possessive relationship (the man's father), and the whole NP acts as the subject of the sentence.

e. The book Ø *you borrowed* is fascinating. – "Ø *you borrowed*" is a relative clause with an omitted (zero) relativizer, modifying "The book." Here the head noun "the book" is the direct object of the matrix clause (implied in a larger context), and within the RC, the missing relativizer would correspond to the object of "borrowed" ("the book [which] you borrowed"). This zero-relative construction is allowable in English when the relativized element is not the subject of the RC (as in this object position example).

In each case, a relative clause can be identified by the presence of the relative pronoun (or a zero marker) at its start and by recognizing that the head noun + clause together form a constituent serving a role in the main clause. These properties help distinguish RCs from other types of subordinate clauses.

3.2.3. Types of Relative Clauses

English has several types of relative clause constructions. Traditional grammars classify RCs into three broad types: (1) nominal relative clauses (also known as free relatives), which act like nouns (e.g., "What he said was surprising," where what he said is a free relative clause functioning as a noun phrase); (2) sentential relative clauses, which refer back to an entire proposition or clause rather than a specific noun; and (3) adjectival relative clauses, which include restrictive and non-restrictive relative clauses (the most common type, modifying a noun). Since the present study is focused on standard noun-modifying relative clauses, particularly the restrictive type, the discussion will center on restrictive vs. non-restrictive relative clauses. Other types (nominal and sentential RCs) will not be reviewed in detail here, as restrictive RCs (RRCs) are by far the most frequent in usage and the primary concern in second language acquisition research.

3.2.3.1. Restrictive and Non-Restrictive Relative Clauses

Relative clauses come in two ways depending on their relationship to the head noun's reference: restrictive and non-restrictive (also called defining vs. non-defining, or essential vs. non-essential, relative clauses). A restrictive relative clause is one that delimits or identifies the reference of the head noun, providing information critical to understanding which particular entity is meant. In contrast, a non-restrictive relative clause adds extra, non-essential information about the noun, which could be omitted without changing the core reference of the noun (Quirk et al., 1985; Crystal, 2003). For example:

5. The student who is studying syntax has sent me a letter.
6. My brother, who is abroad, has sent me a letter.

In sentence (5), the relative clause "who is studying syntax" restricts the meaning of "the student" – it tells us which student (out of many possible students) is being referred to. The clause is essential to identify the intended subject; without it, we wouldn't know which student is meant. This is a restrictive RC, necessary for the noun's identification. In (6), however, "who is abroad" simply adds additional information about "my brother." Since "my brother" is already specific (the speaker presumably has one brother or the context makes it clear who is referred to), the relative clause here is not needed to identify him; it just provides extra details. Such a clause is non-restrictive, and it could be omitted without altering the basic meaning "My brother has sent me a letter". Non-restrictive clauses are typically set off by commas in writing and a pause in speech.

In summary, a restrictive RC narrows the reference of a noun (essential for meaning), whereas a non-restrictive RC supplements the noun with additional information (optional detail). As Crystal (2003) observes, in restrictive clauses the information is so crucial that removing the clause would change the meaning of the sentence (identifying “the student” as a particular one), while in non-restrictive clauses, removing the clause leaves the primary reference intact (it’s still “my brother”).

Because our focus is on restrictive relative clauses (RRCs), we note a few key properties of RRCs in English. Restrictive RCs limit or define the head noun’s reference, essentially identifying which entity is meant (Carnie, 2013). They provide essential information about the antecedent, without which the noun phrase’s meaning would be incomplete. RRCs in English can often be introduced by “that” or by a wh-pronoun (who/which), and sometimes (if not the subject) the relativizer can be omitted, yielding a reduced clause. For instance, English allows that-relativizers and even zero relativizers in many restrictive clauses, as long as the relativized element is not the subject of the relative clause (Dixon, 1992). According to Dixon’s (1992, p.28) description, in a restrictive clause any wh-relative pronoun (except whose) may be replaced by “that,” or even omitted entirely (zero) if the relativized NP is not in subject position. Additionally, English has reduced relative clauses in some cases: if the relative pronoun would be the subject and the clause has present tense, it can sometimes be reduced to a participial phrase (dropping the relative pronoun and using an –ing verb form). For example:

7. The student playing the piano is clever. (This is a reduced form of “The student who is playing the piano is clever.” The relativizer who and the auxiliary is are omitted, and playing is used in -ing form.)

In (7), the restrictive relative clause is reduced to “playing the piano,” yet it still serves to restrict the reference of “the student” to a specific one (namely, the one playing the piano). Such reductions are possible only under certain grammatical conditions and are typical of English relative clause usage.

Non-restrictive relative clauses, on the other hand, always use an explicit relative pronoun (who, which, etc., but not "that" in standard formal English) and cannot be reduced or omitted because they are parenthetical in nature. For example: "My brother, who is a doctor, lives abroad." Even without the clause who is a doctor, we still know it's "my brother," but the clause adds extra information. In writing, non-restrictives are set off by commas. While non-restrictive RCs are important, the current study's interest lies in restrictive RCs, which pose greater learning difficulty.

3.2.4. Relative Pronouns (Markers).

English relative clauses are typically introduced by a relative marker that signals the beginning of the subordinate clause and connects it to the head noun. In restrictive RCs, there are three primary types of relativizer in English: wh- words, "that," and zero (no explicit marker). Each of these can introduce a restrictive clause under the appropriate conditions:

- Wh-type relativizers: These include pronouns such as *who, which, whom, whose, and sometimes where, when, why* (for certain types of relative clauses referring to place, time, reason). In a typical RC, a wh-pronoun appears at the start of the clause and has an antecedent in the main clause. For example:

8. I bought the watch [which you recommended]. Here which introduces the relative clause and refers back to "the watch". Similarly, who refers to people, whom to people as an object, and whose indicates possession.

- That-type relativizer: Many English restrictive clauses can be introduced by that. For instance:

9. I bought the watch [that you recommended].

The word that does not change for gender or number; it can refer to people or things in informal usage (e.g., the person that came or the thing that I found). "That" as a relativizer is very common in spoken and informal English for restrictive clauses.

- Zero relativizer: In some cases, the relative pronoun can be omitted entirely, leaving an implicit connection. For example:

10. I bought the watch [Ø you recommended].

In this sentence, no explicit word appears where "which/that" would normally go, yet English allows the interpretation "I bought the watch that you recommended." This Ø relative clause is understood through context. However, such zero-relative clauses are only grammatical when the relativized element is not the subject of the relative clause.

It is important to note the constraints on using the zero relativizer in English. A zero marker can introduce a restrictive clause only if the missing element is an object or another non-subject role in the relative clause. If one tries to omit the relativizer when the head noun corresponds to the subject of the relative clause, the result is ungrammatical. Consider:

11. These are the books [Ø I like to read].

Here the head noun "the books" is relativized as the object of "like to read," and the sentence is grammatical with no explicit relativizer, meaning "the books that I like to read."

12. *These are the books [Ø are available].

This is ungrammatical, because in the intended clause "Ø are available," the head noun "the books" would be the subject of "are available." In English you cannot omit the relativizer in a subject position; you would need to say "These are the books that are available" or "... which are available."

As examples (11) and (12) show, dropping the relative pronoun (yielding a zero relative clause) is permissible only for non-subject relativizations. Attempting to do so in a subject-relative leads to an ill-formed sentence. This highlights a fundamental syntactic property of English RCs: if the head noun corresponds to the subject within the RC, an overt relativizer (wh-word or that) is required to initiate the clause.

The choice of relativizer in English can depend on formality and clause type. In restrictive clauses, *who* and *that* are both used for human antecedents (e.g., *the teacher who/that taught me*), *which and that* for non-human antecedents (e.g., *the book which/that I read*), *whom* is used for human objects in more formal style (t*he man whom I saw*, though in conversation one would more likely say *the man who I saw or the man that I saw*), and whose is used for possessive relations regardless of animacy (human or non-human). That is a very flexible relativizer (it can replace who, whom, or which in restrictive clauses) but has no possessive form and is generally not used after a comma (thus not in non-restrictive clauses). Whose is the only genitive (possessive) relative pronoun in English and can refer to people or things (e.g., the scientist whose theory was proven; the country whose economy is growing). For this study, only four wh-relatives will be under investigation (e.g. who, whom, which, whose):

• **who** – refers to animate (personal) antecedents; used as subject or object (though as object, whom is prescriptively preferred in formal style).

• **whom** – refers to animate antecedents; used only as object of verb or preposition; generally formal or written usage.

• **which** – refers to inanimate (non-personal) antecedents; used as subject or object.

• **whose** – indicates possession for animate or inanimate antecedents; used before a noun (acts as a determiner within the RC).

• that – can refer to either animate or inanimate antecedents; used as subject or object (no possessive form; not used after a comma).

- Ø (zero) – can replace that/who/which when the relativized element is not the subject of the RC (common in object positions, especially in spoken English).

For instance, in the pair of sentences below, whose functions as a possessive relativizer, replacing a possessive pronoun from separate sentences:

13. He is a boy. His hat is red.
14. This is a boy [whose hat is red].

In (14), *whose* in the relative clause connects to “a boy” and indicates possession (the boy’s hat). The clause “whose hat is red” thus gives essential identifying information about which boy we are talking about (the one with the red hat).

To sum up, English has a rich system of relativizers, and choosing among who/whom/which/that/Ø/whose depends on the noun’s animacy, and the grammatical role of the gap. All of these relativizers mark the beginning of the RC and stand for an element that “is missing” inside the clause (in the sense that the head noun is not repeated, its role being filled by the relativizer or a gap). Indeed, as Biber et al. (1999) note, relative clauses in English are always missing a constituent internally – that missing element is understood to be the head noun, linked via the relativizer. This gap strategy is a hallmark of English RC formation.

There are two strategies used in the process of relativization in the world’s languages. These strategies are a gap strategy or a resumptive retention strategy. English RRCs require the gap strategy as in (15 and 16), while other language like Arabic uses resumptive pronouns in the construction of RRCs as in (17 &18). A resumptive pronoun is a referential pronoun that occur in the position of the relativized NP of the head. As stated by Keenan and Comrie, (1977) that resumptive pronouns function as a facilitated pronoun to identify the syntactic relation of the head noun within the clause.

15. The giraffe that the boy hugged__
16. The giraffe that the boy hugged *it
17. iz-zaraafi illi l-walad ħadʕan-ha
    the-girraffe that the-boy hugged-it
    ‘The giraffe that the boy hugged.’
18. *iz-zaraafi illi l-walad ħadʕan
    the-girraffe that the-boy hugged

(Bshara, 2012:133)

In (15), English RRCs use only the gap strategy while it is ungrammatical when there is a resumptive pronoun as in (16). However, Arabic RRCs apply the resumptive pronoun strategy as in (17), while it is ungrammatical when there is a gap as in (18).

Before moving on, it is crucial to emphasize an overarching property of English RCs: they involve wh-movement. In generative grammar terms, the relative pronoun (or complementizer “that”) can be viewed as occupying the [Spec, CP] position at the start of the clause, having moved (or been base-generated there, depending on analysis) from its original position in the clause. The result of this movement is a gap (or trace) inside the RC where the moved element would have been. Because English uses this wh-movement strategy, inserting a resumptive pronoun in that gap position is generally ungrammatical in standard English. For example:

19. The student [who$_i$ I think [t$_i$ is the tallest]]– Here who refers to “the student” and has been fronted in the relative clause, leaving a trace t$_i$ in the embedded clause after “is”. This sentence is grammatical and shows a long-distance dependency (the relative pronoun who originates as the subject of “is the tallest” but appears at the front of the RC).

20. *I liked the movie [that I watched it on TV]. – This sentence is ungrammatical because of the presence of “it” in the relative clause. The intended meaning is “the movie that I watched on TV,” with “the movie” being the object of “watched.” In a correct English RC, one would say “the movie that I watched on TV” with no pronoun after “watched.” The attempt to insert “it” (referring to “the movie”) inside the clause produces a redundancy that English grammar does not allow. The it in (20) is a resumptive pronoun, and its presence indicates no true wh-movement happened; English requires a gap instead, hence the ungrammaticality.

These examples demonstrate that English RCs rely on a movement-and-gap strategy: the relative pronoun (or “that”) at the clause edge stands in for the head noun’s role, and no additional pronoun is used in the clause to refer to that noun. This absence of resumptive pronouns (except in certain non-standard or very complex cases) is a defining syntactic trait of English RCs. In summary, English relativization = wh-movement to CP + gap, which contrasts with other languages that may use a pronoun in situ. We will see that Arabic is one such language that, unlike English, commonly uses resumptive pronouns in many relative clauses. Understanding this difference is key to analyzing the difficulties L1-Arabic speakers face when learning English RCs.

3.3. Relative clauses in Arabic.

Arabic relative clauses share the general function of modifying nouns, but their structure and usage differ in significant ways from English. In Arabic grammatical tradition, a relative clause is often treated as a type of adjectival clause (sometimes called a “subordinate adjective clause”) when it identifies or describes a noun. According to Badawi, Carter, and Gully (2004, p.491), if a clause follows an indefinite noun and provides description, Arabic grammarians may classify it as part of the noun’s description (essentially an adjective clause), whereas a clause that follows a definite noun is considered an adjunct clause providing additional information. In modern linguistic terms, both are relative clauses (one restrictive, one non-restrictive), but Arabic has a particular way of marking or omitting the relativizer depending on the definiteness of the head noun.

One of the most salient characteristics of Arabic (especially colloquial dialects, including Saudi Arabic) is that Arabic has a dedicated relativizer "illī" (also transcribed alli or illi), which functions somewhat like "that"/"which" in English. However, its use is governed by the definiteness of the head noun. In many varieties of Arabic, a definite head noun (one with the Arabic definite article al-, equivalent to "the") requires the relativizer illī to introduce the relative clause, whereas an indefinite head noun (lacking al-, akin to "a/some") typically does not use a relativizer, and the clause immediately follows the noun without an overt complementizer. In other words, "illī" is only used after definite heads, and if the noun is indefinite, the relative clause is attached with no illī, often just by simple juxtaposition (sometimes these are called "reduced" or participial relative clauses in Arabic grammar). This rule is illustrated by the following minimal pair from Al-Momani (2010):

21. ʃuft l-walad illi gara l-ktab
    (saw. 1.SG DEF-boy-ACC DEF-that. M.SG read.3.SG.M DEF-book-ACC)
    'I saw the boy that read the book.'
22. ʃuft walad (*illi) gara l-ktab
    saw. 1.SG INDEF-boy-ACC INDEF-that. M.SG read.3.SG.M DEF-book-ACC
    'I saw a boy that read the book.

(Momani, 2010: 233)

In example (21), the head noun *al-walad* (the boy) is definite (marked by *al*-), and the relativizer *illī* is used to introduce the clause "*read the book*." In (22), the head noun *walad* (boy) is indefinite (no *al*-), and here the presence of *illī* would be ungrammatical (as indicated by the parentheses and asterisk). The clause "*qara l-ktab*" (read the book) follows directly without a complementizer. Thus, Arabic exhibits a definiteness agreement in relativization: *illī* can be seen as a morphological reflex of a definiteness feature [+def] on the complementizer position, and it must match the definiteness of the head noun. If the head noun is [+definite], *illī* appears; if the head is [–definite], no overt relativizer is used (effectively an "empty complementizer"). Al-Momani (2010) specifically describes *illī* as the realization of the [+def] feature in Arabic relative clauses.

Apart from this definiteness condition, word order in Arabic relative clauses is somewhat analogous to English in that the relative clause follows the noun it modifies (as in the examples above). Arabic also makes the familiar distinction between restrictive and non-restrictive relative clauses in meaning: a relative clause can either identify the noun (when the noun is indefinite, it typically restricts its reference) or just add extra information (when the noun is already definite and identified, the clause is often supplementary). The crucial syntactic difference is that Arabic relies on resumptive pronouns in most types of relative clauses, whereas English does not.

Arabic can relativize a variety of grammatical positions (just like English can have subject relatives, object relatives, etc.). In Saudi Arabic (a dialect of Arabic spoken in Saudi Arabia), it is possible to relativize at least six different positions within a clause: the subject, direct object, indirect object, object of a preposition, possessive (genitive) position, and object of comparison. The examples below (adapted from Saudi Arabic, with glosses) illustrate each of these relativization positions:

- Subject position:

23. al-bint [illī jā-t]
    Gloss: DEF-girl.F.SG [that.F.SG came-3.F.SG]
    "The girl who came"

In this restrictive RC, al-bint ("the girl") is the head noun (definite), and illī introduces the clause. Inside the RC, the verb "came" has no explicit subject noun; effectively, a null pronoun (pro) is understood as the subject, co-referential with al-bint. Arabic does not use a separate pronoun here because the subject gap is allowed (and Arabic is a pro-drop language for subject pronouns). This is a subject relative (the girl is doing the action of coming).

- Direct object position:

24. al-bint [illī šāf-at-ha Lina]
    Gloss: DEF-girl.F.SG [that.F.SG saw-3.F.SG-her Lina.NOM]
    "The girl whom Lina saw."

Here al-bint is the head ("the girl"), and within the RC "Lina saw her," the pronoun -ha ("her") attached to the verb indicates the direct object (referring to "the girl"). This is an object relative clause. The presence of the resumptive pronoun -ha is crucial; it serves as a placeholder for the girl inside the relative clause ("Lina saw ___"). Unlike English, Arabic does not allow a gap here; a pronoun is used to refer back to the girl.

- Indirect object position:

25. al-bint [illī katab-t ar-risāla li-ha]*
    Gloss: DEF-girl.F.SG [that.F.SG wrote-1SG the-letter to-her]
    "The girl that I wrote a letter to."

The head is "the girl" and within the relative clause we have "I wrote the letter to her." The pronoun ha (her) is a resumptive pronoun representing the indirect object of the verb "wrote" (i.e., the recipient of the letter). This is an indirect object relative. English would use "to whom" or a stranded preposition ("the girl that I wrote a letter to") with no pronoun, but Arabic includes the pronoun.

- Object of a preposition:

26. al-bint [illī jalas-t janb-ha]
    Gloss: DEF-girl.F.SG [that.F.SG sat-1SG next.to-her]
    "The girl that I sat next to."

This literally reads "the girl that I sat next to her." The head noun "the girl" is being related to the position "next to ___" in the RC. Arabic again uses a pronoun -ha attached to the preposition janb ("next to") to resume the reference to "the girl" in the prepositional phrase. This corresponds to an object of preposition relative. In English we might say "the girl who(m) I sat next to" (no pronoun, just stranded preposition) or formally "the girl next to whom I sat."

- Genitive/possessive position:

27. al-bint [illī ʾabū-ha māt]
 Gloss: DEF-girl.F.SG [that.F.SG father-her died.3.M.SG]
 "The girl whose father died."

Here the head is "the girl," and the relative clause conveys that "her father died." Arabic does not have a separate word for "whose" in colloquial dialect; instead it uses the structure "the girl that her father died." The resumptive possessive pronoun -ha ("her") attached to "father" indicates the genitive relationship. This is analogous to an English whose-clause, but Arabic again uses a pronoun rather than a special relativizer like "whose."

- Object of comparison:

28. al-bint [illī Lina ʾathka min-ha]
 Gloss: DEF-girl.F.SG [that.F.SG Lina smarter than-her]
 "The girl that Lina is smarter than."

The head noun "the girl" is being compared in the relative clause: "Lina is smarter than her." This is a relative clause where the head corresponds to the object of the comparison (after "than"). English would say "the girl that Lina is smarter than" without adding a pronoun at the end (because the "than" phrase would end the clause). Arabic, however, explicitly includes the pronoun -ha after "than" to indicate the girl. This is another case of resumptive pronoun usage in a comparative construction.

These examples demonstrate that in Saudi Arabic (and many other Arabic dialects), all major syntactic positions can be relativized, but all except the subject position require a resumptive pronoun inside the relative clause. The subject position is unique in that Arabic can drop the subject pronoun (since Arabic allows null subjects) and effectively have a gap (as in example (23) with illī jā-t "who came" where the subject of "came" is not overt). For other positions (direct object, indirect object, etc.), Arabic grammar mandates a pronoun referring back to the head noun within the RC. These resumptive pronouns act as a bridge between the head noun and the relative clause, ensuring the clause is grammatical in Arabic by providing a placeholder for the moved element. In generative terms, this suggests that Arabic RCs do not use the same kind of wh-movement to a gap as English does; instead, the relative clause is base-generated with a pronoun in the extraction site (Aoun, Benmamoun & Choueiri, 2010; Al-Momani, 2010).

Another notable point is that, unlike Modern Standard Arabic (MSA) which has a set of relative pronoun forms (e.g., allaḏī, allaṯī etc. that agree with gender, number, case of the head noun), colloquial Arabic dialects (including Saudi Arabic) primarily use the invariant complementizer "illī" for all cases. Saudi Arabic does not inflect illī for masculine/feminine or singular/plural; it is a neutral relativizer used in all contexts regardless of the antecedent's grammatical properties. Versteegh et al. (2011) note that in colloquial Arabic, relative clauses "usually follow the relative pronoun illī," which does not change form. Essentially, illī neutralizes gender, number, and case distinctions that MSA relativizers would mark. In Saudi Arabic, whether the head noun is masculine or feminine, singular or plural, animate or inanimate, the same word illī is used to introduce a definite noun's relative clause.

To summarize Arabic relativization: A definite head noun triggers the use of illī to introduce the relative clause, and the clause will contain a resumptive pronoun in any position except a missing subject. An indefinite head noun is typically followed by a relative clause without illī (an "zero complementizer" scenario), but even in those clauses, if the relativized position is not subject, a resumptive pronoun appears to maintain grammaticality. The presence of illī is effectively linked to definiteness: if the head noun is indefinite, Arabic treats the clause more like a participial modifier (often without any complementizer whereas a definite head demands illī. Additionally, Saudi Arabic consistently uses resumptive pronouns for objects and other positions, reflecting a lack of true wh-movement in these constructions.

Crucially for our purposes, Arabic and English share the ability to relativize similar grammatical roles (subjects, objects, etc.), but they differ in how they mark the link between the clause and the noun. English uses a variety of relative pronouns and relies on gaps; Arabic uses mostly one relativizer (illī) and relies on resumptive pronouns (proforms in the clause). The study at hand focuses on colloquial Saudi Arabic speakers, who are non-balanced bi-dialectals – they primarily use the Saudi dialect in daily life and have only limited use of MSA. This means the participants' internalized grammar of Arabic relative clauses will align with the description above (predominantly *illī* as a complementizer and heavy use of resumptives). When these speakers learn English, their instinctive strategies (shaped by L1 Arabic) may transfer, causing predictable errors in English RC production and comprehension. The next sections will explore these L1-influenced patterns and how learners gradually adapt to the English system.

3.4. Interpretable vs Uninterpretable features in RRCs

In MCF, the syntax processor embodies the constraints and primitives often described in generative theory; growth is Acquisition by Processing (APT), where representations in the linguistic stores strengthen through frequent processing rather than via a distinct "access/no access to UG" mechanism (Truscott & Sharwood Smith, 2019). I use Minimalist feature labels (e.g., interpretable [±definite], uninterpretable [uCase], [uRel]/[uWh]) purely as a descriptive terminology for the SS configurations involved in English RRCs.

Thus, MCF is the core architecture I'm arguing from: an encapsulated language module whose SS/PS processors select, build, and strengthen representations via processing. Minimalist constructs are used descriptively to label the content of those SS representations (e.g., which features must be valued, what licenses a dependency). In other words, MCF explains the mechanism of development (why and how states stabilize), while Minimalist features specify the target configuration that must be computed for English RRCs. This lets me discuss UG-constrained primitives without claiming that instruction directly edits them; instruction instead biases interface processing so that UG-compatible parses win often enough to stabilize. (Sharwood Smith & Truscott, 2014, 2019; Chomsky, 2001; Rizzi, 1997; Adger, 2003.) Interpretable features are those that feed semantic interpretation at the Conceptual–Intentional interface; for the present domain, these include [±definite] on D (head DP) and lexical distinctions such as [±human] that condition the distribution of *who* versus *which* (Adger, 2003; Huddleston & Pullum, 2002). Uninterpretable features are purely formal requirements that must be valued and eliminated before Logical Form (LF); in English RRCs, two positions matter: an A′- feature (A-bar feature) on C (variously treated as [uWh] or a relative specific [uRel]) that licenses the dependency by attracting/agreeing with a relative operator in Spec CP, and [uCase] on the operator/wh element that is valued by T/v/P depending on its syntactic position (Chomsky, 2001; Rizzi, 1997; Adger, 2003).

These elements (case, definiteness, and operator type) come together to form a clear and organized system of grammatical features for English restrictive relative clauses. The C head requires satisfaction of an uninterpretable dependency licensing feature; satisfaction can occur with an overt operator (who/which/whom/whose) or, in certain object environments, with a null operator and complementizer options. Independently, the head DP bears an interpretable [±definite] feature whose contribution is semantic; crucially, definiteness does not license the dependency in English. The operator itself combines interpretable content (e.g., [+human] for who, [−human] for which) with an uninterpretable [uCase] that is valued structurally: who commonly realizes nominative in subject relatives; whom realizes accusative/oblique; whose is a genitive relative determiner selecting an NP; which is case invariant morphologically but its Case is valued by position/governor (Huddleston & Pullum, 2002; Adger, 2003).

This feature system aligns tightly with the empirical focus of the current thesis. Because [±definite] on D is interpretable, learners must grasp its semantic contrast without treating it as a licensing condition for the CP dependency. Because the C domain requirement and [uCase] are uninterpretable, learners must learn to satisfy them uniformly, irrespective of definiteness.

The four relative forms show different patterns in how easily learners process and acquire them. *Who* (used in subject relatives) is learned more quickly because it appears often and its grammatical role is easy to assign, *whom* is harder to master without focused practice since it's rare and mostly used in formal English, *whose* is more complex because it acts like a genitive determiner inside a noun phrase, which adds structural depth, and *which* is used for nonhuman nouns and often appears in prepositional phrases, where its grammatical role must be figured out even though it doesn't show much case marking. (Huddleston & Pullum, 2002).

Theories based on interpretability explain why some features are easier to learn than others. Features tied to meaning—like definiteness and animacy—are easier for learners to grasp. In contrast, formal features—like those needed to build sentence structure ([uCase] and A′-licensing on C)—take longer to learn and require more repeated exposure, especially for adult learners. (Tsimpli & Dimitrakopoulou, 2007; Hawkins & Hattori, 2006). This is exactly where Feature Reassembly comes in: adult learners must re-map L1 feature bundles to L2 bundles, not just "set a parameter." For RRCs, that means learning that English C carries an A′-licensing requirement independent of D[±definite], that relative operators differ in animacy and case behavior (who/which/whom/whose), and that Case on the operator is structurally valued. If a learner's L1 bundles these features differently (e.g., a single complementizer aligned with definiteness on the head noun), they must reassemble: decouple definiteness from dependency licensing, assign the right operator type, and ensure [uCase] is valued by position/governor. This predicts why meaning-connected features (definiteness, animacy) are often grasped earlier, while purely formal features (A′-licensing on C, [uCase]) require more exposure and practice to stabilize. (Lardiere, 2008, 2009)

This theoretical picture motivates my instructional design. Processing Instruction (PI) aims to reshape input processing so that learners compute target form–meaning connections during comprehension (VanPatten, 1996/2004). In referential structured input activities, the response has a right/wrong answers, which makes the C dependency and [uCase] valuation task essential on every trial; in affective activities, learners provide a preference/stance, which increases exposure but does not guarantee that the uninterpretable features have been computed on each sentence. Within MCF, referential tasks provide frequent exposure that strengthen SS configurations implementing the C dependency independently of D[±def] and valuing [uCase] appropriately; affective tasks add engagement but place a weaker constraint on the critical computations (VanPatten, 1996/2004; Farley, 2005; Benati, 2023; Zhong & Benati, 2024).

3.5. Acquisition of English RRCs by Arabic L1 learners

3.5.1. Studies on Error Patterns in L2 Relative Clauses

Researchers have long examined the difficulties Arabic speakers face when acquiring English relative clauses. Early error analyses were often grounded in contrastive analysis, comparing Arabic and English to predict areas of divergence. One seminal study by Kharma and Hajjaj (1985) catalogued common errors made by Arab learners of English relative clauses. They found that English relative pronouns and clause structures posed significant challenges, and they identified several recurring error types, including:

a. Omission of the relative pronoun: Learners often drop the relativizer in English sentences where it is obligatory, producing sentences like "The man __ I saw is here" (intended: "The man who I saw is here"). This reflects a direct L1 crosslinguistic influence from Arabic, where no complementizer is used with indefinite heads or certain contexts.
b. Resumptive pronoun usage: Arabic speakers frequently insert pronouns redundantly, especially in object or prepositional phrases of the RC.

29. "The boy he goes to school every day works in the evenings too."

In this example, the learner says "*the boy he goes…*" instead of "*the boy who goes…*," effectively using a subject pronoun "*he*" where English requires a relative pronoun or no pronoun at all. This error is a clear instance of L1 crosslinguistic influence, since in Arabic one would say "*al-walad illī huwwa yadhhab….*" (using *huwwa* "he" as a resumptive pronoun in the relative clause).

• Using personal pronouns in place of relative pronouns: This overlaps with the above – learners might use he, she, they in the RC instead of who/which, treating the relative clause almost like a coordinated clause. For instance: "*The girl she is my friend lives next door*" (intended: "*The girl who lives next door is my friend.*").

• Misselection of relative pronouns: When learners do attempt English relativizers, they often confuse their usage. For example, some may use which for people or who for things, or misuse whose. Khalil (2000) notes that Arab learners sometimes misuse "whose" (which is unfamiliar in Arabic) in genitive contexts, or avoid it altogether.

These error types identified by Kharma & Hajjaj (1985) have been corroborated by many subsequent studies. Researchers across different Arab learner populations report similar patterns. Ibrahim et al. (2000), Khalil (2000), Al-Ghussain (2003), and Crown (2008) all found persistent difficulties with English RCs among Arabic-speaking learners, largely aligning with the categories above. For example, Abu-Jarad (1986) investigated Palestinian Arabic speakers learning English and observed frequent errors in relative pronoun selection, sensitivity to the definiteness of the head noun, and pervasive use of resumptive pronouns where they do not belong in English. Khalil (2000), examining Jordanian learners, similarly documented that learners would often delete required relative pronouns, choose the wrong relative pronoun, retain pronouns unnecessarily (resumptives), and struggle with the proper use of "*whose*" in possessive relative clauses. These consistent findings suggest that many errors can be traced to direct interference from Arabic grammar, as well as overgeneralization or misinterpretation of English rules.

In recent years, studies have explicitly probed the source of these errors, frequently affirming that L1 transfer is a major factor. Zagood (2012), Shaheen (2013), Alroudan (2016), Khan and Al-Namer (2017), among others, have all pointed out the influence of the learners' first language on how they comprehend and produce English relative clauses. For instance, Khan and Al-Namer (2017) conducted a study focusing on Arab EFL learners' comprehension of various English relative pronouns. They tested learners on seven different relativizers (*who, whom, whose, which, that, where, when*) through a multiple-choice task with 50 participants at intermediate and advanced proficiency. Their findings revealed that the learners, especially at intermediate levels, lacked a full understanding of English RC usage. One striking result was that the pronoun "*whom*" was the most poorly understood and correctly answered item, whereas a pronoun like "*when*" (used in temporal relative clauses) was relatively easy. They also found a significant proficiency effect: advanced learners performed better than intermediates in comprehending RCs. This indicates that while increased exposure and proficiency help, certain forms (like *whom*, which has no direct equivalent in colloquial Arabic and is even avoided by some native English speakers in informal contexts) remain especially challenging. Khan and Al-Namer (2017) conclude that learners' incomplete awareness of English RC forms—rooted in both L1 transfer and inherent complexity of English relativizers—suggests a need for targeted teaching strategies, particularly to address the misunderstood forms such as whom. They highlight that explicit instruction may be required to overcome these difficulties.

Additional support for L1 influence comes from Alroudan's (2016) research on the acquisition of English RRCs by Arabic speakers. Alroudan examined how learners deal with pronoun retention (resumptives) and the difference between overt vs. null relativizers in relation to the definiteness of the head noun. In her study, about 100 learners were given an acceptability judgment task where they had to judge sentences with various RC constructions. The results showed that learners were often willing to accept ungrammatical resumptive pronouns in English RCs and showed a preference for overt relativizers "*that*" or "*which*" over a zero relativizer, especially when the head noun was definite. This behavior mirrors Arabic: a definite head noun in Arabic always has an overt relativizer (*illī*), so learners felt more comfortable when an English sentence had an overt relativizer, even in cases where English grammar allows dropping it. Conversely, sentences with a zero relativizer (like "*the book Ø I read*") were harder for them to accept, presumably because in Arabic a definite "*book*" would have required *illī*. Alroudan interpreted this as clear evidence of L1 transfer at the level of subtle grammatical features—Arabic speakers transfer the definiteness-conditioned strategy (always have a connector if definite) into English, leading them to prefer structures that align with their L1 and to misjudge or misuse the ones that don't. Encouragingly, Alroudan found that many learners eventually did acquire the proper English patterns, especially at higher proficiency, indicating that the L2 grammatical system can ultimately be mastered. Interestingly, the learners more easily mastered cases where English and Arabic align (e.g., using an overt pronoun in contexts similar to Arabic's usage) than those where English requires something entirely different (like using no pronoun where Arabic would use one). This suggests that when an English construction was more similar to the L1, learners achieved accuracy faster, whereas constructions requiring them to unlearn an L1 pattern (like dropping a pronoun they would normally use) proved tougher.

In sum, error analysis and comprehension studies converge on a few key points regarding Arabic L1 learners acquiring English RRCs:

- Learners start with a strong L1 influence effect: they tend to omit English relativizers (mirroring Arabic zero relativizer with indefinites) or add resumptive pronouns (mirroring Arabic structure in non-subject clauses), and they struggle with forms that Arabic doesn't have (like whose, whom).

- With increasing proficiency and exposure, learners improve, especially on more straightforward aspects like using who/which correctly. However, certain advanced or less common forms (e.g., the zero relative, or whom in object position, or possessor whose) may continue to cause difficulty longer, often until learners receive explicit instruction or sufficient input to notice the correct usage.

- There is evidence that learners can ultimately acquire even those L2 features that are absent in L1, but they may go through a developmental path where interlanguage representations mix L1-based strategies with partial L2 rules. Over time, and potentially with targeted teaching, they reduce their reliance on resumptive pronouns and learn to use the appropriate English relativizers in the right contexts (Alroudan, 2016; Khan & Al-Namer, 2017). The persistence of certain errors underscores the need to tackle these through pedagogical intervention.

Having reviewed the typical error patterns, we turn now to how such acquisition processes are explained within a generative linguistic framework, particularly examining whether adult L2 learners can acquire features in the L2 grammar that their L1 does not instill, and what theoretical models best account for the trajectories observed in studies like those above.

3.5. Studies on the acquisition of English RCs in Generative Framework

The acquisition of relative clauses by L1 Arabic speakers has also been studied from the perspective of Universal Grammar (UG) and generative second language acquisition theories. While a full survey of all generative SLA hypotheses is beyond our scope, the present study is particularly informed by the Full Transfer/Full Access (FT/FA) Hypothesis (Schwartz & Sprouse, 1994, 1996) as it pertains to the acquisition of new syntactic features. The FT/FA hypothesis posits two key things about adult L2 acquisition: (1) at the initial state of learning, learners fully transfer their L1 grammar (all its categories, features, and parameter settings) into their interlanguage; and (2) learners also have full access to UG for the L2, meaning they can in principle acquire new features that are not present in their L1, given sufficient input and learning time. In simpler terms, an Arabic speaker learning English would start out interpreting English relative clauses through an "Arabic lens" (transfer), but with continued exposure, they are capable of restructuring their grammar to accommodate true English-like representations (access to UG), even for aspects like [±wh] movement that Arabic lacks.

The question then is: Can L1 Arabic learners ultimately acquire the properties of English restrictive relative clauses that differ from Arabic (such as the wh-movement and the use of distinct relativizers)? Several studies have investigated this, often focusing on whether learners overcome initial L1-based strategies (like resumptives) and achieve native-like competence in English RCs. Here we review some notable research in this vein, which broadly suggests that with advanced proficiency, learners can acquire L2-specific features, supporting the FT/FA perspective.

A number of researchers have examined the acquisition of English RCs (and related constructions) by Arabic speakers, often through grammaticality judgment tasks, comprehension tests, or production tasks. For example, Bolotin (1996) looked at Hebrew and Arabic speakers acquiring English wh-movement; Yuan and Zhao (2005) studied Chinese speakers (another resumptive language) for comparison; Althubaiti (2007) and Aldwayan (2008) specifically studied Arabic-speaking learners with regard to English RCs and wh-questions; Aldwayan, Fiorentino & Gabriele (2010) and Aldousari (2015) further explored constraints like island effects in wh-movement; and Al-Maani (2020) researched processing of RCs by Jordanian Arabic speakers. These studies vary in focus, but collectively they shed light on whether learners can acquire features like the English [+wh] complementizer system, given that their L1 uses a [+def] relativizer system.

To illustrate, Aldwayan (2008) investigated whether L1 Najdi Arabic speakers (Najdi is a dialect of Arabic) could acquire English restrictive relative clauses and wh-questions, both of which involve wh-movement absent in Najdi Arabic. Aldwayan's study used multiple experimental tasks, including grammaticality judgment tasks and self-paced reading, and tested advanced learners. The analysis considered competing hypotheses: the Representational Deficit Hypothesis (which would predict learners cannot fully acquire features not in L1), the Shallow Structure Hypothesis (predicting persistent processing differences), and Full Transfer/Full Access (predicting eventual success given enough input). The results were telling: advanced Najdi Arabic learners of English demonstrated near-native performance in recognizing ungrammatical RC sentences (e.g., correctly rejecting sentences with Arabic-like resumptive pronouns or other violations). In fact, these advanced learners behaved similarly to native English controls in rejecting sentences that were ungrammatical in English, suggesting they had internalized the English rules. This outcome supports the FT/FA hypothesis—learners had apparently restructured their interlanguage grammar away from the initial Arabic transfer and acquired the necessary L2 features (like understanding that a gap must be used instead of a pronoun). Aldwayan's findings ran counter to the idea that adult learners have a permanent "representational deficit" for new functional features; instead, they indicate that given the right conditions, learners can incorporate those features (in this case, the wh-movement and relativizer distinctions of English).

Another study, Aldousari (2015), focused specifically on the acquisition of syntactic island constraints on wh-movement by L1 Arabic speakers. Islands (constraints on how far an element can move) are not overtly tested in our context, but Aldousari's work is relevant as it probes whether L1 Arabic speakers can learn something as subtle as island constraints that exist in English (and generally in UG) but might not manifest the same in Arabic. He found that advanced Arabic-speaking learners of English were able to obey English island constraints (such as knowing that certain embeddings block wh-movement), performing on par with native speakers in judgments. Interestingly, Aldousari examined whether processing limitations or working memory issues could explain any residual difficulty (as opposed to a grammatical deficit). His evidence suggested that working memory was not the limiting factor; learners' success was more tied to acquiring the necessary syntactic knowledge itself. Learners who did well seemed to have genuinely acquired the syntactic principles, not just found workarounds. This again is consistent with Full Access – learners eventually grasp the abstract constraints of the L2 grammar. Aldousari concluded that the learners' ability to converge on native-like grammatical knowledge (despite the initial absence of those constraints in L1) supports the idea that UG remains accessible and that L1 transfer, though strong initially, can be overcome with learning.

A more recent contribution by Al-Maani (2020) took a deep look at filler-gap dependencies and definiteness effects in the processing of English RCs by L1 Jordanian Arabic speakers. This study is particularly pertinent because it examines exactly the kind of feature reconfiguration discussed earlier: Arabic's use of [+def] on the complementizer vs. English's use of [+wh]. Al-Maani found that learners initially carried over L1 strategies in dealing with English RCs. Specifically, certain combinations in English RCs gave them trouble: definite head nouns with a null complementizer, and indefinite head nouns with an overt complementizer, were hardest for the learners to process correctly. These correspond to constructions that don't occur in Arabic. In Arabic, a definite head must have illī (overt) and an indefinite head must not have illī (covert). In English, both definite and indefinite heads can have overt relativizers (e.g., "the book that...", "a book that...") and both can sometimes have none ("the book Ø I bought" is fine in informal English, and "a book Ø I bought" is also possible although less common register-wise). The learners tended to find "the book Ø I bought" strange (likely expecting a relativizer since "the book" is definite) and perhaps also had issues with sentences like "a book which I bought" (since "a book" in their L1 logic wouldn't take illī, an overt relativizer). The [+def] feature in their L1 is misaligned with the [+wh] feature needed in L2. However, critically, Al-Maani observed that as proficiency increased, learners' performance on these problematic types improved significantly. Through tasks like self-paced reading, she showed that higher-level learners began to process filler-gap dependencies in a native-like way and were more accepting of English structures that violate Arabic definiteness-relativizer patterns. In other words, advanced learners were reconfiguring their internal grammar: they learned that in English, definiteness of the head noun does not dictate the presence of a relativizer, and they became capable of handling RCs with or without “that” appropriately. Al-Maani’s findings strongly support FT/FA: the learners transferred the definiteness-based system at first (Full Transfer), but with increased input and proficiency, they fully accessed UG, ultimately acquiring the English-specific representation of relative clause structure (Full Access). She notes that their success required essentially a feature reassembly—dropping the [±def] trigger for the C position and adopting the [±wh] feature that drives English RC formation. This aligns with Lardiere’s (2009) Feature Reassembly Hypothesis, which argues that one of the hardest tasks in L2 acquisition is reconfiguring how features from L1 are mapped onto new lexical items or functional categories in L2. Here, Arabic learners had to untangle the definiteness feature from the complementizer and instead attach a wh-feature, an adjustment that, while challenging, was achieved by many learners at advanced stages.

Overall, the body of generative studies indicates that L1 Arabic speakers are indeed capable of acquiring the critical features of English RRCs, including those absent in their L1, provided they reach a sufficiently advanced level and receive appropriate input. The initial state is clearly influenced by L1 (e.g., treating English “that” like Arabic illī, overusing resumptives), but the end state for many successful learners is a grammar that conforms to English norms (Schwartz & Sprouse, 1996). This lends support to theories like Full Transfer/Full Access, which in this context means the entire Arabic relativization system is the starting point, but with time learners gain full access to UG principles and adjust to English. Empirical evidence (Aldwayan, 2008; Aldousari, 2015; Al-Maani, 2020) of near-native judgments and processing in advanced L2ers underscores that UG-consistent acquisition happens: features can be dropped or added to the interlanguage grammar. Notably, the reconfiguration often involves what has been termed feature assembly or feature reassembly. Arabic learners do not necessarily need to acquire a brand-new feature (they have the concept of a complementizer and even the concept of a wh-operator for questions), but they must reassemble existing features in new ways. For instance, they must learn that the English complementizer in RCs carries a [wh] feature that triggers movement, rather than an [def] feature requiring agreement with the head noun's definiteness. This reassembly is cognitively demanding and may proceed more slowly than acquisition of entirely new vocabulary, accounting for why even advanced learners might make occasional mistakes until fully internalizing the new feature configuration.

In conclusion, the generative framework studies reviewed provide a optimistic view: despite clear initial transfer effects, Arabic L1 learners can achieve a high degree of competence with English relative clauses. They eventually drop ungrammatical L1-influenced strategies (no more resumptive pronouns in English RCs, appropriate use or omission of relativizers, correct use of "who/which/whom/whose") and handle complex dependencies similarly to native speakers. This sets a hopeful stage for pedagogical interventions, because it implies that learners are capable of learning these distinctions; the task is to facilitate that learning more efficiently.

3.6. Implications for this study

The consistent findings from both error analyses and UG-oriented studies have important implications for teaching and research on L2 acquisition of relative clauses. Firstly, numerous studies in generative SLA (GenSLA) have shown that with sufficient and appropriate input, L2 learners can acquire new functional categories and features that their L1 lacks (Al-Momani ,2010). In the context of English RCs, this means Arabic speakers can learn to use an English-like CP with [+wh] and drop their reliance on [+def]. This provides a theoretical justification for instructional approaches that target those specific problematic features. Therefore, explicit instruction focusing on the role of definiteness in English vs. Arabic could help learners overcome errors in English RRCs. By understanding that definiteness is crucial in Arabic RC formation but not in English, learners might more readily adjust to the English pattern.

Moreover, many researchers have called for pedagogical interventions to address the difficulties identified. The error patterns (pronoun omission, resumptives, etc.) are stubborn if left to passive exposure, because certain forms (like whom or zero-relatives) are infrequent in input or because learners' default processing continues to follow L1 habits. Thus, instructional techniques that explicitly draw learners' attention to these forms or practice them in meaningful ways are warranted. One such approach is Processing Instruction (PI), which is designed to alter how learners process input, often by pushing them to notice and interpret grammatical cues they might otherwise ignore. Given the strong influence of L1 processing strategies on Arabic speakers (e.g., they might not notice a missing relativizer as a meaningful cue in English, or they might not expect its absence to carry meaning), processing-focused training could recalibrate their strategies.

The present study is motivated by these considerations. It seeks to investigate whether a specific form of instruction—Processing Instruction on English relative pronouns—can significantly improve Arabic speakers' comprehension and production of English RRCs. In this work, we concentrate on four relativizers: "*who," "whom," "which," and "whose."* These were chosen because they represent core areas of divergence and difficulty (as reviewed: whom and whose especially, plus the general who/which distinction for animacy). By zeroing in on these forms, we aim to provide a clear and focused instructional treatment without the added variability of optional relativizers like "*that*" or context-specific ones like "*when*/*where*." It is acknowledged that English RC usage does involve some optionality and variation—for instance, sometimes either who or that can be used, or a pronoun can be dropped (in object position). Such optionality (e.g., t*he man who I saw vs. the man that I saw* vs. *the man I saw*) can indeed pose an extra layer of complexity for learners. However, in this study we delimit the scope to avoid confusion: we emphasize the straightforward use of the four chosen wh-pronouns in contexts where they are clearly required (or most appropriate) and do not delve into less common variants like pied-piping (e.g., "*to whom*" constructions) or the usage of "that" vs. zero. This decision is made to ensure that participants can focus on fundamentally mastering the English system of relativization without the distraction of learning stylistic variants. Future research could certainly expand to those broader considerations, but the immediate goal is to establish a firm understanding of the canonical forms (who, whom, which, whose) and their correct usage.

By concentrating on these targeted forms, the study aims to test whether processing instruction (a type of input-oriented, form-focused instruction) can help Arabic L1 learners realign their processing strategies with the requirements of English RCs. For example, PI activities might train learners to correctly interpret sentences with and without overt relativizers, to make form-meaning connections such as recognizing that *whom* signals an object (and thus there should be no doubling "*him*"), or *whose* indicates a possessive relationship and is not interchangeable with other pronouns. The expectation, based on the literature, is that such training could accelerate the restructuring of the interlanguage, effectively guiding learners away from L1-based misinterpretations toward more native-like processing. In line with FT/FA, the learners have the capacity for this change; the instructional treatment is designed to give the needed push by offering plentiful input cues and feedback in a structured manner.

In designing the instructional treatment and the outcome measures, the insights from the contrastive analysis in Section 3.7 will be crucial. The contrastive differences identified (e.g., Arabic *illī* vs. English *wh-/that/Ø*, obligatory resumptives in Arabic vs. forbidden in English except as traces) inform us exactly where learners are likely to struggle. Our instructional materials explicitly highlight these differences (for instance, exercises that demonstrate how "*the boy that he is running*" is incorrect in English, contrasting it with Arabic structure).

In sum, the implications drawn from the literature review can be summarized as follows:

- Focus on Feature Differences: The key challenge for Arabic speakers is reassembling features (definiteness vs. wh) and dropping resumptive pronouns. Instruction should directly target these features—teaching the function of English relativizers.

- Leverage Full Access: Since learners can acquire new features, we should not shy away from teaching what might seem advanced (like whom or whose). Even if these are hard, learners are capable of learning them with the right input, as evidenced by advanced L2 speakers.

- Processing-Based Techniques: Given that some errors stem from processing habits (e.g., always expecting a pronoun), an approach like Processing Instruction, which alters input processing, is promising. By training learners to notice the absence or presence of relativizers and interpret them correctly, we address the issue at the level of comprehension, which may then transfer to production (VanPatten, 2004).

- Measure Both Comprehension and Production: To fully gauge the impact of instruction, our study will assess learners' ability to both understand and produce English RCs appropriately after the intervention. This dual approach acknowledges that learners might internalize form (comprehension) before they can consistently deploy it in speech or writing, and we aim to capture both aspects.

By heeding these implications, the present study situates itself at the intersection of theory and pedagogy. The next section will outline the contrastive analysis of English and Arabic RC structures, summarizing the differences and difficulties, which will form the basis for our instructional materials and hypotheses.

3.7. Contrastive Analysis

A systematic contrastive analysis (CA) of English and Arabic relative clauses helps in predicting specific areas of difficulty for Arabic speakers and provides a rationale for targeted instruction. Contrastive Analysis involves comparing the two languages' structures to identify both similarities and differences. Historically, the Contrastive Analysis Hypothesis (CAH) (Lado, 1957) held that when L1 and L2 structures are similar, learning will be easy, and when they are different, learning will be difficult, with L1 interference causing errors. While CAH in its strong form was later critiqued (as it could not account for all errors or successes), it remains true that many of the persistent issues in RC acquisition by Arabic learners can be traced to concrete differences between Arabic and English.

Similarities: On a general level, English and Arabic both have restrictive and non-restrictive relative clauses that serve to modify nouns. Both languages place the relative clause after the head noun (in Arabic, this is true for the standard word order: *al-walad illī…* just like "*the boy who…*"). Both languages are capable of relativizing subjects, objects, etc., and in both languages the RC conceptually contains some sort of "gap" or missing element that co-refers to the head noun (even if Arabic fills that gap with a pronoun). These broad commonalities mean that Arabic learners do not have to acquire the notion of a subordinate clause modifying a noun—it exists in their L1.

Differences: Despite these functional similarities, the structural implementation diverges significantly. Key differences include:

• Relativizer Inventory: English has a variety of relative pronouns/complementizers (who, which, that, Ø, whom, whose, etc.), whereas colloquial Arabic primarily uses one general relativizer (illī) for all contexts (aside from MSA's more complex system, which many dialect speakers may not fully utilize). Thus, Arabic speakers learning English must learn to differentiate who vs. which vs. that vs. Ø, etc., and use them appropriately based on animacy and formality. The existence of multiple forms in English for what Arabic expresses with a single word is a classic scenario of one-to-many mapping, which can confuse learners. It is predicted that learners will have difficulty with choosing the correct relativizer. For example, they might overuse "that" or misuse "which" for people or "who" for things, until they sort out the distinctions.

• Relativizer–Antecedent Agreement: In English, relative pronouns do not agree in gender or definiteness with the head (only in animacy and case to some extent, e.g., who vs which). In Arabic, *illī* itself does not change form in colloquial, but in MSA the relative pronoun does agree in number/gender with the antecedent. More importantly, Arabic imposes definiteness agreement between the head noun and the use of *illī*: a definite head requires *illī*, an indefinite head forbids it. English has no such rule; a relative clause can modify definites or indefinites freely and always requires some relativizer except in allowable zero cases. This difference means Arabic learners might initially be uncertain about using relativizers after "a ___" (since in Arabic they wouldn't use *illī* for an indefinite). They might erroneously say "*I saw a man he was walking*" (omitting that or who) because "*a man*" in their L1 would be followed by a clause without *illī*. Predicted difficulty: Using an overt relativizer after indefinite heads, and conversely, accepting/producing zero-relatives after definite heads. Essentially, the L1 definiteness constraint could interfere with the free distribution of relativizers in English.

• Use of Resumptive Pronouns vs. Gaps: As discussed, English RCs use gaps (no resumptive pronouns), whereas Arabic RCs use resumptive pronouns in all positions except possibly subject. This is arguably the most crucial difference. Arabic learners strongly tend to insert pronouns in English RCs because that's how their syntactic framework is set up for handling the "missing" element. Predicted difficulty: Learners will produce sentences like

"*The book that I gave it to my friend…*" or "*The man who I met him yesterday…*" and will have trouble judging them as incorrect. They may also have difficulty comprehending English RCs where a pronoun is missing, initially feeling that something is ungrammatical or hard to parse (since in Arabic a similar structure would sound incomplete without the pronoun). This gap vs. pronoun strategy difference is expected to be a primary source of errors and learning difficulty.

• Morphosyntactic feature differences: Arabic and English differ in the features associated with the relative complementizer: Arabic *illī* encodes definiteness agreement (and does not trigger movement), while English complementizers/relatives encode a [±wh] feature that triggers movement to Spec-CP. The consequence is that Arabic RCs do not undergo wh-movement (they are essentially base-generated with an operator and resumptive pronoun), whereas English RCs do involve wh-movement. This can be seen in island-sensitivity (English RCs obey islands; Arabic with resumptives often does not) and overall word order. For instance, English allows constructions like "*The girl to whom I spoke*" (with inversion for a formal register), whereas Arabic would keep *illī* and the pronoun in situ (*al-bint illī kallmt-ha, "the girl that I spoke to her*"). Predicted difficulty: Such nuanced differences may manifest in advanced stages – for example, learners might struggle with more complex RC forms like preposition pied-piping or might not initially respect certain island constraints in English until they fully acquire the movement concept. However, these are advanced considerations; our immediate concern is that learners need to adopt the gap strategy. Essentially, Arabic learners must learn to stop using an overt pronoun and instead allow a gap with an understood link to the head noun. This is a reconfiguration of deep syntax and may require significant practice and exposure to sink in.

In light of these differences, we can predict specific error types and difficulties, Summarizing predictions:

- Relative pronoun selection errors: Using the wrong relativizer (confusing who/which, or avoiding whom/whose). This stems from L1 having one general relativizer vs. English having multiple. We expect persistent misuse until explicitly taught.

- Omission of relativizer (especially after indefinite heads): Arabic speakers may drop "who/that" in English clauses because their L1 wouldn't use *illī* in analogous positions.

- Insertion of resumptive pronouns: This can happen in any non-subject RC (e.g., "*the person who I saw him*"). We expect this error to be very common in spontaneous production and even in comprehension tasks (they might incorrectly judge "*The person who I saw is here*" as incomplete and add a "him" in interpretation).

- Misuse of "whose": Since Arabic uses structures like "*the girl that her father died*," learners might attempt similar constructions ("*the girl that her father died*") instead of using whose. This is a specific instance of resumptive (a possessive resumptive) combined with not knowing whose. Teaching whose explicitly is needed, otherwise learners might say *the girl that her father…* which is ungrammatical in English.

- Overuse of "that": Because that has no gender/animacy restriction and is often optional, learners may rely on it heavily (which is not a grave error in restrictive clauses, but they might overuse it even in formal writing or in non-restrictive contexts where it's not appropriate).

- Difficulty with zero-relative clauses: Learners might avoid them or not comprehend them well, given Arabic doesn't allow an equivalent structure with definites. So they might unnecessarily insert "that" everywhere or misunderstand sentences where it is omitted.

Through contrastive analysis, we also understand why these errors occur, which is crucial for addressing them. Fundamentally, Arabic learners need to drop the [definiteness] criterion and adopt the [wh] criterion in their mental grammar of RCs, and they need to drop overt pronouns in favor of silent gaps. This is not just a surface error but a deeper grammatical shift. Therefore, instruction and practice must reinforce this shift. For example, exercises might contrast an ungrammatical Arabic-influenced construction with the correct English, to help learners notice the difference.

In designing our study's methodology (detailed in the next chapter), we use these contrastive insights to create tasks. We might include, for instance, a sentence combination exercise where learners have to combine two clauses ("*I saw a man. He was singing*") into a single sentence. An Arabic-influenced attempt would be "*I saw a man he was singing*," whereas the correct English is "*I saw a man who was singing*." By explicitly practicing such combinations and getting feedback, learners can gradually suppress the inclination to keep "*he*" and instead use "*who*."

In conclusion, the contrastive comparison of English and Arabic RCs predicts that relative pronoun usage and resumptive pronoun strategies will be the core difficulties for L1 Arabic learners, which indeed aligns with empirical findings. The chapter has reviewed both the descriptive grammars of RCs in the two languages and the research on how learners cope with these differences. The evidence points toward the possibility of overcoming these challenges through informed teaching. The concluding synthesis is that while Arabic-speaking learners often start with an L1-based approach to English RCs (leading to specific errors), they are capable of acquiring the English system in full. Targeted instruction that highlights the differences—for example, emphasizing that Arabic "illi" equates to several English words and that English does not allow the pronoun doubling that Arabic does—should facilitate this transition.

3.8. Summary and Conclusion

Before turning to the methodology, it is useful to synthesize the key theoretical and empirical insights discussed in this chapter. Since the influential meta-analysis by Norris and Ortega (2000), researchers have widely recognized that explicit, form-focused second language (L2) instruction can yield substantial gains in target-language development. In their comprehensive study, Norris and Ortega showed that instructional treatments directing learners' attention to linguistic form or form-meaning connections are far more effective than mere exposure without any focus on form. In other words, L2 learners perform better when instruction is focused (either on grammatical forms or meaningful use of forms) as opposed to unfocused immersion. Subsequent literature has consistently associated explicit instruction with greater L2 gains than purely implicit exposure. At the same time, researchers urge caution in generalizing these benefits to long-term proficiency. For example, Truscott (2004) questioned Norris and Ortega's (2000) conclusions, suggesting the original meta-analytic results may have been overstated. Additionally, some empirical studies have found little difference between the outcomes of explicit and implicit instruction (e.g., Soleimani, Jahangir, & Gohar, 2015; Marzieh, 2015), indicating that the advantages of explicit teaching might not always be as pronounced as early research suggested.

Another important consideration is how the effectiveness of instruction is measured, particularly with respect to learners' metalinguistic knowledge. Norris and Ortega (2001) observed that the apparent impact of instruction can vary by assessment type: effects tend to be smaller on tasks requiring metalinguistic judgment (e.g. grammaticality judgments) than on more controlled response formats, although even metalinguistic tasks still show a greater instructional benefit than entirely free-production tasks. Furthermore, research by Alderson, Clapham, and Steel (1997) suggests there is only a weak correlation between learners' explicit metalinguistic knowledge and their actual L2 proficiency or developmental stage. In practical terms, an elementary learner might know some rules about the target language's grammar yet still struggle to apply them in spontaneous conversation. Within the Modular Cognitive Framework (MCF), such metalinguistic knowledge is considered conceptual, declarative knowledge – an understanding of how the language works that is relatively inert during real-time communication. This kind of knowledge requires conscious retrieval and considerable processing time, making it of limited use for fluent production or comprehension in the moment.

Overall, the research reviewed in this chapter suggests that formal grammar instruction yields several potential benefits and limitations. It can enhance learners' accuracy in controlled, test-like tasks, and it may help them progress more rapidly along natural developmental pathways of language acquisition. Explicit instruction also tends to enrich learners' conscious understanding of grammatical rules, although the practical utility of this metalinguistic insight for spontaneous communication is debatable. Notably, traditional instruction alone does not guarantee improved impromptu speaking or writing ability. However, when pedagogical intervention does have a positive effect on learners' performance, evidence indicates that these gains are often durable rather than fleeting. In sum, while grammar instruction can boost certain aspects of L2 development (especially in accuracy and rate of learning), its influence on free production is less direct, and the long-term retention of benefits requires careful consideration of how instruction is delivered.

Given these insights, a Focus on Form approach emerges as a crucial component of effective L2 teaching. By deliberately drawing learners' attention to specific grammatical features within meaningful input, Focus on Form aims to facilitate acquisition in ways that neither isolated explicit explanation nor unguided immersion can achieve. This approach acknowledges that learners benefit from noticing target forms in the input and making form-meaning connections during practice. At the same time, debate persists regarding the optimal quality and quantity of input needed for effective learning of particular structures (Carroll, 2001; Sharwood Smith & Truscott, 2005). In light of the challenges identified for Arabic learners of English relative clauses, the present study assumes that some degree of explicit, form-focused instruction is necessary to overcome these challenges. The question then becomes what type of instruction is most beneficial for helping L1 Arabic learners acquire English restrictive relative clauses (RRCs).

In this context, the study evaluates the efficacy of Processing Instruction (PI) as compared to more Traditional Instruction (TI) for teaching English RRCs. Processing Instruction, as developed by VanPatten, is an approach that combines explicit information about a grammatical rule with structured input activities that push learners to process the target form. Prior research (reviewed in Chapter 2) has confirmed that PI is a successful technique for teaching grammar across several languages and structures (see Section 2.2). In fact, empirical findings suggest PI often leads to better acquisition outcomes than traditional form-focused exercises or output-based practice. For example, early studies reported that PI was more effective than TI for various aspects of the language system (VanPatten, 2002, p. 775). Crucially, VanPatten and Oikkenon (1996) argued that PI's advantage stems not from its explicit explanation component, but from the nature of its Structured Input (SI) activities. These SI activities require learners to interpret meaning from form in the input, thereby training processing strategies. However, up to now, the standard implementation of PI has combined two types of SI activities – referential and affective – without examining their individual contributions. As discussed earlier (Section 2.2.1.2), referential activities and affective activities in PI have distinct characteristics and potential benefits, yet previous studies have typically treated them as a single package. Marsden (2006), for instance, hypothesized that referential activities (which have objectively correct answers based on interpreting the target form) may be more effective for reinforcing grammatical features, whereas affective activities (which ask learners to express personal opinions or preferences using the target form) might better support vocabulary learning or engagement. To date, there has been little empirical investigation isolating the effects of each activity type. The present study addresses this gap by defining and testing the functions of these two forms of SI activity separately (and in combination) in a new context – Saudi Arabic learners of English. By doing so, the study aims to determine whether one type of activity offers particular advantages for acquiring English RRCs, thereby deepening our understanding of why PI works and how it can be optimized.

In addition to its pedagogical approach, this study is grounded in recent insights from generative second language acquisition (GenSLA) research. GenSLA perspectives posit that one fundamental source of L2 learning difficulty is the mismatch in how grammatical features are organized or mapped between the learner's first language and the target language. Learners often cannot rely on positive input alone to detect these subtle mismatches, because the input does not explicitly tell them which L1 features are absent or reconfigured in the L2. Instead, successful acquisition requires an internal restructuring: the learner must de-assemble certain feature groupings from the L1 and reassemble new configurations for the L2 (Lardiere, 2008, 2009). In the case of English restrictive relative clauses for L1 Arabic speakers, the feature of definiteness offers a clear example of such a reassembly problem. As detailed in this chapter, colloquial Arabic exhibits a morphosyntactic dependency between definiteness and relativization: when a head noun is definite, a dedicated relativizer (such as illi) must introduce the relative clause (often accompanied by a resumptive pronoun), whereas indefinite head nouns are typically followed by a relative clause with no overt relativizer. In effect, Arabic uses an overt complementizer for definite relatives, but a null complementizer (∅) for indefinite relatives, as posited by Doron and Reintges (2005). English, by contrast, does not tie the presence of a relative pronoun/complementizer to the definiteness of the antecedent: an English relative clause generally includes an explicit relativizer (who, which, that, etc.) or occasionally allows it to be omitted in object position, regardless of whether the head noun is definite ("the singer") or indefinite ("a singer"). This cross-linguistic discrepancy means that Arabic-speaking learners must reconfigure their understanding of how definiteness interacts with relative clause formation. They cannot simply learn English relativization from input without addressing this underlying difference, because their L1 has taught them a different rule (i.e. "if indefinite, no relativizer"). Thus, a key pedagogical implication is that instruction should explicitly highlight the feature differences—in this case, definiteness and its role in relativization—so that learners become aware of what needs to change in their internal grammar. Traditional instructional materials for English relative clauses seldom account for such L1–L2 feature mapping differences, underscoring the need for a feature-focused approach informed by GenSLA research.

By integrating the Input Processing/PI framework with GenSLA research, the current study seeks to bridge the gap between cognitive processing instruction and linguistic theory in L2 teaching. In practical terms, this means the instructional treatment in our experiment is designed not only based on PI principles (to improve how learners process English relative clauses in real time), but also informed by an analysis of the specific feature differences between Arabic and English (to ensure the target of instruction addresses the true source of difficulty). This dual approach follows calls by scholars such as Whong (2007), who argued for closer alignment between generative SLA insights and classroom pedagogy. In line with Whong's (2007) effort to reconcile these domains, our study uses the feature reassembly concept to shape instructional materials that directly tackle the linguistic complexity facing learners (for instance, drawing attention to the definiteness distinction in relative clauses). Moreover, we have adopted the MCF as an overarching model of language development to interpret our findings. The MCF allows us to account for both formal linguistic representations and functional processing mechanisms within a modular cognitive system, acknowledging that L2 development involves multiple types of knowledge stored in different modules of the mind. For example, when considering our learners' progress with English RRCs, we can use MCF to describe changes in an underlying grammatical feature (the formal property of overt vs. null complementizer) as well as changes in processing routines (the ease of noticing and using English relativizers in real time) in separate but interacting components of the learner's competence. Using this model, we described how an L1 Arabic learner initially has a low "activation level" for the feature [+overt complementizer] in indefinite relative clauses, since Arabic does not require one. Upon repeated exposure to English input where even indefinite heads are followed by a relativizer (e.g. "a book that I read"), the learner's activation of the [+complementizer] feature gradually increases, eventually reaching a stable high level such that supplying an overt relativizer becomes the default. This evolution—from treating the feature as [-] to consistently treating it as [+]—marks the acquisition of the new feature mapping. In sum, by considering both the formal feature realignment and the processing dimension, the MCF-based interpretation provides a comprehensive view of how our instructional intervention can lead to development in the learners' interlanguage system.

In conclusion, this chapter has reviewed the theoretical foundations and empirical findings relevant to the acquisition of English restrictive relative clauses by L1 Arabic learners, and has outlined the pedagogical rationale for the current study. Key points from the literature include the general effectiveness of explicit, form-focused instruction (and caveats regarding its scope), the principles of Processing Instruction and the critical role of structured input practice, and the importance of addressing specific L1–L2 grammatical differences such as definiteness. These insights collectively inform the design of the present research. By targeting a known problematic feature (the definiteness constraint in Arabic vs. English relativization) and by innovating within the PI framework (isolating referential versus affective input activities), the study is positioned at the intersection of instructed SLA practice and theory. In the chapters that follow, the methodology and experimental design will be detailed, showing how the concepts discussed here translate into concrete instructional treatments and tests. Through this integration of pedagogical technique and generative SLA insights, the current work aims to advance our understanding of how L2 learners can successfully acquire complex structures like English relative clauses, and to contribute to more effective, theory-informed teaching practices for learners with backgrounds in typologically different languages.

The next chapter will build on this foundation to formulate the research design for testing the effectiveness of processing instruction on mastering English relative clauses. By addressing the contrastive differences identified and leveraging the generative insights that learners have full UG access, the instructional approach will attempt to accelerate learners' journey toward native-like proficiency in using English restrictive relative clauses.

Chapter Four: Research Design and Methodology

4.1. Introduction

This chapter describes the research methodology for the study, which employed a controlled experimental design to examine the role of Processing Instruction (PI) in teaching a specific grammatical form—English restrictive relative clauses (RRCs)—to L2 learners. The study builds on prior empirical work in the PI domain and revisits the question of PI's effectiveness, especially given earlier mixed results and claims that PI may have no impact on how L2 learners process input. The effectiveness of PI remains debated in the literature, resulting in findings that are not easily generalizable and leaving researchers and language instructors uncertain about PI's value. One aim of the current research is therefore to help generalize PI's effectiveness to learners from different first-language backgrounds (e.g., Arabic L1 learners). A second aim is to investigate potential differences in learner outcomes when two types of structured input activities—referential activities and affective activities—are delivered separately versus together. In other words, the study seeks to determine whether L2 learner performance varies when referential and affective input practice are provided independently, as opposed to in combination, during instruction.

4.2. Research Questions

The study addresses the following research questions:

RQ1: Are there differences among the three groups of learners – those receiving Processing Instruction (PI), those receiving Traditional Instruction (TI), and a control group – in their improvement on (a) comprehension and (b) production of the target grammatical feature?

RQ2: Which type of structured input activity (referential vs. affective) leads to the greatest improvement in learners' interpretation and production of English RRC forms at the sentence level?

RQ3: Which type of instruction (PI or traditional) is more effective in developing the interlanguage grammar of the target feature and in decreasing L1 cross-linguistic influence as L2-specific representations increased in resting activation under UG-constrained processing?

4.2.1. Research hypothesis

Based on findings from previous research, the study tested three hypotheses corresponding to the questions above:

- H1: Consistent with prior studies, it was hypothesized that only the PI group would show improvement on both the interpretation and production tasks, demonstrating gains in understanding the target form. In contrast, the TI group was expected to improve only on production of the target feature.
- H2: It was hypothesized that if PI proponents are correct, the group receiving both referential and affective structured input tasks would outperform all other groups on all outcome measures. Furthermore, due to the task-essential nature of referential activities, the PI subgroup that received only referential structured input was expected to achieve greater learning gains than the subgroup receiving only affective structured input.
- H3: Learners who received PI were hypothesized to improve their ability to interpret and produce the English relative clause complementizer in all tested conditions. This prediction was based on the idea that PI helps learners adopt appropriate processing strategies for the target structure, which in turn should positively affect their production of sentences containing the target form by mitigating L1 influence.

4.3. Research Paradigm

This section explains the underlying research paradigm, the intervention procedures, and the methods of data collection and analysis used in the study. As Wellington (2015, p.33, as cited in Alraddadi, 2019) defines, methodology is “the activity or business of choosing, reflecting upon, evaluating and justifying the methods you use." The researcher's ontological and epistemological stance for this project is grounded in a positivist paradigm, justifying the choice of a quantitative, experimental approach for examining the research questions. The following subsections outline the philosophical assumptions of this paradigm, the quantitative study design, and the specific research methods and outcome measures, including the study design and sample selection. The theoretical frameworks informing the study and the methodological choices are also discussed.

4.3.1. Positivist paradigm (Quantitative method) in classroom research

4.3.1.1. Philosophy, Definition, and Purposes of Quantitative Research

In the present research, a positivist paradigm was adopted as the most appropriate approach for an experimental, quantitative study. According to Rehman and Alharthi (2016, p.53), the positivist paradigm "assumes that reality exists independently of humans. It is not mediated by our senses, and it is governed by immutable laws." This paradigm embraces a realist ontology and seeks to discover objective truth. In practice, this meant formulating and testing hypotheses through empirical data, an approach not generally applicable in qualitative research. The quantitative, hypothesis-testing orientation was intended to minimize subjective influence by the researcher, emphasizing instead the certainty and measurability afforded by mathematical and statistical analysis (Guba & Lincoln, 1989; Hatch, 2002). Numerous L2 experimental studies have utilized a quantitative approach to probe cause–effect relationships (for a review of such studies, see Norris & Ortega, 2000). In the current study, a quantitative methodology was deemed necessary to address the research questions, employing a pretest–posttest design with numerical data analysis. Statistical analysis was used to quantify relationships between variables, for example by comparing group means, frequencies of correct responses, and correlations between measures (Jablin & Putnam, 2000). By using quantitative data collection instruments, the study aimed for a high level of objectivity and to reduce interpretive bias (Mertler, 2019). This approach helped the researcher avoid potential biases that might otherwise influence the findings. One acknowledged challenge of using a pretest–posttest design is the potential threat to internal validity, since taking a pretest can itself influence participants' performance on later tests. In this study, that threat was addressed by using alternate versions of the tests for the post-tests, so that no participant saw the exact same test items twice (thus mitigating any practice effect from the pretest).

4.4. Intervention Research

4.4.1. Classroom-Based Experimental Research

The experiment was conducted in a real classroom context rather than a laboratory. Laboratory-based experiments allow tight control over variables (e.g. random assignment of participants to conditions) but often sacrifice ecological validity (Mackey & Gass, 2005). By contrast, classroom-based experimental research must contend with numerous factors inherent to an authentic learning environment (e.g. exposure to various input types) that can influence participants' responses to a treatment (Cohen et al., 2011). Nonetheless, Hulstijn and De Graaf (1994) argue that for intervention research to genuinely inform and improve educational practice, the instructional treatment should be implemented in actual classroom settings. Therefore, the present study was carried out in learners' regular classrooms to maintain ecological validity.

Using an experimental design is widely regarded as one of the most effective ways to answer questions about language learning and teaching. Brown and Rodgers (2002, p.195) note that experimental designs are especially suited for establishing cause–effect relationships and for evaluating educational innovations. In line with this purpose, the experimental design here aimed to determine whether a specific instructional treatment (PI vs. TI) had an effect on learners' acquisition of the target structure. An experimental design examines whether changes in an independent variable (type of instruction) produce effects in dependent variables (learner performance measures). The specific design employed was a pre-test, post-test, delayed post-test format, which allowed the researcher to determine if any improvement in learner performance occurred after the instructional treatments and whether such gains were sustained over time. Consistent with standard practice in experimental SLA research, the outcomes were measured as numerical data, and statistical analyses were used to evaluate the nature and magnitude of the relationship between the instructional treatments and the learners' performance (Cohen et al., 2011). In the next section, challenges of conducting experiments in classroom settings are considered, particularly with respect to validity threats and how they were mitigated in this study.

4.4.2. Validity and reliability of the study

In second language acquisition (SLA) research, it is crucial to tightly control and manipulate extraneous variables that could affect the results (Hulstijn, 1997; Mackey & Gass, 2005). Careful control of such interfering variables is necessary to ensure the internal validity of the research and the reliability of the results (Mackey & Gass, 2005). This section details the steps taken to establish the validity and reliability of the study's measurement instruments (the outcome tasks) and the experimental procedure.

To gather evidence for the validity of the measurement instruments, a pilot study was conducted (details in Section 4.8). In the pilot, two groups of participants (who did not take part in the main experiment) completed the assessment tasks. The first group consisted of learners with no prior instruction in English relative clauses (recruited from a mathematics department), and the second group comprised learners who had prior exposure to English relative clauses (recruited from an English department). The logic was that if the tests are valid measures of knowledge of relative clauses, the experienced group should outperform the inexperienced group. A statistically significant difference between these two groups on each test would thus indicate the test is measuring what it intends to (knowledge of the target structure). Indeed, as reported below, the two groups' performances differed significantly on all assessment measures, supporting the construct validity of the tasks.

4.4.2.1. Validity of the Achievement Assessments

Validity is the degree to which an instrument measures what it is intended to measure (Blumberg et al., 2008). Validity in experimental research has two key dimensions: internal validity and external validity. Internal validity concerns whether the study in fact examines what it claims to be examining (i.e. whether the changes in the dependent variable can truly be attributed to the independent variable). External validity pertains to the degree to which the results of a study can be generalized to other populations or settings (Winter, 2000). Both types of validity were considered in designing the current experiment.

4.4.2.2. Content Validity

To ensure content validity of the tests (i.e. that the content of each test adequately represents the target construct), the researcher sought feedback on the instruments from academic English speakers. These experts reviewed the testing instruments to verify that the test items were clear, appropriate, and in line with what the tasks aimed to measure. They were specifically asked to judge whether the content of each test truly assessed the targeted grammatical construct (English restrictive relative clauses) and whether the instructions and items would be understandable to the learners.

4.4.2.3. Validity Results from the Pilot Testing

The pilot study data were analyzed to provide empirical evidence of the tests' validity. Both groups' scores on each of the three assessment tasks were first checked for normality and homogeneity of variance (see Appendix 5 for normality tests and Appendix 6 for variance tests). These checks confirmed that the pilot data met the assumptions for parametric testing. Therefore, an independent samples t-test was performed to compare the two pilot groups' mean scores on each version of each assessment. The results (summarized in Table 2) showed that the group with prior instruction in relative clauses scored significantly higher than the group with no prior instruction on all versions of all tests (the grammaticality judgment test, the picture-cued test, and the translation test). These consistent significant differences constitute strong evidence for the validity of the three versions of each assessment task, since they behaved as expected for learners with differing knowledge levels.

Table 2. Independent Sample test: (Pilot Study)

		Significance	
TESTS	GROUPS	One-Sided *p*	two-Sided *p*
GJT_1	Group 1 vs Group 2	<.001	<.001
GJT_2		<.001	<.001
GJT_3		<.001	<.001
PIC_1		<.001	<.001
PIC_2		<.001	<.001
PIC_3		<.001	<.001
Trans_1		<.001	<.001
Trans_2		<.001	<.001
Trans_3		<.001	<.001

Comparison of pilot groups' performance on each test (Group 1: no prior RC instruction; Group 2: prior RC instruction). All p-values are one-tailed and two-tailed significance levels.

4.4.2.4. Reliability of the Achievement Assessments

To establish the reliability of the interpretation and production tests, the internal consistency of each test was measured using Cronbach's alpha (α). This statistic indicates the extent to which all items in a test measure the same construct, based on the inter-correlations of the items. A Cronbach's alpha value of 0.7 or higher is generally considered evidence that a test is reliably measuring a single construct (Field, 2005, p.668). Prior to the main study, the tests were piloted to calculate Cronbach's alpha for each test version. The reliability analysis confirmed that each test had an alpha value around 0.7 or above, indicating that the items within each test were consistently measuring knowledge of English restrictive relative clauses.

In preparation for the main study, several factors were taken into account to ensure validity and reliability and to minimize potential threats to the internal validity of the experiment. These considerations included controlling who delivered the instruction, ensuring participants' prior knowledge did not confound results, and counteracting test familiarity and attrition. Specifically:

- Instructor Consistency: The instructor delivering the treatments can be a confounding variable in classroom experiments, as differences in teaching style or adherence to the protocol can affect outcomes (Gorard, 2002; Marsden, 2007). To eliminate instructor variability, the researcher himself served as the sole instructor for all treatment groups in this study. This ensured that all groups received instruction in as similar a manner as possible according to the planned protocol.
- Prior Knowledge Screening: Participants' existing knowledge of the target grammatical feature was controlled for by administering a pre-test and applying an exclusion criterion. Any participant who scored 60% or higher on the pre-test of English RRCs was presumed to have substantial prior knowledge of the target structure and was excluded from the instructional intervention and data analysis. This cutoff (60%) follows precedents in PI research to ensure that only learners without strong prior mastery of the target form are included in the sample. It prevented learners with high pre-existing proficiency on RRCs from skewing the results. (See Appendix C for details of the pre-test.)
- Testing Effects and Attrition: Repeated testing can pose a threat to validity, as participants might improve simply from repeated exposure to test formats or items. In

this study, randomization of test versions was used to mitigate practice effects: different groups received different versions (A, B, or C) of each test at pre-test, immediate post-test, and delayed post-test. In this way, no group took the same exact test twice, reducing the likelihood that improved scores were due to memorization or familiarity. Participant attrition (drop-out) is another common challenge that can threaten validity. To reduce drop-outs, participants received a small incentive in the form of partial course credit for completing all phases of the study. This helped ensure that most participants remained in the study through the delayed post-test.

4.5. The Main Experiment: The Role of Input in the Acquisition of English Relative Clauses by L1 Saudi Arabic Speakers (Experimental Design)

With the above considerations in mind, the following sections detail the procedures of the main experiment. First, the context, participant sample, and ethical considerations are described. This is followed by an explanation of the research design, including specifics of the instructional materials and instruments used, and finally the statistical design of the study.

4.5.1. Context of the Main Study

This research examined the effects of PI on learners in their typical educational setting in Najran, Saudi Arabia (the learners' home country). Conducting the study in Saudi Arabia, where English was being learned as a foreign language in a natural classroom environment, was integral to the study's design. The participants were studying English in their usual environment and, for the most part, had never traveled to an English-speaking country. Najran University, where the study took place, traditionally employs a form-focused, explicit grammar teaching approach (the standard method being to explain grammar rules explicitly followed by output-based practice exercises). As noted in the literature review (see Section 2.2), Saudi learners of English have not been the focus of previous PI studies. Thus, this population provided an opportunity to extend PI research to an under-researched group of learners with a different L1 background (Arabic). The learners targeted in this study were at a beginner level of English proficiency, meaning they were at an early developmental stage appropriate for introducing the target form. The target grammatical forms for instruction and testing were English restrictive relative clauses. These forms, as well as the Arabic relativization system, were chosen deliberately because English RRCs are known to be challenging for Arabic-speaking learners of English. Past research and cross-linguistic analyses (see Section 3.4) have documented specific difficulties that Arabic L1 learners face in acquiring English relative clauses (for example, differences in relative pronoun use and word order between Arabic and English). By focusing on this known difficult area, the study aimed to observe whether PI could help overcome learners' L1-based processing strategies in favor of the L2 norms.

4.5.2. Participants

The sample for the main experiment was selected through purposeful sampling, targeting learners who met specific criteria relevant to the study (Dörnyei, 2007). All participants were first-year EFL learners at Najran University, enrolled in various departments (the Preparatory Year program, the Computer Science department, and the English Language/Translation department). A total of 97 Saudi male learners (L1 Arabic) took part in the study. They were randomly assigned to one of five experimental groups (plus one baseline native-speaker group, described below). The five learner groups were as follows: a Processing Instruction with both structured input activities group (PI+ referential *and* affective, abbreviated here as ERA), a Processing Instruction with referential activity only group (ER), a Processing Instruction with affective activity only group (EA), a Traditional Instruction group (TI), and a Control Group (CG). An additional group of 11 native English speakers (NES) was included as a baseline reference; however, the primary comparisons of interest were among the five non-native learner groups. Each of the five learner groups had between 15 and 18 participants (specifically: TI = 18, ERA = 18, EA = 18, ER = 17, CG = 15), in line with recommendations that comparative experimental studies include at least 15 learners per group to ensure sufficient statistical power (Dörnyei, 2007, p.99–100).

All participating learners took the Oxford Online Placement Test at the start of the study (see Appendix 8) to determine their English proficiency level and to ensure a relatively homogeneous proficiency across groups. Only beginner-level learners were selected for inclusion, corresponding approximately to A1/A2 levels in the Common European Framework of Reference (CEFR, Council of Europe, 2011). At the A1 ("Basic User") level, a learner can:

- Demonstrate the ability to comprehend and produce highly basic everyday expressions aimed at addressing immediate and concrete needs.
- Engage in simple exchanges involving self-introduction and the introduction of others, as well as formulate and respond to basic questions concerning personal information (e.g., place of residence, acquaintances, and possessions).
- Participate in basic communicative interactions, provided that interlocutors speak slowly and clearly and are willing to facilitate understanding.

At the A2 level, a learner can:

- Understand commonly used phrases and simple sentences related to everyday topics such as family, shopping, local places, and jobs.
- Take part in basic conversations that involve exchanging information on familiar and routine matters.
- Give short, simple descriptions of their personal background, surroundings, and immediate needs.

These descriptors (Council of Europe, 2011) indicate that A1/A2 learners have only basic English knowledge. This beginner level was chosen deliberately, following the common practice in PI studies of excluding more advanced learners. In line with VanPatten's typical procedures in PI research, any participants who demonstrated substantial prior knowledge of the target form were excluded. In practice, as noted above, learners who scored above 60% on the pre-test were not included in the main sample, on the rationale that such a score suggests the learner already had a basic grasp of English restrictive relative clauses. This ensured that the focus remained on learners for whom the target structure was truly new or not yet mastered, making it possible to observe clear effects of the instructional interventions on acquisition of the form.

4.5.3. Ethical Considerations

All procedures of this study were reviewed and approved by the Research Ethics Committee at the University of Southampton, and the research was carried out in accordance with the university's ethical policies and guidelines (including the Research Data Management Policy, Ethics Policy, Open Access Policy, Data Protection Policy, and Data Sharing Policy – see Appendix 2.a for documentation). Formal ethical approval was obtained prior to data collection, providing assurance that the study met standards of ethical research practice and protecting the credibility of the research (Saunders et al., 2009).

One ethical issue inherent in the experimental design was the use of different instructional treatments for different groups, including a no-instruction control group. As Marsden (2007) emphasizes, researchers must consider the ethics of providing an intervention to some participants while withholding it from others. In this study, the control group did not receive any instruction on the target form during the study period. To address the ethical implications of this, those control group students were offered compensatory instruction after the conclusion of the study – specifically, additional classes covering the target material were provided so they would not be disadvantaged in the long term by their group assignment.

Another ethical consideration was the potential disruption to learners' regular studies. Research activities can intrude on normal class time and study routines (Mackey & Gass, 2005). In this study, the intervention phase was scheduled during the last two weeks before the university's final examinations period. These two weeks (often referred to informally as "dead weeks") typically involve minimal new instruction as students prepare for exams, so using this period for the experimental instruction helped minimize interference with the standard curriculum. All participants were given an information sheet explaining the purpose and procedures of the study, and each participant signed a consent form acknowledging their voluntary participation (Appendix 2.b contains copies of these documents). Participants were informed of their rights, including the assurance that their data and identities would remain confidential. They were told that their individual information would not be used in any publications and that their names would be removed or anonymized on all data collection forms. These steps ensured that participants participated with informed consent and with privacy safeguards in place.

4.5.4. Research Design

The design of the current study was a quasi-experimental design with multiple instructional groups and a no-instruction control. The study employed a pre-test, immediate post-test, and delayed post-test to measure the effectiveness of four distinct instructional treatments for the target structure. The first experimental group received PI with both types of structured input activities (referential *and* affective) – this group is henceforth labeled ERA. The second group received PI with only referential structured input activities (group ER), and the third received PI with only affective structured input activities (group EA). The fourth group received Traditional Instruction focusing on the target structure (group TI). A fifth group received no instruction on the target forms and served as a Control Group (group CG). (Appendices 8–11 provide detailed examples of the instructional treatment materials for each group.) The inclusion of the ER and EA groups (which received only one type of structured input each) allows for analysis of the source of any benefits of PI: it enables the research to determine whether PI's effectiveness, if observed, stems primarily from the referential activities, the affective activities, or the combination of both. Table 3 summarizes the distribution of participants across the five learner groups and their respective instructional treatments in the main experiment.

Table 3. Distribution of Experimental Groups and Instructional Treatments

Group (Label)	Instructional Treatment
Group 1 (ERA)	Processing Instruction (PI) with both referential *and* affective structured input activities
Group 2 (ER)	Processing Instruction (PI) with **only referential** structured input activities
Group 3 (EA)	Processing Instruction (PI) with **only affective** structured input activities
Group 4 (TI)	Traditional Instruction (explicit rule explanation + output practice)
Group 5 (CG)	Control – No instruction on the target form during the intervention period

All participants took a pre-test approximately one week before the instructional intervention began. The instructional intervention itself was carried out over a period of ten days, with daily sessions of roughly three hours, for a total of about 36 hours of instruction (the detailed timetable of the intervention is provided in Appendix 3). An immediate post-test was administered one day after the conclusion of the instruction phase to measure the immediate impact of each type of instruction. A delayed post-test took place approximately seven to eight weeks after the post-test (in this study, roughly 7 weeks + 3 days later) to assess the retention of any learning gains over time (see Appendix 7 for the schedule of testing).

Conducting a delayed post-test several weeks after instruction is recommended by SLA researchers as a means of determining whether instructional effects are durable, rather than short-lived (Mackey & Gass, 2005; VanPatten & Sanz, 1995).

Table 4. Overview of Experimental Procedure

Phase	Description
Pre-test	Administered before the intervention to all participants.
Group Allocation	Participants randomly assigned to five groups: CG, TI, ERA, EA, ER (plus a native-speaker baseline group).
Intervention	10 days of instructional treatment (3 hours per day) according to group: PI treatments (ERA/ER/EA) or TI or (for CG) no target instruction.
Immediate Post-test	Administered the day following the final intervention session, to evaluate immediate instructional effects.
Delayed Post-test	Administered ~8 weeks after the intervention, to evaluate retention of learning gains over time.

The study design can thus be characterized as a quasi-experimental, between-groups design with one between-subjects factor (Instructional Group, with five levels: ERA, ER, EA, TI, CG) and one within-subjects factor of Time (pre-test, post-test, delayed post-test). By including multiple post-tests, the design distinguishes immediate learning outcomes from longer-term retention. Also, by having multiple PI sub-groups (ERA, ER, EA), the design allows for nuanced comparisons to pinpoint the contributions of different components of PI.

Importantly, to minimize test-practice effects as noted earlier, three equivalent versions of each test were created and distributed across testing times. As Marsden and Torgerson (2012) caution, using the same test repeatedly can influence results. Therefore, three different versions of each assessment (labeled A, B, C) were developed, so that no student saw the same items twice. The versions were carefully constructed to be parallel in format, length, and difficulty, differing only in the specific sentences or vocabulary used. This approach was intended to prevent improvements from simply reflecting memory of test items. The assignment of test versions to each group at each phase was randomized and counter-balanced, as described in Section 4.7.3.1 below.

4.6. The Intervention Procedures

The participants' regular course instructor did not participate in the intervention; notably, he was kept unaware of the specific target grammar feature to prevent any unintentional teaching of that feature in the regular class. All special instructional sessions were conducted by the researcher as the instructor.

4.6.1. Design of the Intervention Materials

Explicit Instruction (EI) in the Processing Instruction (PI) framework was delivered to learners in a concise manner and always came before any practice activities, which consisted of Structured Input (SI) tasks. In line with PI guidelines, only one grammatical concept was introduced at a time, in contrast to Traditional Instruction (TI) that often presents an entire paradigm of forms simultaneously. For example, when teaching English restrictive relative clauses (RRCs), PI does not provide a comprehensive table of all relative pronouns at once. Instead, learners are shown two contrasting cases (e.g. a subjective vs an objective relative pronoun) to highlight one point at a time. Unlike TI, which might introduce all relative pronouns together, PI emphasises using a pair of contrasting structures to help learners form accurate form–meaning connections from the outset.

The target feature (English RRCs) was explained to learners by explicitly linking grammatical form to meaning. The explicit grammatical explanation given to the PI groups was incremental: the TI group received a full explanation in one go, but the PI groups received the explanation in smaller parts, focusing on one aspect at a time. This approach ensured that learners had enough exposure to comprehensible, meaningful input for each piece of the target structure before moving on. For instance, an excerpt from the explicit explanation for English relative clauses is as follows:

- **Definition and function:** A relative clause is used to modify a noun or pronoun, and it is introduced by a relative pronoun such as *who*, *which*, *whom*, or *whose*. A relative clause functions as a dependent clause and therefore cannot stand alone as a complete sentence; it must be connected to an independent clause by a relative pronoun.
- **Structure of English relative clauses:** The appropriate relative pronoun in English depends on the grammatical role of the pronoun (subject, object, possessive) and whether it refers to people or things. For people, use *who* as the subject, *whom* as the object, and *whose* to indicate possession. For things, use *which* for both subject and object roles, and *whose* for possession. For example: "*The driver who ran the stop sign was careless*" (person, subject); "*The children whom we love are coming*" (person, object); "*I have a friend whose cat is annoying*" (person, possessive). Likewise, "*I bought a book which you have never read*" illustrates the use of *which* for a thing (object). (In formal English, *whose* can also be used with inanimate nouns to indicate possession.)
- **Continuation in PI vs TI:** At this point in the lesson, the TI group's explicit explanation would end, but the PI groups would continue to receive additional information. The PI groups were taught the grammar in smaller segments, one at a time, allowing them to focus on each form–meaning connection separately. Learners were reminded that an English relative pronoun generally follows the noun or pronoun it modifies and, like a main clause, a relative clause has its own subject and verb. They also learned that English relative clauses are usually located in the middle of the main clause. Crucially, unlike in some other languages, the presence of a

definite or indefinite article ("the" or "a/an") in the English main clause does not affect whether a relative pronoun or complementiser is used.

In addition to the basic definition and structure, the PI groups received an explicit reminder of processing strategies, highlighting how to correctly form and interpret different types of relative clauses. For example, learners were taught how to combine two simple sentences into one sentence containing a relative clause, with special attention to subject vs. object roles:

- **Subject relative clauses:** If the relative pronoun functions as the subject of the relative clause, use *who* (for people) or *which* (for things). To form a correct subject relative clause, replace the subject of the second sentence with the appropriate relative pronoun. *Example:* "*Ali is my cousin. He is reading a book*." becomes "*Ali, who is reading a book, is my cousin*." Likewise, "*The book is mine. It is on the table*." becomes "*The book which is on the table is mine*." Note that the relative pronoun cannot be omitted when it functions as the subject of the clause.
- **Object relative clauses:** If the relative pronoun functions as the object of the relative clause, use *whom* (for people) or *which* (for things). To form a correct object relative clause, replace the object pronoun in the second sentence with the appropriate relative pronoun. *Example:* "*The man is the main speaker. You met him*." becomes "*The man whom you met is the main speaker*." Similarly, "*This sandwich is tasty. You ate it*." becomes "*The sandwich which you ate is tasty*." In these sentences, *whom* replaces "him" (referring to "the man") and *which* replaces "it" ("the sandwich") as the object of the verb. Learners were cautioned that no resumptive pronoun (no duplicate object pronoun) should be used in the relative clause, and that the relative pronoun may be omitted in informal English when it functions as the object. (In the last example, "*The sandwich you ate is tasty*" would also be acceptable in everyday English.)

- **Relative clauses with a preposition:** Learners were also shown how to handle relative clauses that include a preposition. In English, when a relative pronoun functions as the object of a preposition, the preposition is normally placed at the end of the relative clause in everyday usage. For example: "*The man is my teacher. I spoke to him.*" becomes "*The man whom I spoke to is my teacher*." Here, *whom* is the object of the preposition "to," and the preposition is moved to the end of the clause. Learners were advised not to repeat the object pronoun (e.g. not to say "to him" again in the relative clause) – in other words, no resumptive pronoun is used. They also learned that the relative pronoun can be dropped in less formal usage "*The man I spoke to is my teacher*".

These strategy-focused explanations included a comparison with the learners' first language (Saudi Arabic) to prevent L1-based processing errors. For instance, while English allows both the presence or omission of a complementiser **"***that***"** regardless of whether the head noun is definite or indefinite (e.g. "*Ali read the book that her father bought*" vs "*Ali read a book her father bought,*" both of which are grammatical in English), Saudi Arabic uses the complementiser **"***illi***"** only with definite nouns. In Saudi Arabic, the relative particle must be used after a definite head noun and cannot be used with an indefinite head noun. Learners were explicitly warned that in English, unlike in Arabic, the use of a relative pronoun or complementiser does not depend on the definiteness of the antecedent. In other words, English relative clauses do not require an overt marker based on whether the noun is preceded by **"***the" or "a."* (A definite or indefinite article in the English main clause has no bearing on the form of the relative clause.) This cross-linguistic information was included to remind students of the problematic processing strategies (such as transferring L1 rules or relying on the usual location of elements) that could interfere with learning English relative clauses.

After the explicit instruction phase, the practice phase of the intervention began. In PI, this practice phase uses only structured input activities, whereas the TI approach uses output-based activities. The SI activities in PI were further categorised into *referential* and *affective* types (explained in detail in Section 4.6.1.1). Referential activities have a definitive correct or incorrect response and thus force learners to process the target form in order to understand the sentence's meaning. They are consequently regarded as more crucial for establishing form–meaning connections (Lee and VanPatten, 1995; VanPatten, 1996). Affective activities, by contrast, ask learners to express personal opinions or beliefs, and therefore do not have a single correct answer. Learners can respond based on their own information or feelings, so these affective tasks are more open-ended (Lee and VanPatten, 1995; VanPatten, 1996, 2004, 2007, 2009). In the SI portion of the PI treatments, learners were ***not*** required to produce the target structure at all. Concerning the role of output, VanPatten (1996, 2002, 2004, 2007, 2009) acknowledges its importance, as does Swain's (1985, 1995) *Output Hypothesis*, which proposes that producing language (speaking or writing) can aid second language acquisition under certain conditions (see also Swain, 2005:471). Nevertheless, as VanPatten points out, PI (which focuses on input processing) targets the initial stages of language learning, thereby limiting the role of output in helping learners modify their processing behaviours. In other words, at this early stage the emphasis is kept on comprehension and form–meaning mapping rather than on learner production.

Each PI intervention group (ERA, EA, and ER) received the instructional treatment via a series of pen-and-paper worksheet activities. All three sets of instructional materials for these groups shared three key components: **(i)** an explicit explanation of the target feature (English restrictive relative clauses), **(ii)** an explicit reminder about the default processing strategies that learners tend to use (and that might cause problems in interpreting English relative clauses), and **(iii)** structured input activities to practise form–meaning connections. In accordance with the standard PI treatment package (VanPatten, 2002; Wong, 2004a), the first two components were identical for all three PI groups. After the explicit instruction phase, however, the practice activities differed by group: the ERA group received both referential and affective SI activities, the EA group received only affective activities, and the ER group received only referential activities. (Refer to Appendices 8 and 9 for the full lists of SI activities used in each group.) By contrast, the TI group's materials consisted of two main components: an explicit grammar explanation of the target form, followed by output-oriented practice tasks (ranging from mechanical drills to meaningful exercises). Most of the TI activities were adapted from traditional grammar exercises and were representative of those found in standard EFL textbooks. The TI learners were required to produce the target forms in exercises immediately after the explanation, covering all types of English relative clauses. (Appendix 10 provides a complete list of the TI activities.)

Regarding the distinct content between ER and EA, - Input and exposure were identical across the Processing Instruction groups (ER and EA). Learners encountered the same sentence sets, and the same presentation modality. Targeted features were the four English relative forms who, which, whom, whose together with head noun definiteness; lexical content and ordering were held constant to prioritize the grammatical cue. This alignment ensures that any between group differences reflect the activity format rather than unequal linguistic material, mirroring structured input practice where exposure is equated and only activity type varies.

- ER requires a meaning decision with a single correct response, making success on each trial contingent on the learner's ability to compute the target form–meaning connections. Task essentialness was therefore built into every item: the relative dependency had to
be established and the appropriate relative form selected—including Case realization for *whom* and genitive determiner status for *whose*—while head noun definiteness was

interpreted as an independent semantic property. Feedback operated at the item level and was strictly correctness based (correct/incorrect), which reinforced the requirement that the grammatical cue be used to reach the right outcome. This configuration follows structured input principles and implementations in which referential activities operationalize task essentialness and provide accuracy contingent feedback (Marsden & Chen, 2011).

- EA responses addressed personal stance or applicability while presenting the same sentences. All response options were acceptable by design, and no correctness feedback about form was supplied. The activity thus delivered additional comprehensible input and engagement as positive evidence while deliberately avoiding an accuracy contingency. Because no trial required the grammatical cue to be processed in order to succeed, task essentialness was absent in this format, consistent with affective activity definitions in the structured input literature (Marsden & Chen, 2011).

- The content was kept the same and changed only the response type and feedback, so any differences show the effect of task-essentialness. Referential activities are theorized and shown to alter parsing routines because they force attention to the form–meaning connections and reward that processing through immediate correctness feedback; affective activities contribute exposure and communicative alignment but, without a right/wrong answer and without correctness feedback, do not impose the same computational demand. Equalizing tokens and varying only the presence versus absence of task essentialness and correctness based feedback preserves internal validity and aligns the design with prior structured input comparisons (Marsden & Chen, 2011).

- To preserve internal validity in the ER–EA comparison and to document treatment fairly, the researcher served as the instructor for all treatment groups, a dual role deliberately adopted to ensure consistency and fidelity across conditions. I followed a scripted protocol for each lesson, providing identical explanations and instructions to every group (differing only in the intended practice activity format) and refraining from any unscripted guidance or extra feedback beyond what was planned. This consistency in instructional delivery minimized teacher-related variability, ensuring that any differences in outcomes could be attributed to the instructional treatment itself rather than to differences in teaching style or instructor emphasis. By acting purely as the teacher following a set script, I was able to closely monitor the implementation and maintain high fidelity to the experimental design in all groups. This level of control strengthened the internal validity of the intervention, as each group received the same content, timing, and emphasis, with the sole distinction being the presence or absence of task-essential practice (referential vs. affective activities, as described above).

Operating in this teacher-researcher capacity meant that the instructional intervention was delivered under optimal conditions – essentially an efficacy trial design. Efficacy trials test an intervention's impact when it is implemented in ideal circumstances: the instructor (in this case, the researcher) is highly trained and intimately familiar with the approach, the conditions are carefully controlled, and participants receive a maximal dose of the targeted instruction. Indeed, in this study the learners were exposed to an unusually intensive focus on the target feature (English restrictive relative clauses) – for example, the Processing Instruction groups received approximately nine hours of instruction and practice solely on that structure. Such a sustained, form-focused exposure ensured that participants had ample comprehensible input and practice opportunities, far beyond what a typical classroom curriculum might allocate for a single grammar feature. These optimal input conditions were intentionally provided to give the PI treatments the best possible chance to demonstrate their effectiveness in helping learners form accurate form–meaning connections from the outset.

While this high level of control and intensive input is a strength of the experimental design, it also has implications for how we interpret and generalize the results. Because the instruction was delivered by the researcher-instructor under ideal circumstances, the positive outcomes observed can be viewed as the upper-bound of what the intervention can achieve under near-perfect conditions. In other words, the study demonstrates efficacy under optimal conditions, but it was not a test of routine classroom effectiveness. The participants were indeed learning in an environment where many typical constraints (e.g. large class size, limited instructional time, varying teacher expertise or adherence) were stripped away, and thus the learning gains reflect what is possible when the approach is executed with very high fidelity. This means that replicating these exact results in other experiments or in traditional classroom settings might be challenging. In a regular educational context, teachers may not be able to devote as much time and singular focus to one structure, or they may not follow the instructional sequence as rigorously without the researcher's direct oversight. Moreover, classroom instructors vary in experience and may not uniformly apply the method as the researcher did. All these real-world factors could lead to smaller or more variable effects than those seen in the present study.

By explicitly acknowledging my positionality as a teacher-researcher, I underscore that the role I played was pivotal in creating an efficacy-trial environment. The optimal conditions – highly trained instructor, controlled delivery, immediate feedback (for the referential activities), and prolonged focus on the target form – were intentionally part of the study's design to test the theoretical potential of Processing Instruction. This careful configuration boosts confidence that the observed differences between groups (for example, between the ER and EA conditions) were due to the instructional treatments themselves and not confounded by inconsistent teaching. At the same time, it is important to remain cautious when extending these findings beyond the study's context. The results highlight what can happen under ideal circumstances, but further research would be needed to evaluate how well these instructional benefits hold up under typical classroom conditions or with different instructors. In summary, the dual role of teacher-researcher contributed to the optimal implementation of the intervention, aligning with an efficacy trial framework, and this should be kept in mind when considering the robustness and applicability of the study's outcomes in more naturalistic learning environments.

All groups in the study followed the same overall procedure. Before the treatments, all participants took a placement test and completed a background questionnaire, and a pilot study was conducted to trial the materials. A pre-test was administered before the instructional treatments. The PI groups (ERA, ER, EA) then underwent their respective interventions over a period of ten days: each PI group first received about 3 hours of explicit instruction (including information about processing strategies), followed by approximately 9 hours of SI practice activities tailored to their group's focus (both types for ERA, referential-only for ER, affective-only for EA). The TI group received around 3 hours of explicit instruction on the grammar, followed by roughly 6 hours of output-based practice exercises (mechanical, meaningful, and communicative drills) as detailed in table 5. Immediately after the intervention period, a post-test was given to assess the instruction's immediate effects. A delayed post-test was then administered approximately seven weeks later to determine if any learning gains were retained over time. This delayed post-test is recommended by second language researchers to evaluate the durability of instructional effects.

Table 5. Summary of procedures for PI and TI groups

CG	ERA	TI	ER	EA
Placement test Signing the consent form + Questionnaire	Placement test	Placement test	Placement test	Placement test

	Signing the consent form + Questionnaire Pilot study	Signing the consent form + Questionnaire Pilot study	Signing the consent form + Questionnaire Pilot study	Signing the consent form + Questionnaire Pilot study
Pre-test	**Pre-test**	**Pre-test**	**Pre-test**	**Pre-test**
Explicit Instruction (3 hours)	Explicit Instruction Information about Processing Strategies Input SI Activities (9 hours)	Explicit Instruction Output TI activities (6 hours)	Explicit Instruction Information about Processing Strategies Referential SI activities (9 hours)	Explicit Instruction Information about Processing Strategies Affective SI activities (9 hours)
Immediate post-test	Immediate post-test	Immediate post-test	Immediate post-test	Immediate post-test
Delayed post-test	Delayed post-test	Delayed post-test	Delayed post-test	Delayed post-test

4.6.1.1. Guidelines for Structured Input Activities

It is crucial to highlight that any differences between TI and PI training methods stem solely from the principles of Processing Instruction (Lee & VanPatten, 2003). Wong (2004) states that the prescribed guidelines must be followed strictly in order to create authentic structured input activities. Therefore, the activities in this study were designed in accordance with the guidelines outlined by Lee and VanPatten (1995).

1. Introduce one concept at a time
2. Keep meaning in focus
3. Progress from sentences to connected discourse
4. Provide input in both oral and written forms
5. Ensure the learner engages with the input

6. Take the learner's processing strategies into account (p.104)

In this study, two types of structured input activities—referential and affective—were used to help learners focus on English relative clauses. Referential tasks were designed to have a single correct answer, requiring learners to interpret the target grammatical form in order to extract meaning. For instance, when given a sentence like "No, the teacher...", learners had to decide between options such as "whose son studies with us" or "whom son studies with us." To choose correctly, they needed to understand the grammatical role of the word "teacher" and apply the correct relative pronoun, making "whose son studies with us" the appropriate choice.

In contrast, affective activities allowed for multiple acceptable responses since they were based on the learners' personal views or beliefs. These tasks asked participants to respond to culturally themed statements, selecting the sentences that aligned with their own perspectives. Following VanPatten's (1996, 2002, 2004) suggestion, affective activities were administered after the referential ones to help reinforce the grammatical patterns learners had already encountered in a more meaningful and personalized way.

As highlighted by Wong (2004), successful completion of these structured input tasks depended on learners fully understanding the content. For example, Activity 5 required learners to determine the appropriate relative pronoun by examining the surrounding sentence context, such as whether it called for a subject, object, possessive, or inanimate pronoun. Without grasping the meaning, they could not complete the task accurately. This aligns with guideline 2 of Processing Instruction: maintaining a focus on meaning throughout.

Unlike traditional grammar drills that often rely on repetition without comprehension, the activities in this study did not involve mechanical exercises. According to Wong (2004), such drills are a common feature of output-focused instruction but do little to support form-meaning connections. In Activities 1 through 3, learners had to make choices based on their interpretation of the input, such as selecting the correct response from a list of options—meeting guideline 3, which stresses the need for learners to engage actively with the input.

Another key principle (guideline 4) is that learners should be exposed to both written and spoken input. Following Lee and VanPatten's (2003) recommendation, input was provided in both formats to accommodate differences in learner preferences—some benefiting more from auditory input, others from visual. For instance, Activities 4 and 6 involved listening tasks in which learners had to identify the correct relative pronoun based on what they heard, supporting the idea that varied input modalities enhance learning outcomes.

Throughout all tasks, the focus remained on relative clauses, and the design considered learners' typical processing strategies, including the potential influence of their first language and their tendency to prioritize initial sentence elements. This is in line with guideline 6, which emphasizes the importance of directing attention to specific forms within meaningful input. Importantly, all structured input tasks were comprehension-based and did not require learners to produce English relative clauses.

After each activity, learners received feedback on the correct answers. However, they were not provided with explanations for correct responses—only incorrect answers were clarified. This approach ensured learners were made aware of their performance without excessive explicit instruction.

In the Traditional Instruction (TI) group, activities were structured around output practice following a grammar explanation (see Appendix 10). Drawing on earlier research (e.g., Paulston, 1972; Cadierno, 1995; Russell, 2009, 2012), these exercises moved from mechanical drills to more communicative tasks. The early stages included drills that had only one right answer and did not require understanding of sentence meaning. In contrast, the meaningful drills required a connection between form and meaning, even though the expected response was predetermined. The final communicative task demanded that learners understand both the prompt and their own intended meaning, though the teacher could not predict the learner's response in advance.

This instructional design followed Paulston's (1972) classification, which recommends a progression from tightly controlled to more open-ended activities. This structure remains common in many contemporary language textbooks and served as the basis for TI activities in this study, reflecting established pedagogical practices in second language instruction.

4.6.1.2. Processing Instruction (PI) Treatment Materials (ERA, ER, EA Groups)

Only one previous PI study (Alsadi, 2013) had targeted English relative clauses, so some of the PI instructional materials were adapted from that study, and additional activities were informed by materials from Çelik-Yazıcı (2007). The PI training packet developed for this study followed the classic PI model as defined by VanPatten, incorporating both referential and affective structured input tasks. Within the PI condition, there were three variations corresponding to the three PI groups (ERA, ER, EA). The design of the instructional materials for the EA group (affective-only) and the ER group (referential-only) is described here. The ERA group, which received both types of activities, essentially experienced the combined materials of ER and EA; therefore, no separate description is needed for ERA beyond noting that they did all the activities of both single-focus groups.

All PI instructional materials were developed based on the principles suggested by VanPatten (1996) and Lee and VanPatten (2003). In keeping with previous PI research, the current study's PI materials adhered to the structured input guidelines outlined in Section 4.6.1.1.

In practice, due to the low proficiency of the learners, guideline 5 (moving to connected discourse) was not implemented: all structured input activities remained at the sentence level rather than advancing to paragraph-level discourse, to keep tasks manageable for beginners. Thus, the materials followed guidelines 1, 2, 3, 4, and 6, but not 5. Each PI intervention group (ERA, EA, ER) completed the activities using pen-and-paper worksheets in class. Despite differences in which activities they did, all three PI groups' instructional packets consisted of the same three key components delivered in sequence:

i. **Explicit information about the target feature.** This was a brief explanation of English restrictive relative clauses, including what they are and how they function, with simple examples.

ii. **Explicit information about problematic processing strategies.** Learners were explicitly reminded of the default strategies that might mislead them when processing English RRCs. For instance, they were cautioned against assuming the first noun is always the subject of the relative clause, a strategy that could cause misinterpretation due to L1 crosslinguistic influence. This reminder drew on the known processing issues for RRCs and prepared learners to approach the input more effectively.

iii. **Structured Input (SI) activities targeting the form–meaning connections.** These were the practice exercises where learners processed multiple sentences with the target form, according to either referential or affective formats as described above.

In accordance with the standard PI format (VanPatten, 2002; Wong, 2004a), the first two components (i and ii) were identical for all three PI groups and were delivered at the start of the intervention for each group. In other words, all PI learners first received the same explanation of relative clauses and the same discussion of processing strategies and common errors. After this explicit instruction phase, the groups diverged in the practice phase: the ERA group received both sets of practice activities (completing all referential and all affective SI tasks), the EA group received only the affective structured input activities, and the ER group received only the referential structured input activities. (Appendix 8 provides the full list of SI activities for the referential-only treatment and Appendix 9 for the affective-only treatment.) Thus, the amount of exposure to the target input was equal across groups in terms of time, but the EA and ER groups experienced only one type of input activity, whereas the ERA group experienced a broader range of activities.

By structuring the PI treatment in this way, the experiment maintained consistency in what was taught explicitly and how it was introduced, varying only the nature of practice. This enables a clear comparison of whether having both types of structured input vs. just one type yields different outcomes.

4.6.1.3. Traditional Instruction (TI) Treatment Materials

The Traditional Instruction (TI) treatment was designed to represent a more conventional approach to grammar teaching, providing a useful counterpoint to PI. The TI instructional materials were based largely on grammar exercises and activities of the sort found in textbooks. In fact, many of the TI activities were adapted from the materials used in Alsadi (2013), and additional exercises were created by the researcher to fit the target structure (see Appendix 10 for a complete list of TI activities). These exercises are considered "traditional" because they mirror common practice in college-level EFL classes at Najran University and elsewhere: typically, a lesson begins with an explicit rule presentation, followed by mechanical drills and then meaningful practice exercises using the rule.

The TI instructional package consisted of two main components: (1) an explicit explanation of the grammar rule, and (2) subsequent practice exercises, which included both mechanical practice (highly controlled exercises focusing on form) and meaningful practice (more contextualized exercises requiring understanding of meaning). In the TI sessions, the instructor first provided a thorough explanation of English restrictive relative clauses – defining what relative clauses are, how they are formed, the different types of relative clauses in English (e.g., subject vs. object relatives, use of *who/whom/which/that* etc.), and example sentences illustrating these rules. Essentially, the learners were taught the full paradigm of English relative pronouns and their usage conditions. This explicit lesson covered aspects such as where the relative clause attaches to a noun, how English uses relative pronouns or complementizers to introduce the clause, and how that differed from Arabic. However, unlike the PI groups, no discussion was given of processing strategies. That is, TI learners were *not* explicitly alerted to any default processing habits or potential comprehension pitfalls. For example, the TI students were never specifically told to avoid interpreting the first noun as the subject; the instruction did not address their processing approach, only the grammatical form and rules.

After the explicit instruction segment, TI learners engaged in practice exercises. These included mechanical drills (e.g., fill-in-the-blank exercises where students had to insert the correct relative pronoun, or transformation exercises converting two sentences into one sentence with a relative clause) and meaning-oriented practice (e.g., sentences to be completed or combined in ways that require understanding the meaning of the relative clause). All practice was output-focused: students were producing the target form in writing or speaking, rather than just interpreting input. The practice items were modeled on textbook exercises and were unrelated to each other in context (each item stood alone), reflecting typical grammar workbook activities. Throughout these practice tasks, the emphasis was on accuracy of form. Notably, at no point were TI students instructed on *why* certain errors might occur from a processing perspective; errors were corrected in terms of rule application only. For instance, if a student used *that* in a context where *which* was prescriptively required, the correction was simply that *which* is the proper form, without explaining any underlying processing tendency.

In summary, the TI instruction provided a comprehensive rule explanation and rule-driven practice. It simulated the way grammar is traditionally taught in many settings, thereby serving as a suitable basis for comparison with the PI approach, which limits explicit information and emphasizes input processing.

4.6.1.4. Control Group Materials

The control group did not receive any instruction on English relative clauses during the intervention period. To keep these learners engaged (and to ethically justify their participation without treatment), they were given alternate learning materials unrelated to relative clauses. Specifically, the control group's materials were adapted from beginner-level English vocabulary units ("English Vocabulary in Use" by McCarthy & O'Dell, p.78) that are used in Najran University's Preparatory Year English classes. These materials focused on general vocabulary and reading topics and contained no explicit grammar instruction on relative clauses (or on complex sentence structures). Control group participants read short texts on various topics and completed exercises related to those texts (such as answering comprehension questions or practicing the new vocabulary). These activities ensured the control group had a roughly equivalent amount of class time and general English practice as the treatment groups, without inadvertently teaching anything that could affect their knowledge of relative clauses. (Appendix 11 provides the full set of materials and activities used with the control group.) In essence, the control condition was one of business-as-usual English learning, covering content that was part of their normal curriculum (vocabulary, general reading comprehension) but excluding the target grammar feature that the experimental groups were learning.

4.6.1.5. Administering the Intervention

The five experimental groups were formed and conducted in such a way that participants were unaware of the specific grouping or treatment differences. From the learners' perspective, they were simply divided into different classes; they were not told which type of instruction (if any) they were receiving or that other groups were being taught differently. Group assignment was random, and all groups were of equivalent proficiency as established by the placement test.

All intervention sessions for all groups were taught by the researcher, as noted, to avoid any potential "teacher effects" (Marsden, 2007) that could arise if different instructors taught each group. This helped maintain consistency in how the lessons were delivered. Furthermore, the groups were kept entirely separate during the intervention phase to prevent cross-group contamination (Cohen et al., 2011, p.313). Each group had its instruction in a different time slot and location. For example, one group held its daily session from 1:00–4:00 PM in the Preparatory Year building, while another group met in the evening in a Computer Science department classroom, and so on. The staggered schedule (see Appendix 3 for the detailed timetable) ensured that participants from different groups did not intermingle or share information about their lessons during the treatment period. This separation was important because if, say, a student from a PI group discussed activities with a student from the TI group, it could influence their performance or provide unintended exposure to the other type of instruction.

By keeping group membership blind to participants, using the same instructor for all groups, and isolating groups in time and space, the intervention was administered in a way that upheld the internal validity of the experimental comparisons. Each group proceeded through its respective instructional or non-instructional activities over the ten-day period, after which all groups reconvened for the post-tests.

4.7. Outcome Measures

The effectiveness of the instructional treatments was assessed using several outcome measures that tested learners' interpretation and production of English restrictive relative clauses. All outcome measures were written tasks to allow controlled administration and scoring. There were three types of tests used: a grammaticality judgment task (to assess interpretation and form sensitivity), a picture-cued sentence completion task (to assess written production in a controlled context), and a sentence translation task (to assess written production in a slightly more open-ended way). Each of these is described below. The tests were administered as pre-tests, immediate post-tests, and delayed post-tests, with multiple versions as noted. This mix of measures provided both a comprehension-oriented assessment (the judgment task can be seen as primarily tapping interpretation) and production-oriented assessments, giving a comprehensive picture of learner gains. Gathering both comprehension and production data is crucial in SLA research to detect any asymmetries in learners' receptive versus productive knowledge of the target form.

4.7.1. Written Outcome Measures

4.7.1.1. Grammaticality Judgment Task (GJT)

A grammaticality judgment task was used to evaluate learners' ability to recognize correct and incorrect usages of English relative clauses. GJTs are a common research method for probing how learners interpret specific linguistic structures that might not frequently appear in spontaneous output (Loewen, 2009). In such tasks, learners are typically presented with sentences and must judge whether each sentence is grammatical or not, often indicating their judgment on a scale or as a binary choice. This provides insight into the learner's implicit or explicit knowledge of the structure in question. GJTs are useful because they can reveal what learners perceive as acceptable or deviant in the target language (Mackey & Gass, 2016), thus reflecting their underlying syntactic representations (Shiu et al., 2018). In other words, the

GJT can show both what learners *know* to be grammatical and what they recognize as errors according to the target-language rules.

GJTs have been widely used in SLA research (Mackey & Gass, 2016), but there is debate about what exactly they measure. A central issue is whether a GJT taps into implicit language knowledge or explicit knowledge, and how factors like time pressure influence this. Specifically, timed vs. untimed GJTs may engage different cognitive processes. Research has shown that learners often perform better on untimed GJTs than on timed ones (Ellis, 2005; Gutiérrez, 2013; Loewen, 2009; Zhang, 2015), although performance on the two types tends to be highly correlated (Bader & Häussler, 2010). One interpretation of this finding is that untimed GJTs allow learners to draw on their explicit knowledge of the language (rules they can consciously recall), whereas timed GJTs, by limiting the response time, are thought to more directly tap into implicit knowledge (automatic, intuitive grasp of the language) (Ellis, 2005; Shiu et al., 2018; Vafaee et al., 2017). Ellis (2005) described that when completing a GJT, learners may go through three cognitive stages: (a) semantic processing – understanding the sentence's meaning, (b) noticing – identifying any potential error in form, and (c) reflection – double-checking or reconsidering their initial judgment about grammaticality. If learners have ample time, they are likely to complete all three stages, possibly consulting explicit grammatical knowledge during the reflection stage. Under time pressure, they might only manage the first one or two stages before making a judgment.

For the purposes of this project, an untimed written GJT was chosen. There were several reasons for this choice. First, the ultimate goal of second language acquisition is to develop fluent implicit knowledge (Lardiere, 2008), but given the participants' low proficiency, a timed test might obscure whether errors were due to true lack of knowledge or simply processing difficulty under pressure. In fact, as McDonald (2006) argued, poor performance on a timed GJT could result either from genuine syntactic deficits or from processing constraints caused by the speeded condition, making it hard to locate the source of learner mistakes. By using an untimed GJT, the study aimed to avoid conflating processing speed limitations with actual grammatical knowledge. Each learner could take as much time as needed to read and judge each sentence, increasing the likelihood that if they judged something ungrammatical, it was because they actually detected a rule violation, not because they ran out of time or didn't fully parse the sentence. In short, the untimed format was meant to yield a clearer indication of the learners' knowledge of relative clause grammar without the confound of processing stress. (This approach follows the recommendation of Schachter & Yip, 1990, who also employed untimed judgment tasks.)

Another consideration in designing the GJT was the modality of presentation (written vs. aural). Prior research indicates that the modality of GJTs can affect learner performance: learners often find aural GJTs more challenging than written ones because listening imposes a higher processing load (Johnson, 1992; Wong, 2001). Since the goal here was to assess learners' grasp of the RRC structure itself (their morphosyntactic representation), and not their listening comprehension skills, the decision was made to present all GJT sentences in written form. This likely reduced working memory demands and allowed learners to re-read sentences as needed, thereby focusing their effort on the grammatical aspect. Using a written GJT also made the results more directly comparable with other studies on L2 relative clause acquisition, many of which have used written judgment tasks (Hawkins & Chan, 1997; Tsimpli & Dimitrakopoulou, 2007). In sum, the written modality was chosen to enhance the validity of the measure for its intended purpose and to ensure consistency with prior research.

Finally, including a comprehension-oriented measure like the GJT (an interpretation task) alongside production tasks is important for a comprehensive assessment of learning. Especially in PI research, previous studies have sometimes found dissociations between comprehension gains and production gains. Learners may perform well on interpretation tasks but still struggle with production, or vice versa. By collecting both kinds of data, the study can determine if PI affects comprehension and production differently. Indeed, the literature emphasizes examining both to fully understand learners' interlanguage development (Norris & Ortega, 2000). Moreover, production tasks (especially spontaneous speaking) place heavy cognitive demands on learners—particularly those at advanced levels—potentially underrepresenting what learners know because performance can be hindered by real-time processing pressure (Hahne, 2001; Hopp, 2006). Untimed comprehension tasks like the GJT, on the other hand, allow learners to tap into their "offline" knowledge. Therefore, combining the GJT results with production task results provides a more complete picture of the learners' proficiency. It helps ensure that if a learner fails to produce correct relative clauses in a production task, we can check whether they nevertheless recognized correct vs. incorrect usage on the judgment task, indicating some receptive knowledge of the structure. This comprehensive approach to measurement follows calls in SLA research to include multiple types of assessment for both form recognition and form production.

In summary, the GJT used in this study was an untimed, written grammaticality judgment test focused on English restrictive relative clauses. Learners were presented with sentences (some grammatical, some containing typical errors in relative clause formation) and asked to judge each as "acceptable/correct" or "unacceptable/incorrect" in English. This task served as the measure of learners' interpretative knowledge of the target form (their ability to discern correct usage and identify errors).

4.7.1.2. Production Tasks

To assess learners' productive knowledge of English RRCs, two types of written production tasks were used: a picture-cued sentence completion task and a sentence translation task. These tasks required learners to produce English relative clauses in writing, thereby testing their ability to correctly use the target forms in context. By using two different production measures, the study captured both a relatively controlled production context (picture-cued, with guided output) and a slightly freer context (translation, requiring them to generate the structure from L1 meaning). Both tasks elicited sentence-level production rather than extended discourse, which was appropriate given the participants' proficiency.

4.7.1.2.1. Picture-Cued Task

The picture-cued task (PCT) was designed as a controlled written production task to examine the effects of PI on learners' ability to produce relative clauses appropriately. In this task, learners were shown pairs of pictures accompanied by a question prompt. Each question was crafted such that its answer would naturally involve a relative clause using one of the English relative pronouns (*who, which, whom,* or *whose*). The learners were required to look at the pictures and answer the given question in a full sentence that contained a relative clause, thereby using the correct relative pronoun to match the context depicted.

For example, a picture pair might show two different people or objects, and the question could be *"Which one is the teacher?"* The expected answer would be a sentence like *"The teacher is the man who is wearing a hat."* In producing this answer, the learner must use *who* to refer to the person (as opposed to *which* or another form). Each item in the PCT was constructed so that using the wrong relative pronoun would result in a sentence that did not correctly match the picture scenario (or was ungrammatical), while using the correct one would yield a meaningful description of the picture.

Before learners began the picture-cued test, they were reminded of the task requirements: specifically, that their answers must include a relative clause using a wh-word (a relative pronoun). They were explicitly told *not* to use the complementizer *that* in place of the wh-relative pronouns, even though English often allows *that* as an alternative in spoken language. This instruction ensured that the task measured their ability to use *who, whom, which,* or *whose*, since those were the forms taught and practiced, and avoided any ambiguity (*that* usage could sometimes be correct, but the focus here was on mastering the distinct wh-forms). Appendix 13 contains the full set of items from the picture-cued task (PCT).

In essence, the PCT required learners to perform a guided production: the question and pictures cued the content, and learners had to produce the grammatical form correctly to align their sentence with the picture evidence. This task provided a way to see if learners could apply their grammatical knowledge in production when prompted with context, without leaving the output completely open-ended (which might be too challenging for beginners or might not elicit the target structure consistently). By examining their responses, we could assess whether PI-trained learners were better able to supply the appropriate relative pronoun and structure than those in the TI or control groups.

4.7.1.2.2. Translation Task

The sentence translation task served as another measure of productive knowledge, one that inherently engages learners' explicit grammatical knowledge and ability to convert meaning from their L1 (Arabic) into the L2 structure (English RRCs). Translation tasks are considered a valid way to test learners' ability to deliberately apply grammatical rules, because translating a sentence from L1 to L2 requires metalinguistic awareness and explicit processing of grammatical form (Williams, 1999). In translating, learners must consciously think about how to reproduce the same meaning in English, which often involves drawing on their knowledge of English grammar rules. Therefore, this task was expected to tap into the explicit knowledge that learners had developed about relative clauses through the intervention.

For the translation task, participants were given a series of sentences written in Arabic (their native language) and were asked to translate each one into English. All the Arabic sentences were constructed such that their natural English equivalents would contain restrictive relative clauses with relative pronouns. The instructions emphasized that students should maintain the sentence structure as much as possible in translation, except where adjustment was necessary to produce a grammatically correct English sentence. In other words, they were not to simplify or change the meaning; they needed to render the Arabic sentence in English accurately, which included using an English relative clause structure when appropriate. To help the learners focus on the grammar rather than unknown vocabulary, a glossary or hints for certain challenging content words were provided next to most sentences (for beginner learners, unknown vocabulary could otherwise hinder their ability to complete the translation). This way, difficulties in translation would more likely stem from grammar (the relative clause) rather than from not knowing a particular word.

Before starting, participants were reminded (as with the PCT) that all answers must include a wh-type relative pronoun (who, whom, which, or whose) as appropriate, and that using *that* would not be accepted in this task. This reminder reinforced the target forms and ensured consistency in what was being measured. They could ask the instructor for the meaning of any unfamiliar words during the test, which further reduced the chance that vocabulary issues would interfere with grammar performance (this policy was also implemented in the main study for fairness, as described later). Appendix 14 presents the actual items used in the translation test.

The translation task was intended to examine whether learners could produce correct English relative clauses when given the intent in their L1. It required them to effectively decrease the L1 crosslinguistic influence by using the proper English form. For example, an Arabic sentence using the relativizer *illī* would have to be translated into English using *who/which/etc.* depending on context. A learner who had internalized the lessons from PI or TI should be able to do this correctly, whereas a learner who had not might produce erroneous translations (such as a fragment or misuse of *that* or other words). The nature of translation (from Arabic to English) meant learners had to carefully think about English structure, making it a strong test of the explicit grammatical knowledge gained from instruction. Indeed, because it elicits controlled use of grammar, translation is well suited for capturing any explicit knowledge gains that the instructional treatments (especially the rule-focused TI) may have produced.

Overall, the combination of the picture-cued task and the translation task provided a robust assessment of production: the former allowed us to see if learners could spontaneously formulate a relative clause in response to a prompt, and the latter tested if they could deliberately construct a relative clause when required to convey a given meaning. Success on these tasks indicates that learners can not only recognize correct relative clauses (as per the GJT) but also produce them in writing under different conditions.

4.7.2. Missing Data

During the implementation of the study, some participants' data had to be excluded due to various unforeseen issues. In total, 37 participants were removed from the final dataset for one or more of the following reasons:

- **Exceeded proficiency threshold:** Participants who scored above 60% on the pre-test (indicating they may already know the target structure) were excluded, as mentioned earlier in the design.
- **Prior knowledge of target structure:** Any participants who were later found to have had previous formal experience or substantial prior knowledge of English relative

clauses (e.g., through prior coursework) were excluded, as evidenced by exceptionally high pre-test performance or background information.

- **Incomplete participation:** Participants who did not complete all phases of the study (e.g., those who missed either the immediate post-test or the delayed post-test) were excluded, since their data would not allow full comparison across time points.

These criteria were applied to maintain the integrity of the experimental groups. Learners with prior knowledge or who did not receive the full treatment and testing sequence could introduce unwanted variability or bias. After these exclusions, the remaining participant numbers in each group met the required counts for analysis, and the groups were comprised of learners who were truly at the appropriate proficiency level and who had completed the entire procedure.

4.7.3. Three Versions of Each Outcome Measure

As introduced previously, each of the outcome measures (GJT, picture-cued task, translation task) was prepared in three versions: Version A, Version B, and Version C. The rationale for developing three equivalent versions of each test was to avoid test-retest practice effects that could arise from administering the same items multiple times (pre, post, delayed). If a participant sees identical test items more than once, improvements in their score might reflect memory or familiarity rather than actual learning of the target structure. To ensure that any observed improvement was due to the instruction and not due to repeating the same test, the content of the tests was changed across administrations.

The three versions differed in the specific sentences and lexical items used, but they were carefully designed to be equivalent in difficulty, format, and length, and to target the same aspects of relative clause knowledge. For example, all versions of the GJT contained the same number of grammatical and ungrammatical sentences, covering the same error types (just with different nouns or verbs). All versions of the picture-cued task included a similar mix of prompts requiring *who, which, whom,* or *whose* in the answers, and all versions of the translation task included sentences of similar complexity and length with relative clauses. This way, each version tested the same construct to the same extent; only the surface details varied.

One concern when using different versions of what is ostensibly the "same" test is comparability of difficulty across versions (Mackey & Gass, 2005). There is a risk that one version could be slightly easier or harder than another. Two precautions were taken to mitigate this: First, the assignment of test versions to groups at each time was randomized and counterbalanced (detailed next in 4.7.3.1). Second, an additional analysis was embedded in the design (via the pilot and the inclusion of the native-speaker group) to check that the versions were comparable. Essentially, if the native speakers performed at ceiling on all versions and if the pilot groups showed the expected pattern equally on all versions, it would support that the versions were of equal difficulty.

Overall, using three versions of each outcome measure was a methodological choice to bolster the internal validity of the study's findings, by ruling out the alternative explanation of "practice effects" for any pre-test to post-test improvements.

4.7.3.1. Random Assignment of Test Versions to Groups

To implement the multiple test versions, each learner group was assigned a specific sequence of test versions across the three testing times, and this assignment differed by group in a counterbalanced manner (Mackey & Gass, 2005). Table 6 illustrates the scheme of how versions A, B, and C of each test were distributed to each group at pre-test, post-test, and delayed post-test. As shown, the control group received Version A at the pre-test, Version B at the immediate post-test, and Version C at the delayed post-test. The other groups were arranged such that each group got the versions in a different order, ensuring that all versions were used at each testing time across the sample. Specifically, groups EA and ER both received Version A as their pre-test, the ERA group received Version B as its pre-test, and the TI group received Version C as its pre-test. Then, for the post-test and delayed post-test, each group rotated to a different version. In essence, any given version served as a pre-test for one subset of learners, a post-test for another, and a delayed test for yet another, balancing out any form difficulty differences.

Table 6. Assignment of Test Versions to Groups

Tasks	Pre-test			Post-test			Delayed post-test		
	GJT	PIC	Translation	GJT	PIC	Translation	GJT	PIC	Translation
TI	A	A	A	B	B	B	C	C	C
ERA	B	B	B	C	C	C	A	A	A
EA	C	C	C	A	A	A	B	B	B
ER	C	C	C	B	B	B	A	A	A
CG	A	A	A	C	C	C	B	B	B

(Note: GJT = Grammaticality Judgment Task, PCT = Picture-Cued Task. Each group saw each test version exactly once. "Version A (for all tasks)" means that group's GJT was Version A, its PCT was Version A, and its translation was Version A, etc.)

As Table 6 indicates, for example, the TI group had Version C as the pre-test and then got Version B and Version A in subsequent tests. The ERA group started with Version B, then C, then A. The EA group (and similarly ER group) started with Version A, then moved to another version at post-test, and so on. This assignment ensured that by the end of the study, all groups had taken all versions of each test, just in different orders. Thus, any learning effect observed is unlikely to be an artifact of test version, because improvement cannot be attributed to simply retaking the same set of items. Additionally, because the native English speaker baseline group also took versions of the tests (not for all phases, but to provide a benchmark), we could confirm that all versions were capable of being scored nearly 100% by proficient speakers, lending confidence that differences in learner performance were due to the learners' abilities rather than flaws or variability in the test forms.

4.8. Pilot Study

A pilot study was carried out in the academic year prior to the main experiment with a small sample of learners. The pilot had several purposes: to trial the assessment tasks and make sure they were suitable for the target learner population, to identify any issues in administering the tasks, and to gather initial validity and reliability evidence for the measures (as discussed in Section 4.4.2). The pilot study ultimately informed adjustments to materials and procedures before the full study was implemented.

The pilot involved 13 Saudi learners of English at Najran University. They were divided into two groups. The first group (N = 7) was recruited from the Preparatory Year program at Najran University, and the second group (N = 6) was from the English Language/Translation department. These learners participated in the pilot in late November 2022 over four days (21–24 November; see Appendix 3 for the pilot schedule). It is important to note that none of these pilot participants took part in the main experiment, and they were not involved in the validity/reliability testing described earlier (those involved different individuals). The pilot was solely for the purpose of refining the instruments and procedure.

4.8.1. Background Documents

Before the pilot participants engaged in any testing, they were given the same background questionnaire and consent process planned for the main study. The background questionnaire included a consent form and basic participant information sheet. Consistent with ethical recommendations, these documents were provided in English (the target language of instruction), but they were written in simple language. The questionnaire collected data on participants' age, years of formal English study, and the native languages of their parents, among other background details (see Appendix 4). This practice run of the consent and questionnaire process confirmed that participants understood the forms and that providing them in English was acceptable (given the learners' level).

4.8.2. Testing of Assessment Tasks

The pilot study mainly focused on piloting the testing procedures (pre-test, post-test, delayed post-test for each outcome measure). Because of time constraints and the limited scope, the instructional treatment itself was not piloted in full. In other words, the pilot participants did not go through the entire PI or TI instructional program; rather, they helped test the assessment instruments under conditions similar to the actual study timeline. The pilot pre-test was administered one week before the main study's pre-test date, and the pilot post-test and delayed post-test were administered according to a compressed schedule that fit within the four-day pilot window (this was due to constraints in the academic calendar, meaning the pilot's "delayed" test was not as far delayed as in the main study, but it still provided useful feedback).

The aims of the pilot were: (1) to ensure the content of the tests was appropriate and clear to learners at this level, (2) to determine approximately how long it took participants to complete each test, and (3) to confirm that all tasks were understandable and that the instructions were unambiguous. By observing the pilot participants and gathering their feedback, the researcher identified a few necessary adjustments to improve the instruments for the main study.

The pilot revealed the following key points that were addressed subsequently:

- **Examples in Instructions:** Initially, the tasks (especially the GJT and picture-cued task) did not include example items illustrating how to respond. During the pilot, it became apparent that the absence of examples caused confusion for some learners about what they were supposed to do. Two pilot participants in particular expressed uncertainty about how to indicate their answers. In response, the task instructions were revised for the main study to include a clear example at the start of each test.

This ensured that all participants would understand the format and what a response should look like. For instance, the GJT instructions were modified to show one sample grammatical sentence and one ungrammatical sentence with the expected judgments. Similarly, the picture-cued task included an example question-answer pair demonstrated by the instructor before the test began.

- **Length of the Picture-Cued Task:** One pilot participant commented that the picture-cued task had too many items, leading to fatigue. The original version of the PCT used in the pilot had 19 items. Given this feedback and considering the time it took to complete, the number of items in the final PCT was reduced to 15 for the main study. This shortening aimed to keep the task within a reasonable duration and maintain student engagement throughout.

- **Unfamiliar Vocabulary:** The pilot indicated that some vocabulary in the assessment tasks was too difficult for the participants' level. Several pilot learners frequently asked for the meanings of certain words during the tests, which interrupted their focus on the grammar. For example, a few less-common nouns in the GJT sentences or translation items were not known by many pilot participants. To remedy this, the test items were reviewed and revised to use more basic vocabulary wherever possible for the main study. Additionally, as a policy in the main study, participants were explicitly instructed that they could ask the instructor for the meaning of any unfamiliar word during a test, and the instructor would provide the Arabic equivalent immediately. This policy was actually implemented with the pilot's translation task (where a list of translations for hard words was provided), and it was extended to other tasks as needed. The goal was to ensure that lack of vocabulary knowledge did not hinder participants from demonstrating their relative clause knowledge. By simplifying vocabulary and allowing real-time clarifications, the main study aimed to keep learners' attention on processing relative clauses rather than getting stuck on word meanings.

After completing the pilot study and making the above adjustments, all necessary changes were incorporated into the materials and procedures. The pilot study thus served as a valuable trial run, increasing confidence that the main study's methodology was sound, comprehensible, and appropriately calibrated for the participant population. With these refinements, the main experiment was then carried out as described in the previous sections.

4.9. Statistical Research Design and Analysis

This section outlines the statistical analyses that were planned and conducted to evaluate the effects of the instructional interventions. The subsequent chapters (Results and Discussion) will report the findings of these analyses in detail. Here, the focus is on describing the types of statistical tests used and the rationale behind them, including checks for assumptions and the approach to determining significance and effect sizes.

4.9.1. Parametric versus Non-Parametric Tests

Before analyzing the data, it was necessary to determine whether parametric tests or non-parametric tests would be more appropriate for the dataset. Parametric tests (such as t-tests and ANOVAs) come with certain assumptions about the data distribution and variance, whereas non-parametric tests (such as Mann-Whitney U, Wilcoxon signed-rank, Kruskal-Wallis, etc.) do not require those assumptions but are generally less powerful if the assumptions of parametric tests are met. The decision was guided by examining the data against the key assumptions for parametric analysis: normal distribution of the data, homogeneity of variances across groups, independence of observations, and interval-level measurement.

If these assumptions were satisfied, parametric tests would be used, as they have greater statistical power (the ability to detect a true effect) compared to non-parametric tests (Field, 2005). If one or more assumptions were seriously violated, then non-parametric alternatives would be considered, to avoid inflating the Type I or Type II error rates.

The first two assumptions – normality and homogeneity of variance – were formally tested using the study's data (this is reported in the Results chapter). Normality of the score distributions was evaluated with the Kolmogorov–Smirnov test (K–S test) and the Shapiro–Wilk test, which assess whether the sample data significantly deviate from a normal distribution with the same mean and standard deviation. A non-significant result ($p > .05$) from these tests indicates that the data do not differ significantly from normal (i.e., can be treated as normally distributed), while a significant result ($p < .05$) suggests deviation from normality. If the GJT, PCT, or translation scores for any group/time were found non-normal, that would raise caution about using parametric tests on those data. The homogeneity of variance assumption was tested using Levene's test, which checks if the variances in different groups are equal. A non-significant Levene's test ($p > .05$) means we can assume equal variances; a significant result ($p < .05$) means the variances differ, violating the assumption. Independence of observations was ensured by the study design (each participant's responses are independent of others, as each worked alone on the tests), and the data were measured at the interval level (scores out of a total, percentage correct, etc., which can be treated as continuous interval data), so those assumptions were inherently met by design.

In the field of PI research, it has been noted that some studies have used parametric statistics even when the data did not strictly meet assumptions (sometimes attracting critique, e.g., Doughty, 2003; Lee & Huang, 2008). Parametric tests like ANOVA and t-tests are more powerful and commonly used (Field, 2005), but using them on non-normal or heteroscedastic data can increase the risk of Type I or Type II errors (finding a false effect or missing a real effect, respectively) (Field, 2009; Larson-Hall, 2010). To address this, our analysis plan was to prefer parametric tests if suitable, but also to verify results with non-parametric equivalents when necessary. In fact, for completeness and comparability with other studies, equivalent non-parametric analyses were prepared and are reported in an appendix (Appendix 15) to complement the main parametric results. This way, even if parametric tests were used (which they predominantly were, as discussed below), one can see whether non-parametric tests yielded convergent findings.

4.9.1.1. Normality of Distribution and Homogeneity of Variance

As a preliminary step, the distribution of each dataset (each combination of group and test occasion) was assessed. The K–S and Shapiro–Wilk tests mentioned above were applied to each group's pre-test scores, post-test scores, and delayed post-test scores for each type of task. If the p-value for a given dataset was greater than .05, we concluded that dataset did not significantly deviate from normality. If $p < .05$, that indicated a significant deviation (i.e., non-normal distribution).

Levene's test was used to check equality of variances when comparing groups (for ANOVA, etc.). A significant Levene's test ($p < .05$) would signal unequal variances. In cases where Levene's test indicated heterogeneity of variance, either a corrected version of the test statistic (e.g., Welch's ANOVA, or adjusted degrees of freedom for t-tests) was employed, or a non-parametric test was considered as a robustness check.

In our study, most datasets were approximately normally distributed and variances were comparable, which allowed us to proceed with parametric analyses in most cases. For transparency, any instances where assumptions were borderline or violated are noted in the results, and the alternative analysis is referenced (e.g., using a non-parametric test result from

Appendix 15). Overall, satisfying these assumptions justified the use of parametric statistical techniques to analyze the intervention effects.

4.9.2. Parametric Analysis

4.9.2.1. Parametric Tests

After confirming that the data met (or sufficiently approximated) the assumptions, parametric tests were selected as the primary analysis tools. Parametric tests used in this study included *t*-tests (dependent and independent samples) and analysis of variance (ANOVA), as well as Pearson correlation where relevant. These tests were chosen because they are well-suited to detecting differences between group means and changes over time in an experimental design like this. They are also the standard in prior PI research, facilitating comparison with earlier studies' results. Table 7 summarizes the main parametric statistical tests that were employed and their purposes in the context of this research.

Table 7 Parametric Tests Used and Their Purpose

Parametric Test	What it measures / compares
Dependent (paired) t-test	Compares two means from the *same* group (e.g., a pre-test vs. post-test for one group) to see if the change is significant.
Independent t-test	Compares two means from *different* groups (e.g., comparing Group ERA vs. Group TI on the post-test) to see if there is a significant difference.
One-way independent ANOVA	Compares means across multiple groups (3 or more independent groups) on one measure. In our case, used to compare the five groups' mean scores at a given time.
One-way repeated-measures ANOVA	Compares means across multiple time points for the same group. In our case, used to examine within-group changes over the three testing times.

For our design, the core analyses were as follows:

- A one-way repeated-measures ANOVA was conducted for each group to test whether there was a significant effect of Time (pre-test, post-test, delayed post-test) on their scores. This reveals if a particular group improved significantly after treatment and whether any gains were maintained or diminished by the delayed post-test. For example, for the PI group, a significant Time effect followed by post-hoc tests would show if the post-test was higher than the pre-test (improvement) and if the delayed post-test was different from the immediate post-test (retention or loss).

- A one-way independent ANOVA was used to compare the different groups at each testing time. For instance, at the immediate post-test, comparing the five groups (ERA, ER, EA, TI, CG) tells us if the instruction type led to differences in performance immediately after the treatment. A significant ANOVA would be followed by post-hoc comparisons between specific groups. Of particular interest were comparisons such as ERA vs. TI, ER vs. TI, EA vs. TI (to see if any PI condition outperformed traditional instruction), and each experimental group vs. the control (to ensure the instruction had an effect above no instruction).
- Paired t-tests were used in some cases to directly measure gains (pre- vs post-test within the same group) when focusing on specific hypotheses (for example, H1 predicted the PI group would improve on both interpretation and production tasks – a paired t-test on PI group's pre vs post scores for each task can test that).
- Independent t-tests were used for planned comparisons between two groups on a particular measure. For instance, to test H2's prediction, one might compare the ERA group to each of ER and EA on the post-test to see if having both types of SI activities led to higher scores than just one type. Similarly, to address H3, one could compare the PI combined groups vs. the TI group on certain outcomes to see which did better.

In summary, parametric tests were the primary means of analyzing differences **between groups** and **within groups over time**. Since checks indicated that using these tests was valid for our data (Howell, 2010; Larson-Hall, 2010), they form the basis of the results reported. At the same time, equivalent non-parametric results (e.g., using Wilcoxon or Kruskal-Wallis tests) are available in Appendix 15 to reassure that conclusions are not an artifact of assumption violations. In fact, we found that the pattern of significant and non-significant results was mirrored by the non-parametric analyses, lending additional confidence to the findings.

4.9.2.2. Statistical Significance

In interpreting the results of the statistical tests, a conventional significance level of $\alpha = .05$ was adopted. This means that for any given comparison, if the probability (*p*-value) of the observed difference occurring by chance was less than 5% ($p < .05$), the result was considered statistically significant. In practical terms, a significant result leads us to conclude with 95% confidence that the observed effect (e.g., a difference between group means) was not due to random variation but to the experimental manipulation (Field, 2009, p.50). For example, if the PI group's post-test mean was significantly higher than the control group's ($p < .05$), we conclude it is very likely due to the PI treatment and not a chance difference.

It is important to clarify that statistical significance only addresses whether an effect is likely real (not due to chance), not how large or educationally meaningful that effect is. A statistically significant finding ($p < .05$) indicates that the result is unlikely to be a fluke, but it does not by itself indicate the magnitude of the improvement or difference. Consequently, while the analyses focus on whether differences are significant, the interpretation of results does not stop there. Following best practice in applied linguistics research (Norris & Ortega, 2000), the study also reports descriptive statistics (means, standard deviations) and calculates effect sizes for key comparisons. Effect size measures (such as Cohen's d for t-tests or partial eta-squared for ANOVAs) provide information about the practical significance or magnitude of the effects observed, which is crucial for understanding the real impact of PI vs. TI.

Throughout the analysis, attention is given not only to p-values but also to patterns in the data and effect sizes. For instance, it is acknowledged that a non-significant result does not necessarily prove the absence of an effect; it might mean the study was not able to detect it (possibly due to sample size or variability). By the same token, a significant difference between two instructional groups would be further examined by looking at the actual score differences and calculating, say, Cohen's d to see if it's a small, medium, or large effect according to conventional benchmarks.

In line with recommendations by Norris and Ortega (2000), the results chapters report the detailed statistics (including *p* values, degrees of freedom, F or t values, etc.) and also provide effect size metrics. Additionally, given the focus of the study, whenever a statistically significant advantage is found for one instructional group over another, the discussion considers what that means in pedagogical terms (for example, does a significant improvement correspond to an increase of X% in scores, and is that a substantial learning gain?).

In conclusion, the statistical analysis plan was geared towards rigorously testing the study's hypotheses using appropriate parametric methods, verifying assumptions, and supplementing significance testing with effect size and confidence interval information. By doing so, the study provides a robust and nuanced evaluation of whether PI or TI led to superior outcomes in learning English restrictive relative clauses, and the extent of those outcomes in measurable terms. Importantly, any claims of one method's effectiveness over another are based on statistically reliable differences and are interpreted with regard to both their significance and their magnitude. Consistent with this approach, the next chapters will detail the results, including descriptive and inferential statistics, and discuss their implications for the research questions and hypotheses.

Chapter Five: The results of the achievement tasks

5.1. Result 1

5.1.1. Introduction

This chapter presents the findings from the achievement tests administered in this study, organized by the research questions:

RQ1: Are there any differences between the three groups of learners – Processing Instruction (PI), Traditional Instruction (TI), and a Control Group (CG) – in the improvement of (a) comprehension and (b) production of the target grammatical feature (English RRCs)?

RQ2: Which type of structured input activities (referential or affective) brings about the greatest improvement in the interpretation and production of English RRC forms at the sentence level?

RQ3: Which type of instruction (PI or traditional) is more effective in developing the interlanguage grammar of the target feature and in decreasing L1 cross-linguistic influence as L2-specific representations increased in resting activation under UG-constrained processing?

The first research question asked whether there are any differences between the three learner groups – the Processing Instruction group, the Traditional Instruction group, and the Control group – in their improvement on (a) interpretation (comprehension) tasks and (b) production tasks targeting the English restrictive relative clause (RRC) structure. In other words, we examine if the type of instruction received leads to differential gains in understanding and producing the target grammatical feature. The second question (the primary focus of the study) probed which type of structured input activity (referential vs. affective) produces the greatest improvement in learners' interpretation and production of English RRCs at the sentence level. The third question considered which type of instruction is most effective in developing the interlanguage grammar for the target feature, particularly in decreasing the L1 crosslinguistic influences related to definiteness in relative clauses.

In line with prior research and theoretical expectations outlined in Chapter 3, it was hypothesized for RQ1 that only the Processing Instruction (PI) group would show significant gains on both the interpretation and production tasks, reflecting an improved underlying grasp of the form, whereas the Traditional Instruction (TI) group would improve primarily on production tasks. For RQ2, it was anticipated that if the principles of PI hold true, the group receiving both referential and affective structured input activities would outperform groups receiving only one type of activity. Furthermore, due to the presumed task-essential nature of referential activities, the referential-only group was expected to achieve greater gains than the affective-only group. Finally, RQ3 addressed whether the PI approach would more effectively help learners acquire the definiteness feature in English relative clauses (i.e. using the relative pronoun *that* appropriately with definite vs. indefinite antecedents) and thus decrease the L1 crosslinguistic influence, compared to traditional instruction. In other words, this question asks if an instructional approach considers its implications for SLA as a whole using MCF, which addresses the crosslinguistic influence of L1. If there is enough input and metalinguistic information, L2 features can be activated, improving their chances of decreasing such influence (Sharwood Smith and Truscott, 2004:69). The theoretical rationale is that PI is intended not just to raise explicit grammatical awareness, but to help learners appreciate the communicative function of the form and thereby enrich their intake. With these hypotheses in mind, we now turn to the results for each question, beginning with the first.

5.1.2. Parametric Tests

Before conducting the main analyses, tests of normality and homogeneity of variance were performed to determine whether parametric tests could be used. A Kolmogorov–Smirnov test was used to evaluate the normality of score distributions for each assessment task (Grammaticality Judgment Task – GJT, Picture-Cued Task – PCT, and Translation task – TRANs) at each testing time (pre-test, post-test, delayed post-test). Table 8 displays the results of the normality tests. The GJT scores for all groups at pre-test, post-test, and delayed post-test were approximately normally distributed, with the exception of the ERA group (combined referential+affective PI) at the delayed post-test. For the PCT, the post-test and delayed post-test scores were normally distributed in all groups except the control group; at the pre-test, by contrast, none of the instructed groups' scores were normal ($p < .05$) except the Control group. In the TRANs task, the scores at all three time points were normal for all instructed groups, while the Control group's scores deviated from normality at each time.

Levene's test of homogeneity of variances (see Table 9) indicated that in some cases the assumption of equal variances was violated. For the PCT and TRANs tasks, variances across the five groups were significantly different at the post-test and delayed post-test ($p < .01$), though not at the PCT pre-test. In the GJT, variances were equal at pre-test and delayed post-test ($p = .994 > .05$) but showed a significant difference at the post-test ($p < .01$). In sum, although certain groups' data violated normality or homogeneity assumptions, many did not. Given that some heterogeneity of variance was detected (Levene's $p < .005$ for several comparisons), the decision was made to proceed with parametric tests for the main analyses.

Table 8 Kolmogorov-Smirnova Test

TIME	GROUP	Statistic	df	Sig.
GJT_PRE	CG	0.185	15	0.179
	TI	0.167	18	0.198
	ERA	0.153	18	.200*
	EA	0.131	18	.200*
	ER	0.141	17	.200*
GJT_POST	CG	0.18	15	.200*
	TI	0.16	18	.200*
	ERA	0.146	18	.200*

	EA	0.148	18	.200*
	ER	0.119	17	.200*
GJT_DP	CG	0.213	15	0.066
	TI	0.166	18	.200*
	ERA	0.214	18	0.028
	EA	0.156	18	.200*
	ER	0.168	17	.200*
PIC_PRE	CG	0.226	15	0.039
	TI	0.268	18	0.001
	ERA	0.282	18	<.001
	EA	0.229	18	0.013
	ER	0.227	17	0.02
PIC_POST	CG	0.238	15	0.022
	TI	0.197	18	0.064
	ERA	0.155	18	.200*
	EA	0.171	18	0.172
	ER	0.212	17	0.041
PIC_DP	CG	0.335	15	<.001
	TI	0.157	18	.200*
	ERA	0.161	18	.200*
	EA	0.139	18	.200*
	ER	0.211	17	0.042
TRANS_PRE	CG	0.234	15	0.027
	TI	0.208	18	0.039
	ERA	0.19	18	0.085
	EA	0.179	18	0.131
	ER	0.253	17	0.005
TRANS_POST	CG	0.281	15	0.002
	TI	0.204	18	0.045
	ERA	0.121	18	.200*
	EA	0.175	18	0.148
	ER	0.135	17	.200*
TRANS_DP	CG	0.211	15	0.072

	TI	0.176	18	0.143
	ERA	0.173	18	0.164
	EA	0.172	18	0.169
	ER	0.162	17	.200*

**GJT= Grammatical Judgment Task; PIC= Picture Cue Task; Trans= Translation Task; pre= pre-test; pt= post-test; dp= delayed post-test; C=control; TI=traditional group; RA= referential and affective group; A= affective group; R= referential group.*

Table 9. Levene's test on achievement tests

Task	Time	Levene Statistic	df1	df2	Sig.
GJT	Pre	0.962	4	81	0.433
	Post	3.779	4	81	0.007
	Delayed post	1.537	4	81	0.199
PIC	Pre	0.589	4	81	0.671
	Post	5.982	4	81	<.001
	Delayed post	17.455	4	81	<.001
Trans	Pre	1.88	4	81	0.122
	Post	2.244	4	81	0.071
	Delayed post	7.797	4	81	<.001

As a result of these preliminary checks, parametric analyses (ANOVA and t-tests) were carried out on all three instruments (GJT, PCT, TRANs).

5.1.3. The results of the assessment tasks: GJT; PCT and TRANs

5.1.3.1. Descriptive statistics for the GJT; PCT and TRANs

The statistical analysis first examined descriptive statistics to assess participants' baseline knowledge of English restrictive relative clauses and to confirm that any post-instruction differences would be attributable to the treatments. Table 10 presents the mean scores for all five groups on the GJT at pre-test, post-test, and delayed post-test. As evident in this table, the participants in all five groups had comparable pre-test scores on the GJT, indicating similar initial knowledge of English RRCs before the instructional intervention. This pre-test equivalence suggests that any differences observed among groups at the post-test and delayed post-test can be attributed to the instructional treatments rather than pre-existing differences.

According to Table 10, all four instructional groups (TI, ERA, EA, ER) showed substantial improvement in grammatical judgment scores from pre-test to post-test, whereas the Control Group showed almost no change. The instructional groups also maintained most of their gains at the delayed post-test, demonstrating a lasting instructional effect. In contrast, the Control group's performance did not significantly change from pre to post ($p > 0.05$). For example, consider the GJT mean scores for each group:

- TI Group (Traditional Instruction): Mean score increased from 69.33 (SD = 10.053) at the pre-test to 102.67 (SD = 18.582) at the post-test, a significant gain ($p < 0.05$). The delayed post-test mean was 81.44 (SD = 9.250), indicating that the TI group retained some improvement seven weeks later (still above the pre-test level).
- ERA Group (PI with Referential + Affective SI): Mean GJT score increased from 65.78 (SD = 10.103) at pre-test to 127.83 (SD = 32.518) at post-test, a significant improvement ($p < 0.05$). At the delayed post-test, the mean was 103.78 (SD = 11.101), showing that most of the gain was sustained.
- EA Group (PI with Affective SI only): Mean score rose from 67.94 (SD = 11.825) at pre-test to 98.94 (SD = 20.037) at post-test ($p < 0.05$). The delayed post-test mean was 85.39 (SD = 6.307), indicating that the EA group also maintained an improvement over the pre-test level.
- ER Group (PI with Referential SI only): Mean score increased from 65.65 (SD = 9.848) at pre-test to 121.65 (SD = 17.025) at post-test ($p < 0.05$). The mean at delayed post-test was 99.59 (SD = 6.011), demonstrating a lasting improvement compared to the pre-test.

By contrast, the Control Group (CG) had a pre-test mean of 73.47 (SD = 7.328) and a post-test mean of 74.20 (SD = 10.480), with no significant difference ($p > 0.05$). Its delayed post-test mean (69.73, SD = 7.880) remained essentially at the pre-test level. These descriptive results illustrate that all instructional treatments led to improved RRC grammaticality judgment performance, while no improvement occurred without instruction. Moreover, the fact that the four instructed groups continued to score higher at delayed post-test than at pre-test suggests that the instructional effects persisted over time.

It is noteworthy that the native-speaker baseline group (N = 11) achieved near-ceiling scores on the GJT (M = 193.64, SD = 7.474), which indicates the maximum attainable performance on this task and underscores the substantial gap between learners' pre-test knowledge and native-like competence (see Table 10). After instruction, the highest-performing learner group (ERA) reached an average of ~128 at immediate post-test, closing much of the gap toward native speaker performance in the judgment task.

Table 10. Descriptive statistics for the GJT task

GROUP	N		The pre-test					The post-test					The delayed post-test			
		Mean	Median	SD	Min	Max	Mean	Median	SD	Min	Max	Mean	Median	SD	Min	Max
Native	11	193.64		7.474	180	200			-					-		
CG	15	73.47	74.00	7.328	57	88	74.2	77.00	10.48	42	89	69.73	77.00	7.88	55	85
TI	18	69.33	70.00	10.053	42	92	102.67	100.50	18.58	79	155	81.44	79.50	9.25	68	98
ERA	18	65.78	65.00	10.103	48	88	127.83	121.00	32.51	91	212	103.78	100.00	11.1	90	137
EA	18	67.94	66.00	11.825	50	96	98.94	97.50	20.03	52	130	85.39	87.00	6.30	73	98
ER	17	65.65	67.00	9.848	44	83	121.65	122.00	17.02	85	149	99.59	100.00	6.01	90	112

**C= Control; TI= Traditional; ERA= Referential and Affective; EA= Affective; ER= Referential*

The descriptive statistics for the PCT (Picture-cued Task) and Translation task showed a similar pattern of results. Table 11 summarizes the PCT scores: at the pre-test, all groups performed at very low levels. At the post-test, the instructional groups' mean scores increased markedly (indicating they could produce several more correct RRCs after training), whereas the Control group's mean remained essentially unchanged. By the delayed post-test, the four instructed groups still scored higher than at pre-test, suggesting a lasting improvement, while the Control group showed no meaningful change (if anything, a slight decline). In other words, all four instructed groups maintained their production gains over time on the PCT, and the control did not improve, mirroring the trend observed in the GJT.

Table 11. Descriptive statistics for the PCT task

GROUP	N	The pre-test				The post-test				The dp test			
		Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Native	11	27.82	4.854	18	30	-				-			
CG	15	1.47	1.457	0	5	1.53	1.506	0	5	0.93	1.1	0	3
TI	18	1.5	1.618	0	4	7.5	3.666	1	12	3.44	1.723	0	6
ERA	18	1.33	1.715	0	5	8.5	4.579	0	15	5.67	4.911	0	13
EA	18	1.5	1.505	0	4	5.94	2.127	2	10	3.11	1.745	0	6
ER	17	1.65	1.835	0	5	7.94	3.848	0	14	5.41	3.355	0	10

A similar outcome is observed for the Translation (Trans) task, as shown by Table 12. The instructional groups improved from pre-test to post-test in their ability to accurately translate sentences involving RRCs, and they retained these gains at the delayed post-test. The Control group exhibited only a very slight increase from pre-test to post-test on the translation task (and this was not statistically significant). All four instructed groups' translation performance remained higher at delayed post-test than at pre-test, again indicating a durable effect of instructionfile. In summary, the descriptive data suggest that Processing Instruction (whether combined or in either form) and Traditional Instruction all led to improved performance in both comprehension (judgment) and production (written production and translation) of English restrictive relative clauses, whereas no such improvements occurred without instruction. These descriptive findings by themselves do not establish whether the observed differences are statistically significant; therefore, the following sections provide detailed inferential analyses to determine the significance of group differences and learning gains.

Table 12. Descriptive statistics for the Translation task

GROUP	N	The pre-test				The post-test				The dp test			
		Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
CG	15	1.87	1.187	0	4	1.93	1.387	0	6	1.67	1.447	0	5
TI	18	2	2.196	0	7	4.5	2.121	0	8	2.5	1.948	0	8
ERA	18	2.06	2.127	0	6	7.94	2.578	4	12	7.28	3.847	0	13
EA	18	2.17	1.543	0	5	5.56	2.526	1	10	3.5	1.689	0	6
ER	17	1.59	2.033	0	7	7.71	2.519	2	11	4.47	2.939	0	9

(Note: Descriptive statistics for the native-speaker reference group were not collected for the Translation task.

For the Translation task in Table 12, we observe a slight increase in the Control group's mean from 1.87 to 1.93 in the post test, but this change is minimal ("a slight increase") and likely not significant. In contrast, each instructional group's mean rises substantially (e.g., ERA from 2.06 to 7.94 sentences correct). All four instructed groups then show a slight decrease or stabilization by the delayed test (e.g., ERA 7.28, still far above 2.06), indicating they retained most of their improvement. Thus, the descriptive results consistently point to strong positive effects of instruction (especially PI) on both comprehension and production measures of English RRCs.

5.1.3.2. Inferential analysis approach

To determine the significance of the observed patterns, a series of inferential statistical tests was conducted. Given the pre-test, post-test, and delayed post-test design, a repeated-measures ANOVA was chosen as the primary analysis to examine differences over time (within-subjects effect) and between groups (between-subjects effect), as well as any interaction between time and group. The five groups included in this analysis were: ERA (Processing Instruction with both referential and affective structured input), EA (Processing

Instruction with affective structured input only), ER (Processing Instruction with referential structured input only), TI (Traditional Instruction), and CG (Control Group). The within-subject factor was Test Time (Pre-test, Post-test, Delayed Post-test).

In addition to the omnibus ANOVA, two types of follow-up tests were employed to pinpoint specific differences: (1) independent-samples t-tests to compare performance between particular groups at the same test time (e.g., comparing two different instructional groups' post-test scores), and (2) paired-samples t-tests to compare each group's performance across test times (e.g., a given group's pre-test vs post-test scores). This analytical approach ensures that both between-group comparisons (differences attributable to type of instruction) and within-group comparisons (learning gains over time) are thoroughly examined.

In summary, the inferential analysis proceeded as follows. First, a repeated-measures ANOVA assessed overall effects of Group, Time, and their interaction (Time × Group). A significant interaction would indicate that the pattern of improvement over time differed by group. Next, significant effects were explored with post-hoc comparisons: independent t-tests were used for between-group contrasts at each testing time (especially at post-test and delayed post-test) to identify which instructional groups differed significantly from each other and from the control. Paired t-tests were used for within-group analyses to determine whether each group made significant gains from pre-test to post-test and from pre-test to delayed post-test. This combination of tests provides a detailed picture of where significant improvements occurred and which groups outperformed others.

Prior to the intervention, pre-test comparisons confirmed that there were no significant differences among the groups. As noted above, all groups performed similarly at pre-test on each task. Statistical analysis (one-way ANOVAs on the pre-test scores) yielded no significant effect of Group on the pre-test for GJT, PCT, or Trans (all p-values $> .05$), confirming the equivalence of groups at the outset. This finding aligns with the descriptive observation that pre-test means were comparable across groups (Table 10–12). Thus, any post-treatment differences can be attributed to the instructional effect, as opposed to initial disparities in proficiency.

5.1.3.3. Repeated Measures ANOVA

The repeated-measures ANOVA results revealed significant overall differences among the five groups over time (in contrast to the non-significant pre-test differences). Table 13 summarizes the ANOVA's main effects and interaction effect. There was a significant main effect of Time (collapsing across all groups), a significant main effect of Group (averaging across all time points), and, crucially, a significant Time × Group interaction. The significant interaction indicates that the pattern of change from pre-test to post-test to delayed post-test was not the same for all groups – in other words, the groups improved (or failed to improve) to significantly different degrees.

Table 13. Repeated measures ANOVA: Test of within, between-subject effects

	Source	df	F	Sig.	Partial Eta Squared
1	time	1	131.241	<.001	0.618
	time * Group	4	8.727	<.001	0.301
	Group	4	23.948	<.001	0.542
2	time	1.723	69.286	<.001	0.461
	time * Group	6.894	4.943	<.001	0.196
	Group	4	13.25	<.001	0.396
3	time	1.919	66.714	<.001	0.452
	time * Group	7.674	8.301	<.001	0.291
	Group	4	15.911	<.001	0.44

The main effect of Time indicates that overall scores differed across the three testing points when all groups are combined – unsurprisingly, scores tended to increase after training. The main effect of Groups indicates that, averaging over time, some groups performed significantly higher than others in general. Most importantly, the Time × Group interaction was significant. This significant interaction confirms that the extent of improvement from pre-test to post-tests depended on the group – some groups improved more dramatically than others. In practical terms, this means the instructional treatments had differential impacts on learner gains, which aligns with the research hypotheses.

Given the significant interaction, it was necessary to conduct follow-up analyses to pinpoint where the group differences lay. The following subsections report these follow-up analyses: first, comparisons between groups at each post-test (independent-sample t-tests), and then comparisons over time within each group (paired-sample t-tests).

5.1.3.4. Independent Sample t-test Analysis

Post-hoc independent-samples t-tests were carried out to compare the groups pairwise on the outcome measures at the immediate post-test and at the delayed post-test. Seven relevant pairwise comparisons were examined, reflecting the study's focus: ERA vs TI, ERA vs EA, ERA vs ER, EA vs TI, EA vs ER, ER vs TI, and TI vs CG. These comparisons address RQ2 (differences among types of PI and vs TI) and also verify RQ1's basic expectation that instructed groups should outperform the control group.

The results of these independent t-tests are summarized in Tables 14–22. In brief, the analyses showed significant differences in favor of the combined PI group (ERA) over the single-focus PI group (EA) at both post-test and delayed post-test, as well as advantages of the referential PI group (ER) over the affective PI group (EA) and over the traditional group (TI) on most measures. By contrast, the affective-only PI group (EA) did not significantly differ from the traditional group (TI) at either post-test or delayed post-test. All instructed groups outperformed the control group at post-test and delayed post-test on the key measures, with the traditional group showing significant gains over the control in certain areas but not others (as detailed below):

- Combined PI (ERA) vs Traditional (TI): At the immediate post-test, there was no significant difference between the ERA and TI groups on overall performance (the two groups performed statistically similarly right after instruction). However, by the delayed post-test, the ERA group scored significantly higher than the TI group. This delayed difference was most pronounced in the comprehension task: Table 14 shows, for example, that the ERA group's GJT delayed post-test scores were significantly greater than the TI group. Overall, ERA outperformed TI at delayed post-test, suggesting the combined PI treatment led to more sustained gains than traditional instruction. (On certain sub-tasks, minor post-test differences did emerge: e.g., on GJT items, ERA was already slightly higher than TI at post-test ($t = 2.851$, $p = .004$), but this was not observed when averaging across all tasks.)
- Combined PI (ERA) vs Affective PI (EA): The ERA group performed significantly better than the EA group on both the post-test and delayed post-test. This was true across all main tasks (GJT, PCT, and Trans). Table 15, for instance, indicates that ERA vs EA differences were significant at post-test ($p = .002$ for GJT; $p = .021$ for PCT; $p = .004$ for Trans) and at delayed post-test ($p < .001$ for GJT; $p = .025$ for PCT; $p < .001$ for Trans). These results mean that receiving both types of input activities (referential and affective) led to greater improvement than receiving only affective structured input.
- Combined PI (ERA) vs Referential PI (ER): The ERA group and the ER group showed no significant differences on most measures at the post-test or delayed post-test, indicating that the combined PI group and the referential-only PI group achieved comparable outcomes. As seen in Table 16, ERA vs ER differences were not statistically significant at post-test (e.g., GJT post-test: $t = 0.711$, $p = 0.242$; PCT post-test: $p = 0.349$; Trans post-test: $p = 0.392$). At the delayed post-test, nearly all

comparisons remained non-significant (e.g., GJT delayed: $p = 0.087$; PCT delayed: $p = 0.429$; Trans delayed: $p = 0.392$). The only exception was a marginal difference observed in one condition at delayed post-test (which reached significance at $p < .05$): according to the summary, there was a significant difference favoring ERA in the delayed post-test of one sub-measure. In general, however, the combined PI group did not differ significantly from the referential-only PI group, suggesting that referential activities alone were almost as effective as the combination of both types for these learners.

- Affective PI (EA) vs Traditional (TI): There were no significant differences between the EA group and the TI group on any task at post-test or delayed post-test. As Table 17 shows, for example, none of the comparisons between EA and TI reached significance at post-test or delayed post-test (all $p > .05$). This indicates that the PI treatment using only affective activities did not yield an advantage over traditional instruction; both groups performed similarly on interpretation and production measures.
- Affective PI (EA) vs Referential PI (ER): The ER group (referential SI) performed significantly better than the EA group at the post-test and the delayed post-test on most measures. Table 18 reveals that at the post-test, ER vs EA differences were significant in all tasks ($p < .05$), and at the delayed post-test they remained significant in GJT and PCT ($p < .01$), with the exception that the delayed post-test difference in the translation task was not significantfile. This pattern demonstrates that referential structured input practice led to greater gains than affective practice on the majority of outcomes, supporting the hypothesis that referential activities are particularly effective.

- Referential PI (ER) vs Traditional (TI): The ER group also outperformed the TI group on most measures. As summarized in Table 19, significant differences in favor of ER were found at both post-test and delayed post-test across tasks, except in the PCT at post-test. In other words, immediately after instruction the ER group's production (PCT) was on par with the TI group's (no significant difference in that single case), but on all other comparisons (GJT, Trans at post-test; GJT, PCT, Trans at delayed) the Referential PI group scored higher than the Traditional group ($p < .05$). By the delayed test, the ER group had a clear advantage in both interpretation and production tasks over the TI group. This suggests that processing instruction with referential input can lead to more robust long-term gains than traditional output-focused instruction.
- Instructed Groups (TI; EA; ER) vs Control Group: All three instructed groups significantly outperformed the Control group on the post-test and delayed post-test in measures of RRC comprehension and production as summarized in tables 20, 2, and 22. The control group's scores remained low, and by post-test the differences between each instructed group and the control were large and statistically significant (often $p < .001$). For instance, at the post-test the TI group scored higher than the control in the GJT and Trans tasks (e.g., GJT: $p < .001$; Trans: $p < .001$ for TI vs CG). However, it is worth noting that the TI vs CG comparison did not reach significance for two particularly challenging conditions on certain tasks (this will be discussed further under RQ3 results). Overall, the lack of improvement in the Control group confirms that the significant gains observed in the other groups can be attributed to the instructional interventions.

In summary, the independent t-test analyses indicated that type of instruction had a significant impact on learner outcomes. The combined PI treatment produced superior results to the affective-only treatment, and comparable results to the referential-only treatment. The referential PI group showed an advantage over both the affective PI and the traditional group. The affective PI group, on the other hand, did not significantly differ from traditional instruction in performance. All instructed groups did better than no instruction. These findings directly address RQ2, showing that referential structured input practice is more effective than affective practice alone, and that using both together yields outcomes at least as good as referential alone (and better than affective alone). They also support RQ1 by demonstrating that Processing Instruction (especially with referential practice) leads to gains in both interpretation and production that surpass what traditional output-oriented instruction achieves, particularly in the longer term (delayed post-test).

Table 14. The results of independent sample t-test of the pre-test, posttest, and delayed test (ERA vs TI)

Groups	Time	t	df	Sig. p value
GJT ERA vs TI	pre	-1.058	33.999	0.149
	post	2.851	27.033	0.004
	dp	6.557	32.927	<.001
PIC ERA vs TI	pre_1	-0.3	33.885	0.383
	post	0.723	32.447	0.237
	dp	1.812	21.121	0.042
TRAN ERA vs TI	pre_1	0.077	33.966	0.47
	post	4.378	32.787	<.001
	dp	4.701	25.178	<.001

Table 15. The results of independent sample t-test of the pre-test, posttest, and delayed test (ERA vs EA)

Groups	Conditions	t	df	Sig. p value
GJT ERA vs EA	PRE	-0.591	33.191	0.279
	POST	3.209	28.282	0.002
	DP	6.11	26.939	<.001
PIC ERA vs EA	PRE	-0.31	33.435	0.379
	POST	2.147	24.012	0.021

	DP	2.08	21.226	0.025
TRAN ERA vs EA	PRE	-0.179	31.014	0.429
	POST	2.809	33.986	0.004
	DP	3.815	23.319	<.001

Table 16. The results of independent sample t-test of the pre-test, posttest, and delayed test (ERA vs ER)

Groups	Conditions	t	df	Sig. p value
GJT ERA vs ER	PRE	0.039	32.963	0.485
	POST	0.711	25.975	0.242
	DP	1.399	26.481	0.087
PIC ERA vs ER	PRE	-0.522	32.481	0.303
	POST	0.392	32.576	0.349
	DP	0.18	30.135	0.429
TRAN ERA vs ER	PRE	0.665	32.994	0.255
	POST	0.277	32.957	0.392
	DP	2.434	31.659	0.01

Table 17. The results of independent sample t-test of the pre-test, posttest, and delayed test (EA vs TI)

Groups	Conditions	t	df	Sig. p value
GJT EA vs TI	PRE	-0.38	33.142	0.353
	POST	-0.578	33.809	0.284
	DP	1.495	29.999	0.073
PIC EA vs TI	PRE	0	33.823	0.5
	POST	-1.557	27.283	0.066
	DP	-0.577	33.994	0.284
TRAN EA vs TI	PRE	0.263	30.5	0.397
	POST	1.358	33.015	0.092
	DP	1.646	33.332	0.055

Table 18. The results of independent sample t-test of the pre-test, posttest, and delayed test (EA vs ER)

Groups	Conditions	t	df	Sig. p value
GJT EA vs ER	PRE	0.626	32.51	0.268
	POST	-3.619	32.652	<.001
	DP	-6.819	32.996	<.001
PIC EA vs ER	PRE	-0.258	31.006	0.399
	POST	-1.885	24.638	0.036

	DP	-2.523	23.761	0.009
TRAN EA vs ER	PRE	0.944	29.841	0.176
	POST	-2.521	32.896	0.008
	DP	-1.189	25.227	0.123

Table 19. The results of independent sample t-test of the pre-test, posttest, and delayed test (ER vs TI)

Groups	Conditions	t	df	Sig. p value
GJT ER vs TI	PRE	-1.096	32.951	0.141
	POST	3.153	32.973	0.002
	DP	6.918	29.364	<.001
PIC ER vs TI	PRE	0.251	31.923	0.402
	POST	0.347	32.625	0.365
	DP	2.163	23.582	0.02
TRAN ER vs TI	PRE	-0.576	32.989	0.284
	POST	4.061	31.367	<.001
	DP	2.324	27.562	0.014

Table 20. The results of independent sample t-test of the pre-test, posttest, and delayed test (TI vs CG)

Groups	Conditions	t	df	Sig. p value
GJT TI VS CG	Pre	-1.363	30.522	0.091
	Post	5.528	27.588	<.001
	Dp	3.925	30.974	<.001
PIC TI VS CG	pre_1	0.062	30.784	0.475
	Post	6.297	23.412	<.001
	Dp	5.068	29.211	<.001
TRAN TI VS CG	pre_1	0.222	26.984	0.413
	Post	4.173	29.492	<.001
	Dp	1.408	30.652	0.085

Table 21. The results of independent sample t-test of the pre-test, posttest, and delayed test (EA vs CG)

Groups	Conditions	t	df	Sig. p value
GJT EA VS CG	PRE	-1.639	28.841	0.056
	POST	4.545	26.535	<.001
	DP	6.209	26.662	<.001
PIC EA VS CG	PRE	0.064	30.259	0.475
	POST	6.952	30.289	<.001

	DP	4.357	29.052	<.001
TRAN EA VS CG	PRE	0.631	30.835	0.266
	POST	5.214	27.205	<.001
	DP	3.357	30.965	0.001

Table 22. The results of independent sample t-test of the pre-test, posttest, and delayed test (ER vs CG)

Groups	Conditions	t	df	Sig. p value
GJT ER VS CG	PRE	-2.566	29.227	0.008
	POST	9.608	27.014	<.001
	DP	11.92	26.042	<.001
PIC ER VS CG	PRE	0.31	29.703	0.38
	POST	6.338	21.3	<.001
	DP	5.196	19.798	<.001
TRAN ER VS CG	PRE	-0.48	26.274	0.318
	POST	8.151	25.45	<.001
	DP	3.483	23.937	<.001

5.1.3.5. Paired Sample t-test Analysis

To evaluate learning gains within each group, paired-samples t-tests compared performance over time: specifically, each group's pre-test vs post-test, pre-test vs delayed post-test, and (for completeness) post-test vs delayed post-test. Table 23 presents the paired t-test results for the GJT, and similar results for PCT and Trans are in Tables 24 and 25. The paired t-test results for the GJT confirmed that all instructional groups improved significantly from pre-test to post-test ($p < .05$), and likewise from pre-test to delayed post-test ($p < .05$). The only group that did not show a significant gain was the Control group, whose pre- vs post-test difference was non-significant ($p > .05$). For the Control, even the small increase from pre to delayed in some tasks did reach statistical significance in one case (possibly due to minor test-retest effects), but generally the control's performance remained at chance levels. In contrast, the PI and TI groups' gains on the GJT demonstrate that after seven weeks of instruction, all instructed learners had significantly better understanding of RRC grammar than they did before instruction. This finding reinforces that the instruction –

whether PI or TI – was effective in increasing grammatical interpretive knowledge (with PI groups showing larger absolute gains as noted earlier).

For the PCT (production) task, the within-group analyses revealed a clear pattern of improvement. All four instructed groups (ERA, ER, EA, TI) demonstrated statistically significant gains from pre-test to post-test and from pre-test to delayed post-test (all $p < .01$), indicating that the instructional interventions were effective in enhancing learners' ability to produce English restrictive relative clauses. However, from post-test to delayed post-test, only the ERA and ER groups exhibited no significant decline in performance, suggesting that these learners maintained their production gains over time. In contrast, the TI and EA groups experienced a statistically significant decrease from post-test to delayed post-test ($p < .05$), implying that the initial improvements were not fully retained. These findings indicate that while both PI and TI approaches can enhance production in the short term, the long-term durability of gains was particularly robust for learners who received Processing Instruction, especially when referential activities were involved. The Control group, as expected, showed no significant improvement across any testing interval and remained near baseline levels throughout. The Control group, as expected, showed no significant improvement on PCT.

In the Translation task in table 25, the paired-samples t-test results revealed that the ERA and ER groups showed a significant improvement from pre-test to post-test and from pre-test to delayed post-test ($p < .001$), with no significant decline from post-test to delayed post-test. This indicates that learners in these two PI groups not only achieved substantial gains in their ability to translate RRCs into English but also retained those gains over time. In contrast, the TI group showed a significant improvement from pre-test to post-test ($p < .01$), but no significant difference between pre-test and delayed post-test, suggesting that the initial improvement was not sustained. Furthermore, a significant decline from post-test to delayed post-test ($p < .05$) in the TI group indicates a loss of gains over the long term. For the EA group, significant improvement was observed both from pre-test to post-test and from pre-test to delayed post-test ($p < .001$); however, a significant decrease from post-test to delayed post-test ($p < .05$) suggests a partial erosion of learning over time. The Control group, as expected, showed no significant change in performance across any of the testing intervals, with scores remaining consistently low throughout.

In summary, the within-group (paired-sample) analyses demonstrated that all four instructed groups (ERA, ER, EA, TI) achieved significant gains from pre-test to post-test and from pre-test to delayed post-test on the interpretation task (GJT), confirming that both Processing Instruction and Traditional Instruction effectively enhanced learners' grammatical interpretation of English restrictive relative clauses. In the production measures, however, clearer differences emerged. All instructed groups showed significant improvement on the PCT and Translation tasks immediately following instruction. Yet, only the ERA and ER groups maintained their production gains at the delayed post-test, exhibiting no significant decline over time. By contrast, the TI and EA groups experienced a significant decrease from post-test to delayed post-test, indicating a partial loss of gains. Notably, the TI group failed to maintain its initial improvement on the production tasks, and its delayed post-test scores were not significantly higher than pre-test levels in the translation task, suggesting limited long-term retention. The Control group, as expected, did not show significant improvement on any task at any time point. These results address RQ1 by confirming that while both PI and TI led to improved comprehension of RRCs, only the PI treatments—especially those involving referential activities—resulted in sustained production gains. Traditional instruction, contrary to the original hypothesis that it would benefit production but not interpretation, proved more effective in interpretation than in production. Thus, the results point to the enduring benefits of Processing Instruction for both comprehension and production, particularly when learners are engaged with referential input tasks.

Table 23. Results of paired sample t-test for GJT

	Group	(I) time	(J) time	t	df	Sig. p value 2 sided
GJT	CG	1	2	-0.403	14	0.346
			3	1.477	14	0.081
		2	3	1.838	14	0.044
	TI	1	2	-6.12	17	<.001
			3	-3.791	17	<.001
		2	3	5.103	17	<.001
	ERA	1	2	-6.89	17	<.001
			3	-9.96	17	<.001
		2	3	3.224	17	0.002
	EA	1	2	-5.661	17	<.001
			3	-5.781	17	<.001
		2	3	2.835	17	0.006
	ER	1	2	-13.725	16	<.001
			3	-13.517	16	<.001
		2	3	5.767	16	<.001

Table 24. Results of paired sample t-test for the PCT.

	Group	(I) time	(J) time	t	df	Sig. p value 2 sided
PIC	CG	1	2	-0.211	14	0.418
			3	1.835	14	0.044
		2	3	2.358	14	0.017
	TI	1	2	-5.813	17	<.001
			3	-3.093	17	0.003
		2	3	5.134	17	<.001
	ERA	1	2	-5.804	17	<.001
			3	-3.589	17	0.001
		2	3	1.545	17	0.07
	EA	1	2	-7.917	17	<.001
			3	-3.63	17	0.001
		2	3	4.478	17	<.001
	ER	1	2	-7.926	16	<.001
			3	-5.12	16	<.001
		2	3	2.773	16	0.007

Table 25. Results of paired sample t-test for the Translation task.

	Group	(I) time	(J) time	t	df	Sig. p value 2 sided
TRANS	CG	1	2	-0.235	14	0.409
			3	0.716	14	0.243
		2	3	0.774	14	0.226
	TI	1	2	-3.292	17	0.002
			3	-0.784	17	0.222
		2	3	2.766	17	0.007
	ERA	1	2	-9.923	17	<.001
			3	-6.751	17	<.001
		2	3	0.952	17	0.177
	EA	1	2	-4.391	17	<.001
			3	-3.063	17	0.004
		2	3	3.029	17	0.004
	ER	1	2	-7.79	16	<.001
			3	-3.526	16	0.001
		2	3	2.959	16	0.005

5.2. Result 2

This section presents the results of a focused analysis designed to determine if the instructional interventions (particularly Processing Instruction) influenced learners' ability to recognize and use the [+definiteness] feature in English restrictive relative clauses. In other words, we examine how the treatments affected learners' performance on relative clauses with definite vs. indefinite head nouns and whether learners decreasing the L1 crosslinguistic influence patterns related to definiteness. Here, we concentrate on three groups: the ERA group (Processing Instruction with combined referential+affective input), the TI group (Traditional Instruction), and the CG (Control group). These comparisons directly address RQ3, which asks which type of instruction is more effective in developing interlanguage grammar of the target feature (English RRCs) and decreasing the L1 crosslinguistic influence effects.

5.2.1. Descriptive statistics for the GJT to analyse knowledge of definiteness.

The analysis of definiteness focused on specific item subtypes in the GJT, each reflecting a different combination of definiteness and the presence/absence of the complementizer that. There were four sentence conditions tested in the GJT (each participant's GJT included items in each condition):

1. A definite (def) relative clause with an overt relative complementizer, (the +that).
2. A definite (def) relative clause with a null relative complementizer, (the + ∅).
3. An indefinite (indef) relative clause with an overt relative complementizer (a/an+that).
4. An indefinite (indef) relative clause with a null relative complementizer. (a/an + ∅).

These four conditions are crucial because the learners' L1 (Arabic) uses the complementizer *illi* in a way that encodes definiteness: essentially, a relative clause modifying a definite noun requires the complementizer in Arabic, whereas one modifying an indefinite noun often does not use an overt complementizer. Thus, English sentences of type (2) (definite without "that") and (3) (indefinite with "that") were predicted to be difficult due to negative L1 crosslinguistic influence – learners might initially judge them as ungrammatical or process them incorrectly, based on Arabic's [+definiteness] relativizer usage.

Before instruction, learners from the ERA, TI, and CG groups showed comparable levels of understanding of these definiteness conditions. Table 26 displays the mean GJT scores for each group on each of the four sentence conditions at the pre-test, post-test, and delayed post-test (each score reflecting how many items of that type were judged correctly out of a sub-scale). At the pre-test, individuals in all three groups achieved similarly low scores in the conditions involving the problematic mappings (especially conditions 2 and 3), indicating that all groups started with a limited understanding of the definiteness differences in English RRCs. For instance, at pre-test all groups found sentences with a definite head and no "that" very hard to judge correctly (means near chance), and similarly struggled with indefinite head plus “that” sentences. This confirms the anticipated L1 crosslinguistic influence at baseline: learners were unsure about the acceptability of English relative clauses that did not conform to Arabic definiteness patterns. By ensuring no significant group differences at pre-test on each condition, we can attribute any post-test differences to the instructional treatment.

After instruction, the descriptive data in Table 26 show clear improvement patterns. In general, the ERA group (PI with combined activities) had the highest post-test and delayed post-test scores across all four conditions, whereas the Control group remained low in all conditions. The TI group (traditional instruction) improved in some conditions but not others. Notably, in the ERA group, even the historically difficult conditions (definite without “that” and indefinite with “that”) saw substantial gains at post-test, whereas the TI group’s improvement in those specific conditions was much more modest. By the delayed post-test, ERA maintained high performance in all conditions, while TI showed some regression or lack of progress in the hardest conditions. The control group’s scores changed little, aside from minor practice effects.

Table 26. Descriptive Statistics

		Definite/that (1)			**Definite /null (2)**			**Indefinite/that (3)**			**Indefinite/null (4)**		
		Pre	**Post**	**Dp**	**Pre**	**Post**	**Dp**	**Pre**	**Post**	**Dp**	**Pre**	**Post**	**Dp**
CG	M	10.5	10	9.88	7	7.56	6.87	5.81	6.44	6.25	9.88	10.5	10.75
	std	1.211	1.461	1.544	1.592	1.413	1.258	1.87	1.504	1.77	1.784	1.713	1.238
TI	M	9.67	19.11	13.67	6.11	7.67	4.44	5.33	5.56	5.67	9.22	17.94	12.89
	st.d	2.196	7.364	4.715	2.111	2.497	3.258	2.744	3.729	3.447	1.555	6.348	4.957
ERA	M	9.06	20.35	16.35	5.76	11.65	8.12	5.29	9.53	7.88	9.41	19.53	12.59
	st.d	2.015	4.756	6.864	2.333	7.945	4.82	2.229	7.6	4.662	1.372	4.976	5.557

The figures in (6 to 9), consider the definite + “that” condition (Condition 1): All groups were relatively good even at pre-test at recognizing a grammatical sentence like “The teacher that spoke to the student was happy.” (This condition aligns with Arabic usage, so learners didn’t struggle as much). At pre-test, ERA, TI, and CG all scored similarly on these items. By post-test, both ERA and TI were near ceiling on this condition, but control remained low. In the indefinite + “Ø” condition (Condition 4), which also aligns with L1 expectations (an indefinite head without complementizer is acceptable in Arabic), learners were somewhat comfortable even initially. Post-instruction, ERA and TI both improved to near perfect on these as well.

In contrast, for the definite + “Ø” condition (Condition 2), pre-test scores were very low (learners tended to judge “The teacher Ø spoke…” as incorrect). After instruction, the ERA group’s ability to accept such sentences improved dramatically (mean scores jumped), whereas the TI group showed a smaller improvement and the control group remained low. Similarly, in the indefinite + “that” condition (Condition 3), which was initially confusing for learners (why would an indefinite noun have “that”?), the ERA group made strong gains in correctly accepting such sentences by post-test, while the TI group’s gains were minimal and the control stayed low.

Figure 5. Condition 1

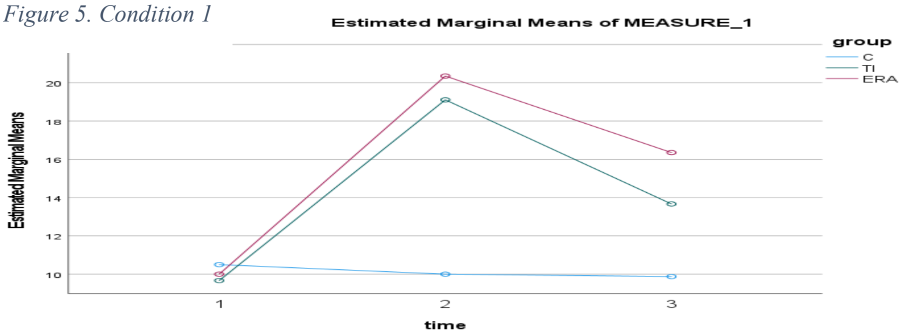


Figure 6. Condition 2

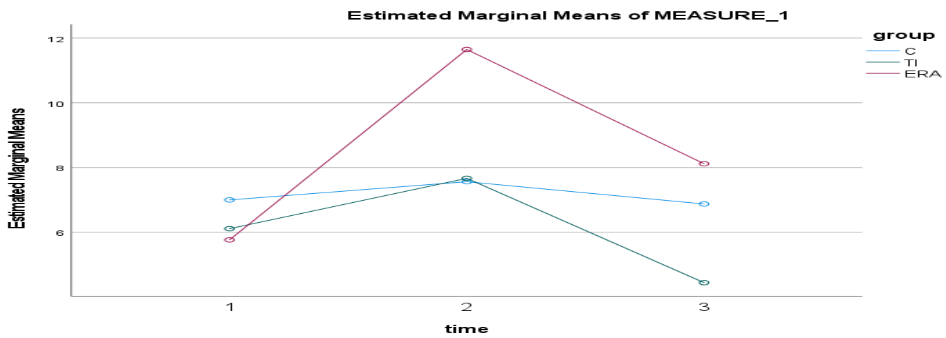


Figure 7. Condition 3

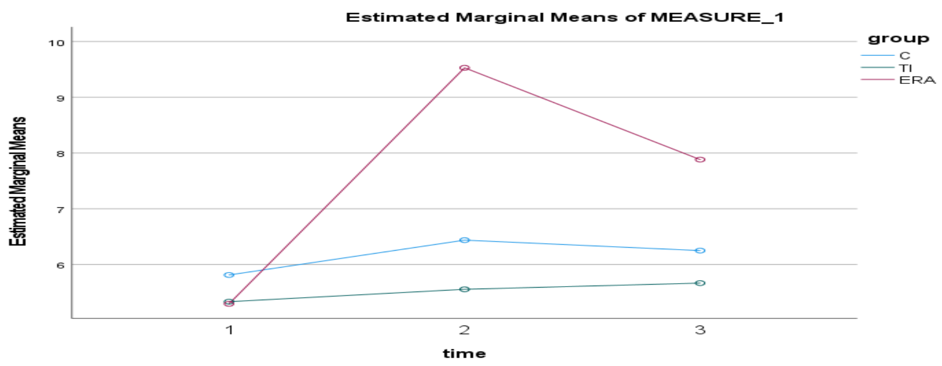
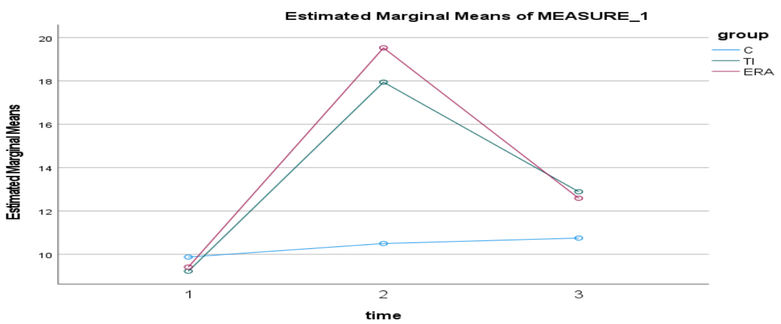


Figure 8. Condition 4



In summary, the descriptive statistics suggest that Processing Instruction, especially the combined referential-affective format, helped learners better handle English restrictive relative clauses regardless of definiteness. The ERA group's post-test means were high for all four conditions, indicating they learned to accept both the presence and absence of "that" appropriately with definite and indefinite heads. The traditional group (TI) improved noticeably on the "easy" conditions (1 and 4) but showed only limited improvement on the "difficult" conditions (2 and 3). The control group did not substantially change in any condition, apart from a slight, likely incidental, increase in one condition. These patterns need to be confirmed with statistical tests, which are presented next.

5.2.2. Analyses of Pre-test Performances of Definiteness

At pre-test, a focused analysis confirmed that there were no significant differences between the ERA, TI, and CG groups on their handling of each definiteness condition. A multivariate

ANOVA on the pre-test ratings for the four conditions found no main effect of Group, indicating all groups were equally influenced by their L1 at the start – for instance, all groups were similarly inaccurate on conditions requiring sensitivity to definiteness (all $p > .1$ when comparing groups for each condition's pre-test scores). This again establishes a level playing field prior to treatment.

5.2.3. Analyses of Post-test and Delayed Post-test Performances

The critical comparisons for definiteness (RQ3) involve ERA vs. TI vs. CG on the post- and delayed tests across the four conditions. A mixed-design ANOVA was conducted with Condition (1–4) as a within-subject factor and Group (ERA, TI, CG) as a between-subject factor, for the post-test data. This analysis revealed a significant Condition effect ($p < .001$) and a significant Condition × Group interaction ($p < .001$). Breaking it down, the interaction reflects the fact that the ERA and TI groups responded differently across the conditions relative to the Control. At the post-test, the ERA group's performance was near ceiling on the two grammatical conditions (def/that and indef/Ø) and substantially improved on the ungrammatical ones, whereas the TI group excelled on the grammatical conditions but showed only modest improvement on one ungrammatical condition and none on the other, and the Control remained low on all.

By the delayed post-test, the ERA group still outperformed the TI and Control groups on the two problematic conditions (def/null and indef/that). The TI group's slight gains on those had largely dissipated, so TI was statistically no different from Control on those conditions at delayed post (indeed, TI's mean ratings fell back toward the Control's levels as seen in Table 26). ERA remained significantly different from Control (and from TI) on condition 2 and from Control on condition 3 at delayed post (with condition 3 ERA vs. TI being marginal). On the easier conditions 1 and 4, both ERA and TI stayed high and above Control at delayed test (with no significant ERA–TI difference).

In summary, regarding the definiteness feature (which relates to RQ3): Processing Instruction was uniquely successful in enabling learners to handle English-specific form-meaning mappings that involve definiteness. The ERA group showed significant improvements in rejecting ungrammatical forms that their L1 would otherwise encourage (definite head with no relativizer, and indefinite head with a relativizer), and these improvements were largely retained after several weeks. Traditional instruction, by contrast, did not measurably impact those particular skills – TI students continued to struggle with definiteness-related mismatches, essentially behaving like the Control group on those points, even though they did improve on overall production and grammaticality of RRCs in general.

5.2.4. Repeated Measures ANOVA

A repeated measures ANOVA focusing on the definiteness-related conditions—treating Time and Condition as within-subject factors and Group (ERA, TI, CG) as the between-subject factor—substantiated the findings derived from the pairwise comparisons. The analysis revealed a significant three-way interaction of Time × Condition × Group ($p < .001$), indicating that the progression of scores over time varied not only by condition type (i.e., the four definiteness/relativizer combinations) but also by instructional group. This interaction confirms that the ERA group followed a distinctly different developmental trajectory from the TI and CG groups, particularly in the more challenging ungrammatical conditions (definite + Ø and indefinite + that), where marked improvements were observed post-instruction and retained over time. As indicated in Table 27, there were statistically significant main effects for Time and for the interaction of Test × Group across most conditions, with the exception of the third condition (indefinite + that), where the main effect of Time was not significant across groups, although significant differences between groups were still present. This suggests that while all groups showed some response to instructional input, the magnitude and direction of change were largely dependent on the specific grammatical condition and the type of instruction received. The ERA group's gains were especially notable in those structures that required learners to decrease the L1 crosslinguistic influence tendencies related to definiteness—a pattern not observed in the TI or Control groups.

Table 27. Repeated measures ANOVA: Test of within, between-subject effects

	Source	df	F	Sig.	Partial Eta Squared
1	time	1.866	30.948	<.001	0.392
	time * Group	3.732	9.102	<.001	0.275
	Group	2	19.088	<.001	0.443
2	time	1.654	7.885	0.002	0.141
	time * Group	3.307	2.866	0.037	0.107
	Group	2	6.811	0.002	0.221
3	time	1.575	2.649	0.089	0.052
	time * Group	3.149	1.477	0.226	0.058
	Group	2	4.016	0.024	0.143
4	time	1.679	36.857	<.001	0.434
	time * Group	3.358	7.873	<.001	0.247
	Group	2	10.894	<.001	0.312

5.2.5. Independent Sample t-test Analysis

To evaluate differences in performance between instructional groups at each testing stage, a series of independent-samples t-tests was conducted comparing the ERA, TI, and Control (CG) groups on their pre-test, post-test, and delayed post-test scores across the four definiteness-related conditions. At the pre-test stage, comparisons were run for ERA vs. TI, ERA vs. CG, and TI vs. CG. As shown in Table 28, none of these comparisons yielded statistically significant differences across any of the four conditions: (1) definite antecedent with overt complementizer (the + that), (2) definite antecedent with null complementizer (the + ∅), (3) indefinite antecedent with overt complementizer (a/an + that), and (4) indefinite antecedent with null complementizer (a/an + ∅). These results confirm that the groups were equivalent in their baseline knowledge and similarly influenced by L1 crosslinguistic effects prior to receiving any instruction.

Table 28. The results of independent sample t-test of the pre-test

Groups	Conditions	t	df	Sig. p value
ERA vs TI	pre_1	0.53	33	0.3
	pre_2	-0.461	33	0.324
	pre_3	-0.046	33	0.482
	pre_4	0.381	33	0.353
ERA vs CG	pre_1	-1.088	31	0.143
	pre_2	0.508	31	0.61
	pre_3	-0.721	31	0.238
	pre_4	-0.839	31	0.204
TI vs CG	pre_1	-1.345	32	0.094
	pre_2	-1.372	32	0.09
	pre_3	-0.587	32	0.281
	pre_4	-1.14	32	0.131

At the post-test stage, the comparisons in Table 29 revealed emerging differences attributable to instructional effects. When comparing the ERA and TI groups, statistically significant differences were found in condition 2 (definite + null) and condition 3 (indefinite + that)—both of which are grammatical in English but ungrammatical in Arabic speakers. These results suggest that the ERA group outperformed the TI group specifically in rejecting L1-induced ungrammatical constructions, indicating the superior effect of Processing Instruction in remediating these forms. However, in condition 1 (definite + that) and condition 4 (indefinite + Ø), which are grammatical both in English and Arabic, no significant difference was observed between ERA and TI, suggesting that both instructional approaches were equally effective in reinforcing target-like judgments for these simpler cases.

The comparison between ERA and the Control group revealed statistically significant differences in all conditions. This pattern shows that the ERA group demonstrated more accurate judgments than the Control group on all conditions following instruction. Finally, when comparing the TI group with the Control group, significant differences were observed only in condition 1 (definite + that) and condition 4 (indefinite + ∅). These findings indicate that the TI group improved on these two constructions, but unlike the ERA group, failed to show significant gains in identifying the ungrammaticality of the L1-transferred forms (conditions 2 and 3). Collectively, these results underscore the comparative advantage of the ERA group in decreasing L1 crosslinguistic influence errors in the interpretation of English relative clauses, particularly in the more challenging definiteness-based contrasts.

Table 29. The results of independent sample t-test of post-test

Groups	Conditions	t	df	Sig. p value
ERA vs TI	post_1	0.589	33	0.28
	post _2	2.024	33	0.026
	post _3	1.981	33	0.028
	post _4	0.819	33	0.209
ERA vs CG	post _1	8.339	31	<.001
	post _2	2.025	31	0.026
	post _3	1.597	31	0.06
	post _4	6.879	31	<.001
TI vs CG	post _1	4.857	32	<.001
	post _2	0.147	32	0.442
	post _3	-0.883	32	0.192
	post _4	4.54	32	<.001

In summary of the post-test: The ERA group outperformed the TI group specifically on the two challenging conditions (definite without "that" and indefinite with "that") immediately after instruction, while on the two straightforward conditions (definite+"that", indefinite+Ø) ERA and TI performed similarly (both high). The traditional group did not significantly beat the control on the two challenging conditions at post-test, whereas the ERA group did. This suggests that right after instruction, PI had a distinct advantage in training learners to handle those sentences that conflicted with their L1 patterns expectations, whereas traditional instruction had not made an impact on those specific sentence types by the post-test.

At the delayed post-test (Table 30), we see the longer-term effects:

- Condition 1 (Definite + “that”): Still no significant difference between ERA and TI both remained very high. Both were significantly higher than Control (ERA vs CG $p < .001$; TI vs CG $p < .001$, similar to post-test).
- Condition 2 (Definite + Ø): ERA vs TI remained significantly different ($t = 2.655$, $p = 0.006$), indicating that even seven weeks after instruction, the combined PI group was better than the TI group at accepting grammatical definite relative clauses without “that.” Moreover, at delayed test, ERA vs CG was significant for this condition ($p < .001$) and importantly TI vs CG was still not significant for this condition. The delayed outcome underscores that the traditional group never substantially improved on processing definite-no-“that” structures compared to having no instruction, whereas the PI group did show a robust improvement.
- Condition 3 (Indefinite + “that”): A similar result: ERA vs TI was marginally significant or approaching significance at delayed ($t = 1.605$, $p = 0.059$, which is just above .05). This suggests the ERA group still tended to outperform the TI group on indefinite + “that” sentences at delayed, though the difference was slightly less pronounced than at immediate post (TI may have caught up a little by delayed on this condition, but not to a statistically significant degree). ERA vs CG was significant (the ERA group far above control, $p < .001$ presumably), whereas TI vs CG remained non-significant on condition 3 at delayed (the TI group was still not reliably better than control on indefinite + “that”: $p = 0.192$ at post, likely similarly non-sig at delayed). Thus, even after some time, the traditional group did not show clear mastery of the indefinite-with-“that” structure relative to uninstructed learners, whereas the PI group did.
- Condition 4 (Indefinite + Ø): As before, ERA and TI both near perfect, no difference between them (ERA vs TI). Both significantly better than control at delayed (TI vs CG: $t = 4.540$, $p < .001$ at post, similarly at delayed). Interestingly, the summary note indicates TI vs

CG had significant differences only in first and fourth conditions at delayed (as at post), meaning condition 4 remained a strength for TI over control.

Table 30. The results of independent sample t-test of delayed post-test (dp)

Groups	Conditions	t	df	Sig. p value
ERA vs TI	dp_1	1.356	33	0.092
	dp _2	2.655	33	0.006
	dp _3	1.605	33	0.059
	dp _4	-0.169	33	0.433
ERA vs CG	dp _1	3.685	31	<.001
	dp _2	0.999	31	0.163
	dp _3	1.313	31	0.099
	dp _4	1.292	31	0.103
TI vs CG	dp _1	3.069	32	0.002
	dp _2	-2.8	32	0.004
	dp _3	-0.609	32	0.274
	dp _4	1.677	32	0.052

To summarize the delayed post-test comparisons: The PI group (ERA) maintained a clear advantage over the TI group in the two key difficult conditions (statistically significant in Condition 2, and a strong trend in Condition 3). The PI group also outperformed control in all four conditions by delayed test, reflecting broad learning. The TI group, however, only significantly outperformed the control in the easiest conditions (1 and 4) and showed no significant advantage over control in the two difficult conditions even by the delayed post-test. This indicates that traditional instruction did not effectively eliminate the L1-driven definiteness errors: after traditional training, learners were still as likely as the control group to be uncertain about sentences like “a man that…” or “the man Ø…”. In contrast, the PI training largely remedied those issues: PI learners accepted “the man Ø…” and “a man that…” correctly significantly more often than uninstructed learners, and more often than those who received only traditional instruction.

These results strongly suggest that Processing Instruction was more effective than Traditional Instruction in addressing the definiteness-related processing problems (i.e., in helping learners overcome the influence of the Arabic [+definiteness] relativizer rule). The ERA group's superior performance on Conditions 2 and 3, relative to TI, directly answers RQ3: the type of instruction (PI vs TI) did make a difference on the specific constructions that were predicted to be difficult due to L1 crosslinguistic influence. The combined referential-affective PI, in particular, enabled learners to generalize the target structure to contexts that conflict with their L1 norms (definite without complementizer, indefinite with complementizer), whereas the traditional output-focused instruction did not sufficiently do so.

5.2.6. Paired Sample t-test Analysis

To examine within-group development over time, paired-samples t-tests were conducted for each group (ERA, TI, CG), comparing their performance across three intervals: pre-test vs. post-test, pre-test vs. delayed post-test, and post-test vs. delayed post-test for each of the four definiteness-related conditions (see Table 31).

For condition 1 (definite + that) and condition 4 (indefinite + ∅), both the ERA and TI groups demonstrated statistically significant gains from pre-test to post-test ($p < .05$), as well as from pre-test to delayed post-test ($p < .05$). These results indicate that both groups successfully learned to accept these grammatical constructions, and that their gains were largely maintained over the seven-week period between the post-test and delayed post-test. The Control group, by contrast, did not show any significant change across any testing interval for either of these conditions ($p > .05$), suggesting that without instruction, learners' judgments of these forms remained static.

In contrast, for condition 2 (definite + ∅) and condition 3 (indefinite + that)—both of which are ungrammatical in Arabic and require learners to decrease L1 crosslinguistic influence — the patterns diverged. The ERA group showed statistically significant improvement from pre-test to post-test ($p < .05$) on both conditions, suggesting that the immediate effect of

Processing Instruction extended even to more challenging ungrammatical constructions in their L1. However, the comparisons between pre-test and delayed post-test, as well as post-test and delayed post-test, were not statistically significant ($p > .05$), indicating that although learners improved initially, those gains were not retained at a statistically significant level over time. Nevertheless, delayed post-test scores in these two conditions remained higher than pre-test scores, suggesting partial retention of instructional effects.

The TI group, on the other hand, did not exhibit statistically significant gains in either of these conditions at any point (pre- to post-test or pre- to delayed post-test), with the exception of a statistically significant decline from post-test to delayed post-test ($p < .05$). This suggests that the modest improvements that may have occurred immediately after instruction were not sustained and regressed over time, ultimately returning to pre-test levels or below. The Control group also failed to show any significant change across the three-time intervals in these two conditions, remaining consistent with a lack of instructional input.

Taken together, the paired-sample analyses confirm that both ERA and TI groups benefited from instruction on grammatical relative clause structures (conditions 1 and 4), with learning gains retained over time. However, only the ERA group made initial progress in rejecting ungrammatical, L1-influenced forms (conditions 2 and 3), and although this improvement was not fully sustained at the delayed post-test, it represents an instructional effect not observed in the TI group. The Control group showed no significant learning gains in any condition, confirming the necessity of targeted instruction for overcoming L1-based difficulties in the interpretation of definiteness-related relative clauses.

Table 31. Results of paired sample t-test.

	Group	(I) time	(J) time	t	df	Sig. p value 2 sided
		1	2	1.519	15	0.15

1	CG		3	1.619	15	0.126
		2	3	0.293	15	0.774
	TI	1	2	-4.871	17	<.001
			3	-3.336	17	0.004
		2	3	2.911	17	0.01
	ERA	1	2	-8.976	16	<.001
			3	-3.628	16	0.002
		2	3	2.156	16	0.047
2	CG	1	2	-1.145	15	0.27
			3	0.239	15	0.814
		2	3	1.655	15	0.119
	TI	1	2	-2.026	17	0.059
			3	2.051	17	0.056
		2	3	3.362	17	0.004
	ERA	1	2	-2.658	16	0.017
			3	-1.753	16	0.099
		2	3	1.519	16	0.148
3	CG	1	2	-1.253	15	0.23
			3	-0.685	15	0.504
		2	3	0.341	15	0.738
	TI	1	2	-0.27	17	0.79
			3	-0.369	17	0.717
		2	3	-0.115	17	0.909
	ERA	1	2	-2.265	16	0.038
			3	-1.92	16	0.073
		2	3	0.661	16	0.518
4	CG	1	2	-1.071	15	0.301
			3	-1.647	15	0.12
		2	3	-0.488	15	0.633
	TI	1	2	-5.437	17	<.001
			3	-3.371	17	0.004
		2	3	3.181	17	0.005
	ERA	1	2	-7.994	16	<.001
			3	-2.314	16	0.034
		2	3	3.36	16	0.004

5.2.7. The effect size of the GJT

To complement the null hypothesis significance tests above, effect size analyses (using Cohen’s d) were conducted for each group in each condition, measuring the magnitude of change from pre-test to post-test and from pre-test to delayed post-test. This provides additional insight into how much each group improved in each condition and helps interpret the practical significance of the results. Table 32 and Table 33 summarize these effect sizes. Table 32 presents effect sizes comparing each instructed group to the Control group (and to each other in some cases) at post-test and delayed post-test for each condition, while Table 33 focuses on within-group improvement effect sizes.

Table 32. The effect size of the GJT

	the+that		The+∅		a/an+that		a/an+∅	
Group	**D at the post-test**	**d at delayed post-test**	**D at the post-test**	**d at delayed post-test**	**D at the post-test**	**d at delayed post-test**	**D at the post-test**	**d at delayed post-test**
TI vs CG	1.716	1.080	0.054	0.983	0.309	0.211	1.600	0.592
ERA vs CG	2.941	1.300	0.716	0.354	0.564	0.462	2.426	0.457
EA vs CG	1.475	0.355	0.296	0.625	0.108	0.023	1.221	0.162
ER vs CG	3.693	1.148	0.543	0.445	0.286	0.079	1.994	0.095
ERA vs TI	0.200	0.455	0.675	0.894	0.663	0.539	0.278	0.056
EA vs TI	0.197	0.247	0.296	0.211	0.141	0.165	0.788	0.402
ER vs TI	0.123	0.046	0.373	0.418	0.459	0.250	0.470	0.486

(the +that) = A definite relative clause with an overt relative complementizer; (the + ∅) = a definite relative clause with a null relative complementizer; (a/an + that) = an indefinite relative clause with an overt relative complementizer; (a/an + ∅)= an indefinite (indef) relative clause with a null relative complementizer.

Table 33. The magnitude of change of interventions

	the+that		The+∅		a/an+that		a/an+∅	
Group	**Pre to post-test**	**Pre to delayed post-test**	**Pre to post-test**	**Pre to delayed post-test**	**Pre to post-test**	**Pre to delayed post-test**	**Pre to post-test**	**Pre to delayed post-test**
CG	0.372	0.446	0.372	0.090	0.371	0.241	0.354	0.566
TI	1.737	1.087	0.674	0.608	0.070	0.109	2.018	1.160
ERA	3.091	1.441	1.149	0.845	0.757	0.708	2.719	0.745
EA	1.553	0.408	0.321	0.189	0.220	0.268	1.624	0.667
ER	3.796	1.491	1.557	0.408	0.590	0.412	2.258	0.815

Several key observations emerge from the effect size analysis:

- In Condition 1 (definite + “that”), all instructional groups showed large gains, which is expected since this structure was relatively easier (and all improved mostly as part of overall learning). The magnitude of change from pre-test to post-test was large ($d > 0.8$) for ERA, EA, ER, and TI in this condition. Even the TI and PI subgroups had big improvements here, though they already started somewhat high. By the delayed post-test, ERA, ER, and TI still had large net gains (the EA group’s gain between pre and delayed was a bit smaller, as was the control’s, which remained small). In other words, for sentences that were easy (definite with “that”), all instructed learners improved a lot (ceiling effect), so this condition doesn’t distinguish the methods much (aside from control vs instructed).
- In Condition 2 (definite + Ø), only the ERA and ER groups achieved large effect sizes from pre-test to post-test. According to Table 33, the ERA and ER groups had the only significant effect sizes here, while the TI group had a medium effect and the EA and Control groups had very small effects (d close to 0). This aligns with our earlier findings: referential input (ER) and combined PI (ERA) produced substantial learning on definite without “that”. Furthermore, only the ERA group showed a significant pre-to-delayed improvement in this condition (its effect size remained high from pre to delayed), whereas the TI group showed only a medium effect from pre to delayed, and EA/Control remained negligible. This indicates that the combined PI group not only improved the most on the definite+Ø items, but also retained that improvement, whereas the traditional group’s moderate gains did not translate into a large long-term effect.
- In Condition 3 (indefinite + “that”), the pattern was similar: ERA and ER groups had medium or significant effect sizes from pre to post (meaning they showed meaningful improvement on this initially troublesome structure), while the TI and EA groups had only small effect sizes (little improvement). The ERA group was the only one to achieve a medium effect from pre to delayed in this condition; all others (TI, EA, ER, CG) showed only

minor net effects by delayed test. Thus, the combined PI group's improvement on indefinite+"that" was not only noticeable initially but also the only one that remained appreciable over time. The referential-only group ER did improve initially (medium d), but by delayed their net gain shrank to minor. TI and EA groups had little to no improvement on this condition at any point (consistent with earlier results).

- In Condition 4 (indefinite + Ø), interestingly, all four instructed groups showed significant improvements from pre-test to post-test (since this is a straightforward structure, once taught, everyone got it) – ERA, TI, EA, ER all had large effect sizes immediately (and CG had minor change). By the delayed post-test, the TI and ERA groups showed a large effect from pre-test ($d > .8$), whereas the EA group showed a medium effect. Importantly, the effect sizes "compared to TI" for condition 4 indicate that the EA group had a moderate to large effect at both time points relative to TI, meaning the affective group performed well on this condition (possibly even slightly better than TI on some measures, though both did well).

Considering all conditions together, the effect size analysis reinforces that Processing Instruction, especially with referential practice (as in ER and ERA), had the strongest impact on the difficult sentence types tied to definiteness, whereas Traditional Instruction had a much weaker impact on those specific areas. The ERA group in particular exhibited large and sustained improvements across all sentence types, including those requiring decreasing L1 crosslinguistic influence (with effect sizes indicating practically significant gains where others had little).

From the perspective of L1 crosslinguistic influence: at the pre-test, learners likely treated "that" as obligatorily tied to definiteness (and absence of "that" tied to indefiniteness), reflecting Arabic norms. After Processing Instruction, especially in the combined and referential formats, learners were far less constrained by that L1 rule – they learned that English allows "that" or zero in both definite and indefinite contexts. The PI training effectively helped them acquire the feature: they began to accept grammatical English sentences that do not follow the Arabic definiteness rule (definite without complementizer; indefinite with complementizer). Traditional instruction, focusing on output practice and explicit grammar explanation, improved overall knowledge of relative clauses but did not specifically target the processing strategy tied to definiteness. As a result, TI students improved on general ability (especially on forms that align with L1 expectations or were explicitly taught), but many continued to apply (consciously or subconsciously) the L1-based rule in the problematic contexts, as evidenced by their lower acceptance rates and lack of significant gains there.

5.3. Summary of the Results

i) **Comparison between ERA, TI, and Control Groups (CG):**

a) The analysis of the Grammaticality Judgment Task (GJT) data showed that the ERA group exhibited substantial gains in grammatical interpretation accuracy following instruction. These gains were greater than those of the Traditional Instruction (TI) group and the uninstructed Control group, with improvements evident in both immediate and delayed assessments.

b) Performance on the Picture-Cued Task (PCT) similarly reflected meaningful progress in both the ERA and TI groups when compared to the Control group. However, the ERA group demonstrated a more pronounced advantage, particularly at the delayed post-test, suggesting better long-term retention of production skills.

c) Findings from the Translation Task (Trans) indicated that the ERA group consistently outperformed both the TI and Control groups across all time points. This suggests that Processing Instruction, as implemented in the ERA condition, contributed more effectively to learners' ability to integrate relative clause structures in productive language use, both shortly after instruction and several weeks later.

ii) Comparison between ER, EA, TI, and Control Groups:

a) Across all three outcome measures (GJT, PCT, and Trans), the ER, EA, and TI groups displayed notable improvements following instruction, in contrast to the Control group, which showed no comparable progress. While all three instructional groups retained significant learning gains up to seven weeks post-intervention, the TI group demonstrated a partial decline in performance at the delayed post-test.

b) The results across all tasks indicate that the referential-only PI group (ER) outperformed the affective-only (EA), traditional instruction (TI), and control groups. This advantage was observed in both short-term and long-term evaluations, suggesting that referential structured input may provide a particularly effective means of supporting both comprehension and production of English relative clauses.

c) The EA and TI groups showed similar patterns of improvement, with both significantly outperforming the Control group on all measures. However, neither group demonstrated superiority over the other, suggesting that affective structured input and traditional instruction may offer comparable instructional benefits in certain areas of relative clause acquisition.

iii) Evaluation of ERA, TI, and CG in Relation to the Definiteness Feature:

Analysis of the definiteness-related conditions in the GJT focused on how learners interpreted relative clauses when definiteness (definite vs. indefinite noun phrases) interacted with complementizer presence (overt *that* vs. null).

Overall, learners performed better on grammatical combinations—specifically, definite antecedents with overt complementizers (*the* + *that*) and indefinite antecedents with null complementizers (*a/an* + *Ø*)—than on grammatical conditions involving definite nouns with null complementizers or indefinite nouns with *that*.

Both ERA and TI groups improved significantly in recognizing and accepting the grammatical (def/that and indef/null) structures, indicating successful learning of target-like patterns. However, when it came to these structures (def/null and indef/that), only the ERA group showed statistically significant gains, highlighting its superior effectiveness in helping learners decrease L1 crosslinguistic influence errors related to the definiteness in relative clause formation.

In conclusion, the results in this chapter indicate that Processing Instruction (PI) led to significant improvement in both interpretation and production of English restrictive relative clauses, surpassing the gains from Traditional Instruction, particularly in long-term retention and in challenging sentence contexts involving definiteness. Among PI treatments, using referential activities either alone or in combination with affective activities proved more beneficial than using affective activities alone. The combined referential+affective SI group (ERA) performed best overall, suggesting a complementary effect of both SI types, although the referential-only group (ER) achieved nearly equivalent gains on most measures. The affective-only group (EA), while improving, did not outshine traditional instruction, underscoring that referential activities were the crucial component driving the PI advantage. Finally, regarding L1 crosslinguistic influence of definiteness, the PI approach (and especially the inclusion of referential practice which likely pushed learners to process form-meaning connections more deeply) was effective in helping learners decrease the L1 crosslinguistic influence. PI-trained learners learned to correctly interpret and produce English relative clauses whether or not the relativizer "that" was present, regardless of the head noun's definiteness, thereby minimizing the L1 crosslinguistic influence. In contrast, learners under traditional instruction remained more prone to L1-influenced errors in definiteness conditions (e.g., still feeling a definite RRC without "that" is odd, or not using "that" with an indefinite), indicating that PI offers a superior pedagogical technique for developing target-like processing strategies in this domain. These findings align with the Input Processing framework's goal of enabling learners to appreciate the communicative function of grammatical forms – in this case, understanding that English "that" does not encode definiteness – and thereby enriching the learners' intake in a way that traditional output practice did not fully achieve. The evidence presented in this chapter supports the conclusion that Processing Instruction, particularly with referential structured input tasks, is a highly effective method for teaching English restrictive relative clauses and decreasing the L1 crosslinguistic influence. The next chapter will discuss these results in detail, situating them in the context of previous research and theoretical implications.

Chapter Six: Discussion of the results

6. Introduction

This chapter discusses how the PI intervention (ER vs EA), alongside TI and Control, affected learners' accuracy in comprehending and producing English RRCs when input was held constant and only response format/feedback differed. Undergraduate Saudi learners at Najran University received equated input targeting English restrictive relative clauses (*who, which, whom, whose*; head-noun definiteness) under two PI activity formats: referential (ER), which required a single correct meaning decision with item-level correctness feedback, and affective (EA), which elicited stance/applicability responses with no correctness feedback. A traditional instruction (TI) group and a control group provided comparison. I discuss how these instructional formats shaped learners' comprehension and production of RRCs across instruments and time points, and what the results imply for input processing. These abilities were measured through a sequence of tests comprising three tasks: a Grammaticality Judgment Task (GJT), a Picture-Cued Task (PCT), and a Translation task. In the present study, four distinct types of interventions were implemented to examine the effectiveness of various instructional approaches in facilitating acquisition of the target grammatical feature. The interventions were as follows:

- ERA: This intervention combined referential and affective Structured Input (SI) activities. It provided learners with opportunities to engage with the target language in meaningful contexts while also incorporating elements intended to evoke affective responses.
- ER: In this intervention, learners received explicit information and engaged solely in referential SI activities, focusing on form-meaning connections of the target feature within linguistic contexts.

- EA: This intervention consisted of explicit information followed exclusively by affective SI activities, designed to stimulate learners' emotional engagement with the target language and create a positive learning environment.
- TI: Learners in this Traditional Instruction group were given explicit grammatical explanations of the target feature, followed by output-oriented practice (mechanical drills) to reinforce form use in comprehension and production.

The motivation for this research stemmed from the need to understand the impact of Structured Input activities within the Processing Instruction (PI) framework on L2 grammar comprehension and production. A key goal was to determine whether differences in learning outcomes could be explained by the type of SI activities used**.** Previous research on PI has highlighted SI as the critical component potentially influencing L2 attainment (e.g., VanPatten & Oikkenon, 1996; Benati, 2004; Fernandez, 2008; VanPatten & Borst, 2012; Wong, 2004; among others). The current study therefore investigated whether using only one type of SI activity or a combination of types could account for variability in L2 learning of two specific properties: English relative clauses with wh-words and the definiteness feature in RRCs. The inclusion of definiteness as a variable was intended to test whether PI would affect those contexts predicted to be difficult for learners. In particular, it examined if beginner Saudi L2 learners start with the L1 value (e.g., [+def] feature of the Arabic relative complementizer *illi*) dominating the system to their initial mental representation of the English complementizer *that*. The Feature Reassembly Hypothesis proposes that L2 learners initially carry over feature values from their L1 but can later reorganize these features when L2 input provides evidence to do so. In the context of Arabic-speaking learners, this would mean they might initially start with the L1 value dominating the system, their interlanguage grammar at this starting point bore strong influence of L1 rules, but could later readjust this if prompted by sufficient input. From the perspective of MCF, the initial representations of the

L2 for newcomers input are weaker than those of their first language, necessitating substantial cognitive effort to increase their activation levels and effectively compete with the L1 representations. When L2 information is first received, it will be mapped to L1-based representations whenever this is possible. According to Sharwood Smith (2013), new representations will challenge the existing ones until they become stronger through more exposure to the language.

The Feature Reassembly Hypothesis specifies what adult learners must change at the representational level: they must re-map and re-bundle features from L1 to match L2 (e.g., decoupling D[±definite] from the C-domain dependency in English RRCs, unlike Arabic where the complementizer may pattern with definiteness). The MCF explains how that change happens mechanistically: through Acquisition by Processing (APT) in an encapsulated language module where SS/PS representations compete by activation strength. Early on, high-activation L1 bundles dominate processing; structured input increases successful construction of the L2-appropriate SS configurations, which raises their resting activation and gradually stabilizes the reassembled bundle. In this study, PI makes the C-dependency and operator/type computations task-essential (ER) so that, over repeated trials, the L2 bundle [C with A′-licensing, operator features, [uCase] valued structurally, D[±def] interpreted but not licensing] wins more often at the SS–CS interface. In short, FRH gives the target of change; MCF supplies the change mechanism, and the PI design supplies the input conditions that bias processing toward the reassembled feature set.

6.1.Overview of research questions and hypothesis

Before examining the results in detail, it is useful to reiterate the research questions and hypotheses that guided this study. The study addressed three primary research questions (RQ1, RQ2, and RQ3), each with an associated hypothesis:

- **RQ1**: Are there any differences between the three groups of learners (Processing instruction, Traditional instruction, and control group) in the improvement of a) comprehension and b) production of the target grammatical feature?

  Hypothesis 1 (H1): It was hypothesized that only the Processing Instruction group would show improvement in both interpretation and production tasks, demonstrating an understanding of the target form's underlying grammar. In contrast, the Traditional Instruction (TI) group was expected to improve only in production tasks. This hypothesis anticipated that PI leads to gains in both receptive and productive knowledge, whereas TI yields gains mainly in productive ability.

- **RQ2:** What leads to most improvement in performance: explicit instruction followed by only referential SI activities or only affective SI activities?

  Hypothesis 2 (H2): It was hypothesized that the group receiving explicit information with *both* referential and affective activities (the combined PI approach, i.e. ERA) would outperform all other groups on all measures. Furthermore, due to the task-essential nature of referential activities, it was predicted that the group receiving only referential SI activities (ER) would have greater learning gains than the group receiving only affective SI activities (EA).

- **RQ3:** Which type of instruction (PI or traditional) is more effective in developing the interlanguage grammar of the target feature and in decreasing L1 cross-linguistic influence as L2-specific representations increased in resting activation under UG-constrained processing?

  Hypothesis 3 (H3): This hypothesis stated that learners who receive Processing Instruction would significantly improve their ability to interpret and produce the English relativizer in all of the tested conditions (combining definiteness and complementizer presence). In other words, PI was expected to help learners apply the target language processing strategies so that they decrease first language crosslinguistic effects. As a result, PI learners would show target-like performance in both comprehension and production, even in those contexts initially predicted to cause L1 interference.

With these questions and hypotheses in mind, the following sections discuss the findings for each research question, evaluate whether the hypotheses were supported, and relate the results to relevant second language acquisition (SLA) theories.

6.2. RQ1. Are there any differences between the three groups of learners (Processing instruction, Traditional instruction, and control group) in the improvement of a) comprehension and b) production of the target grammatical feature?

6.2.1. Effect of instruction on GJT

6.2.1.1. The relative impact of the interventions on the GJT

To assess improvements in learners' comprehension of the target structure, a grammaticality judgment test (GJT) was used. The GJT required participants to judge the grammaticality of sentences containing English restrictive relative clauses (RRCs), thereby evaluating their underlying knowledge of those structures. Such tasks target implicit grammatical knowledge. An untimed GJT was employed to assess knowledge of English RRCs. Because untimed formats allow deliberation, responses can draw on explicit, metalinguistic knowledge as well as any implicit representations. I therefore interpret GJT performance as indexing a mixture of knowledge types, not solely implicit competence. This interpretation follows validation work showing that time pressure and online measures are required to bias judgments toward implicit processing, whereas untimed GJTs permit rule consultation and analytic reasoning (Ellis, 2005, 2009; Bowles, 2011). To mitigate construct blur, we triangulate GJT outcomes with our meaning-oriented tasks and treat convergent patterns as stronger evidence of underlying competence. Future work could employ speeded

GJTs or acceptability judgments with strict response deadlines to target implicit processing more directly (Ellis, 2005, 2009).

In this study, the GJT was untimed to minimize the influence of processing speed or working memory on performance (Hopp, 2014; McDonald, 2006). This untimed format provided a clearer measure of learners' actual grammatical competence by reducing performance constraints.

The GJT results showed clear differences among the groups. Participants who received Processing Instruction with combined referential and affective practice (the ERA group) achieved significantly higher grammaticality judgment scores than both the Traditional Instruction (TI) group and the Control group at both the immediate post-test and the delayed post-test. In other words, the ERA intervention led to substantial improvements in learners' ability to judge the grammaticality of RRC sentences, and these gains were largely maintained seven weeks after instruction. The TI group also performed significantly better than the Control group on the GJT (they improved their comprehension to some degree), but not as well as the ERA group. The overall pattern of performance on the GJT can be summarized as a hierarchy: ERA > TI > Control at both time points. These results indicate that the Processing Instruction approach (in its fullest form, ERA) was more effective than traditional output-focused instruction in developing learners' intuitive grasp of the target grammar.

Notably, this finding diverges from Toth (2006), who compared PI to another form of instruction (a meaning-based output task for Spanish) and found that PI was not superior on a GJT. In our study, however, PI (ERA) clearly outperformed the traditional approach. One possible explanation is the design: Toth did not have a direct TI comparison, whereas our study did. The current results suggest that when directly compared, PI yields larger gains in grammatical judgment ability. This strengthens the evidence for the efficacy of Processing Instruction in improving implicit grammatical knowledge.

In terms of effect sizes, the ERA intervention had the largest impact on GJT performance. The instructional effect sizes can be ordered: ERA > TI > Control at both immediate and delayed tests. The control group's gain was minimal (d= 0.11), which is comparable to the small effects reported for uninstructed groups in other studies (Norris & Ortega, 2000; Spada & Tomita, 2010). Including a control group (as in Mackey & Gass, 2005; Marsden & Torgerson, 2012) confirms that the improvements were due to the instructional interventions rather than extraneous practice or testing effects.

Overall, the GJT results provide strong evidence that Processing Instruction—particularly when it includes structured input tasks like the ERA treatment—significantly enhances learners' grammatical interpretation of RRCs. Learners in the ERA group not only made greater judgment gains than those in the TI group but also retained those gains over time, indicating deeper learning. The TI group's modest improvement relative to control shows that traditional practice can yield some explicit knowledge gain, but these gains were substantially smaller and less durable than those from PI.

Overall, the GJT results indicate that Processing Instruction—particularly with structured-input tasks such as the ERA treatment—improved learners' judgment performance on RRCs and that these gains were better maintained than those observed for TI. Because GJT was untimed, the measure can draw on both explicit, metalinguistic knowledge and any automatized representations; I therefore refrain from assigning the gains exclusively to one knowledge type. The ERA advantage could be interpreted as evidence of heightened sensitivity to RRC cues under judgment conditions, with stronger retention relative to TI. Given the untimed format, GJT gains reflect a mix of explicit and implicit contributions; thus

I report improved judgment accuracy and retention for ERA over TI, without attributing the effect solely to explicit knowledge.

6.2.2. Effect of instruction on production

6.2.2.1. Discussion of the findings of the Picture-Cued task (PCT)

6.2.2.1.1. The relative impact of the intervention on the Picture-Cued task

The Picture-Cued Task (PCT) evaluated learners' ability to produce the target RRC structures in an elicited production context. Immediately after instruction, both the ERA and TI groups outperformed the Control group on the PCT. In fact, the ERA and TI groups performed equally on the immediate post-test (both were higher than Control). However, by the delayed post-test, a clearer hierarchy emerged: the ERA group maintained a higher level of performance than the TI group (approximately ERA > TI > Control by delay post-test). These findings indicate that instruction – whether PI or traditional – gave learners a short-term boost in production, but the PI condition led to more lasting knowledge.

One explanation is that output-oriented practice (as in TI) aided production right after training: the TI learners had practiced producing the forms (through drills and translation), so they could perform well immediately. However, as Gass (1997) notes, output practice alone does not guarantee integration into the learner's grammar. TI learners likely benefited from practicing sentence production in class, but without forced focus on form, those gains were not fully consolidated. In contrast, the ERA group's input-oriented tasks provided implicit practice constructing RRCs that required noticing form-meaning connections, fostering a more proceduralized ability to produce RRCs. As a result, the ERA group's performance remained higher at the delayed post-test.

The Control group showed no change. In sum, the PCT results suggest that both types of instruction were effective to some degree in teaching learners to produce the target English

RRCs, but the Processing Instruction (ERA) had a more lasting impact. The TI group's performance seemed to reflect what they had practiced (they could produce what they were trained to produce), but the ERA group's performance went beyond what was explicitly practiced during instruction. ERA participants were able to correctly produce RRC structures that they had not been explicitly drilled on, indicating a more generalizable learning of the underlying rule. This points to the PI approach enabling learners to internalize the structures in a way that they could transfer to new sentences, rather than merely memorizing responses.

6.2.2.2. Discussion of the findings from the Translation task

6.2.2.2.1. The relative impact of the interventions on the Translation task

The Translation task required learners to translate sentences into English, thereby testing their ability to produce grammatically correct RRCs in writing. This task differs from the PCT in that it allows learners slightly more processing time and encourages the use of any explicit grammatical knowledge they have, since they can think through the translation. The findings for the Translation task share some similarities with the PCT results, with some notable differences due to the nature of the task.

Overall, both the ERA and TI groups showed significant gains in the Translation task after instruction, as evidenced by higher scores at the post-test compared to the pre-test. Both instructional groups outperformed the Control Group on this task in the immediate post-test. However, differences between the ERA and TI groups became apparent in the delayed post-test. By the time of the delayed test (seven weeks later), the ERA group maintained a high level of performance on the Translation task, whereas the TI group's performance declined such that it was no longer significantly better than that of the Control Group. In practical terms, the ERA group was able to preserve the improvements in translating RRCs into English over the long term, but the TI group lost much of the ground it had gained initially.

This pattern can be understood in terms of the types of knowledge and processing each group relied on. Translation tasks typically allow learners to draw on explicit grammatical knowledge because the task gives them time to consciously reflect on form. Learners who had acquired rules in a declarative, explicit form during the intervention could apply those rules to produce correct translations immediately after instruction. This likely explains why the TI group did well on the immediate post-test: their explicit knowledge gained from grammar explanations and practiced output was available for conscious use. Indeed, translation demands conscious understanding of grammatical structures (Williams, 1999. 38). However, explicit knowledge is often less durable than implicit knowledge; it tends to decay or become inaccessible if not continuously practiced. By the delayed post-test, the TI learners appeared to struggle to accurately translate the more complex RRC sentences, suggesting that some of their gains were transient. In contrast, the ERA group's training emphasized processing input and making form-meaning connections implicitly, which likely fostered more implicit knowledge of the RRC structures. Therefore, even after several weeks without practice, ERA learners could still successfully translate sentences with the target structures at a high rate of accuracy.

In concrete terms, the ERA group significantly outperformed the TI group on the delayed translation test, indicating a clear long-term advantage for the PI approach. Immediately after instruction, the ERA and TI performances on the translation task were similar (both leveraging explicit understanding to succeed on the task), but over time the PI group's ability to produce target-like sentences held steady much better. The control group, as expected, showed no improvement in either post-test, highlighting that the marked gains in the ERA (and initial gains in TI) groups can be attributed to the instructional interventions.

A closer look at which types of sentences were challenging for learners reinforces this interpretation. The TI group's translation accuracy remained relatively good for simpler sentences or those closely mirroring practiced examples, but they struggled with sentences that demanded transfer of learning to new contexts (especially those that required understanding subtleties of the RRC structure that were not explicitly practiced). The ERA group, on the other hand, was able to handle even those sentences, implying they had internalized a more robust representation of the RRC rule. Thus, the translation task outcomes align with the idea that while explicit, output-focused instruction can yield short-term gains in production (especially in tasks like translation where conscious rule application is possible), an input-oriented approach like PI produces knowledge that is more deeply embedded, and therefore more resilient over time.

From the MCF's view, in the case of the complementizer *that*, Arabic L2 learners of English in TI group seem not to develop the ability to perceive the differences between definite and indefinite contexts when used with RRCs in the external input during the instructional period. This means that they could not perceive concepts and meanings related to the different contexts of the complementizer *that*. In terms of cognitive stages of acquisition, conscious perceptual (visual, auditory, sensory, etc.), conscious conceptual, and maybe unconscious syntactic and phonological representations have lower activation levels and are less readily available to be selected during processing. The learners here are not experiencing a conscious state of this piece of information, which indicates that the corresponding mental representation is not yet made globally available to adjacent systems of the mind. For example, the use of *that* when it is used in [-definite] contexts were not active in the visual system to activate the visual representation of the written form of the structure. It can also be saying that there was not activation in the auditory system to activate the auditory representation of the pronunciation. Thus, no conscious state of the RRCs was occurring. The learner's mind then did not hold such structure because it has not brought it to the workspace that maintains it independent of the time and place in which the learner first perceived it.

After the stimulation is gone, it is very unlikely that such structure is stored in long-term memory (LTM) in the conceptual system, to be used in the future.

The Translation task required learners to translate sentences into English, thus testing their ability to produce grammatically correct RRCs in writing. Both the ERA and TI groups again showed significant gains after instruction, outperforming the Control group immediately. However, by the delayed post-test, differences were pronounced: the ERA group maintained its high level of performance, whereas the TI group's scores fell to the point that they were no longer significantly above the Control group.

This pattern can be understood in terms of knowledge type. Translation tasks allow learners to use explicit grammar knowledge because they have time to consciously reflect on form. TI learners who had learned explicit rules during instruction could apply those rules to produce correct sentences right after training, explaining their strong immediate post-test scores. In other words, the TI group could transfer their explicit metalinguistic knowledge to the translation task initially. However, explicit knowledge tends to decay without reinforcement. By the delayed test, the TI group struggled with more complex RRC translations, whereas the ERA learners – who had developed more implicit, procedural knowledge through input processing – still translated accurately. Indeed, the ERA group significantly outperformed the TI group at delay post-test, underscoring the long-term advantage of the PI approach.

A closer analysis of sentence types reinforces this interpretation. The TI group did well on simpler or practiced sentences but struggled with sentences that required transfer to new contexts (those involving the difficult RRC configurations not explicitly practiced). The ERA group, however, handled even those novel sentences successfully, implying they had internalized a robust representation of the RRC rule. Thus, these translation results align with the idea that output-focused instruction can yield quick production gains when explicit knowledge is applicable, but an input-oriented approach like PI produces more deeply embedded knowledge that is resilient over time.

From a cognitive perspective, this also makes sense under the Modular Cognitive Framework (MCF). TI learners apparently did not achieve a conscious perceptual/conceptual representation of the definiteness differences in RRCs during instruction. Under MCF, only perceptual and conceptual representations (not the syntactic structure itself) enter awareness. TI learners never had a conscious "state" corresponding to the L1-based definiteness rule, so that rule was not well encoded in memory. The ERA intervention, by repeatedly highlighting the contrast in meaningful practice, helped ERA learners notice and cognitively register this feature, allowing their knowledge of it to become robust. In sum, the ERA group's success on the translation task, especially at the delayed post-test, indicates that PI led to knowledge that was both proceduralized and transferable, whereas the TI group's knowledge remained more fragile and context-bound.

Summary for RQ1: To summarize RQ1 findings across all measures: the Processing Instruction (ERA) approach was more effective overall than Traditional Instruction. The ERA group showed significant improvement in both comprehension (GJT) and production tasks and maintained those improvements over time. The TI group improved mainly in production (as predicted) and showed much smaller gains in comprehension; some of the TI group's gains were not sustained long-term. The Control group showed virtually no change. These results align with Hypothesis 1: only the PI group (ERA) improved on both interpretation and production, whereas the TI group improved mainly in production. It appears that the TI learners developed some explicit knowledge that helped them perform in output tasks, but this knowledge did not fully integrate into their implicit comprehension system. In other words, TI learners could apply learned rules in production but not in automatic comprehension, supporting the idea that explicit knowledge aids controlled output but not spontaneous processing.

When considering overall performance across all three outcome measures (GJT, PCT, and Translation), the ERA group again emerged as superior. Averaging the results, the ERA intervention led to the highest overall gains, significantly outperforming the TI and Control conditions in both short-term and long-term tests. One exception was on the immediate PCT (where ERA and TI were equal), but apart from that, ERA was the leader on every measure. The TI group did better than Control on most measures ($p = .001$), except on the delayed Translation, where its score fell to control levels. In sum, PI produced the most substantial and sustained mastery of RRCs. The TI group's collapse to control on delayed translation suggests that explicit knowledge alone (without continued practice) does not easily convert to lasting implicit competence.

Pairwise comparisons confirmed that the ERA group significantly outperformed the TI group on overall scores at both testing points (except the one PCT exception). This demonstrates that combining explicit instruction with referential SI practice (ERA) yielded deeper learning. By contrast, while the TI intervention (explanation + drills) helped somewhat, it did not match PI's effect on the learners' underlying grammar.

Processing Instruction is fundamentally designed to reshape how learners process input by directing attention to form–meaning connections (VanPatten, 2004). Our results indicate that the PI treatment achieved this: for example, ERA learners were able to override typical first-language strategies (e.g., the First Noun Principle) by the end of training. Mean scores show that ERA learners treated both the definite+*that* and indefinite+null conditions in a target-like way after instruction, despite those being problematic under L1 logic. Statistically, the ERA group significantly outperformed the TI group overall, confirming Hypothesis 1 that PI is more effective for this feature.

These outcomes are consistent with previous research on PI. For instance, studies have shown that learners can accurately produce target structures after PI, even without explicit practice (Benati, 2001; Cadierno, 1995; Cheng, 2002; Collentine, 1998; VanPatten & Cadierno, 1993). In line with this, our ERA learners produced the correct RRC forms in both the PCT and Translation tasks, despite PI not explicitly targeting output. This supports the view that structured input alone can enable accurate production of new forms.

On the other hand, the TI group also acquired some new knowledge and was more effective than no instruction. The TI learners' improvement on interpretation tasks suggests they did gain metalinguistic knowledge during training – presumably using their explicit rule knowledge. This pattern echoes many PI vs. TI comparisons in the literature (e.g., Cheng, 2004; Benati, 2001; Allen, 2000), where TI yields some benefits. For example, TI learners often show increased awareness of the target structure when it can be applied explicitly (as in these tasks).

6.3. RQ2. What leads to most improvement in performance: explicit instruction followed by only referential SI activities or only affective SI activities?

This question examined whether referential SI or affective SI activities (each following explicit instruction) led to greater improvement. All groups started at baseline (chance performance) on both comprehension and production. Immediately after instruction, the ER, EA, and TI groups all made significant gains on both tasks, while the Control group did not. Most of these gains were retained at the delayed test, except for a drop in one measure for the TI group.

Importantly, the ER group (explicit + referential) outperformed the EA group (explicit + affective) overall. ER achieved higher scores than EA on interpretation and at least matched EA on production, both immediately and at delay. In mean terms, the ranking was ER > EA = TI > Control. In practical terms, providing referential practice after instruction led to greater gains than providing affective practice. Both types of practice were better than none (EA > Control), but referential tasks had a clear edge in effectiveness. In other words, requiring learners to process form in order to interpret meaning (referential SI) drove stronger learning. In contrast, affective activities (while engaging) did not force attention to the grammatical form, so the EA learners did not acquire as much. Notably, EA and TI ended up at similar levels, implying that affective SI alone provided no extra advantage over a traditional output approach. Both EA and TI conferred moderate gains (above control) but neither reached the effectiveness of ER. This suggests that simply exposing learners to meaningful content (EA) or having them practice output (TI) helps only partially; what was crucial was making form central to understanding (as in the referential tasks).

We also observed that only the ER group fully maintained its gains through the delayed test. The EA and TI groups saw some regression on certain measures (for example, the TI group's translation scores dropped by delay, and the EA group's GJT scores fell short of ER's). Thus, ER not only produced the largest immediate improvements but also the most stable retention.

In answer to RQ2, explicit + referential practice clearly led to greater improvement than explicit + affective practice. This supports the idea that form–meaning-focused activities are critical in PI. Our findings align with prior research suggesting that affective SI activities may not be necessary for success. For example, Marsden & Chen (2011) found no significant learning gains from affective tasks. In our study, both ER and EA groups had the same explicit grammar explanation beforehand; ER's advantage demonstrates that the key factor was the type of SI activity, not just the presence of explicit information. Indeed, previous work has shown that providing explicit explanation by itself does not guarantee learning (VanPatten & O'Connor, 1996; Fernandez, 2008; VanPatten & Borst, 2012). The results imply that while explicit information was held constant, the referential activities provided a critical ingredient that the affective activities did not. This suggests that within the PI framework, Structured Input activities are a crucial component for driving acquisition, echoing the assertion of Benati and Batziou (2019a) that SI activities themselves may be the primary active ingredient in PI. Our results also indicate that task-essential practice (referential SI) makes the crucial difference: it provides the corrective, form-focused feedback that drives acquisition.

6.4. RQ3. Which type of instruction (PI or traditional) is more effective in developing the interlanguage grammar of the target feature and in decreasing L1 cross-linguistic influence as L2-specific representations increased in resting activation under UG-constrained processing?

This question asked whether PI or TI was more effective in restructuring learners' interlanguage grammar and decreasing L1 influence. Before instruction, all groups showed evidence of strong L1 influence: on the pre-test GJT, they were nearly perfect on the conditions aligning with Arabic (definite+*that*, indefinite+null) and at floor on the conditions that conflict with Arabic (definite+null, indefinite+*that*). This "ceiling vs. floor" pattern indicates that learners were initially interpreting English RRCs using Arabic processing strategies.

After instruction, however, the PI and TI groups diverged markedly. The PI group (ERA) made significant improvements on the previously problematic conditions (definite+null and indefinite+*that*). By post-test, ERA learners were much more accurate with those "hard" types, indicating a shift from Arabic L1 values to English L2 values in their interlanguage grammar. They learned that in English, definiteness does *not* rigidly determine whether *that* appears (and vice versa). In contrast, the TI group improved mainly on the “easy” conditions: after instruction, TI learners handled the Arabic-congruent structures (definite+*that* and indefinite+null) more accurately, but they continued to struggle with the difficult conditions. In short, TI learners largely followed the L1 pattern in their final state.

Statistical analyses confirmed these trends: instruction type interacted with definiteness and complementizer presence. Only the PI group reduced the difficulty of the initially L1-driven conditions; the TI group did not. Hypothesis 3 is supported: processing instruction made learners perform targetlike across all conditions, whereas traditional instruction did not.

From a MCF perspective, these findings suggest that the Processing Instruction seems to be effective which helped Saudi Arabic L2 learners of English RRCs construct better CS representations of their input. These improved CS representations serve as enrichment to language-related knowledge in CS, and might indirectly help the development of syntactic representations, as processing in SS is influenced by active representations in the CS. In this case, Arabic bundles definiteness with the use of a complementizer in relative clauses (only definite heads take the complementizer *illi*), whereas English does not have such a constraint (definite or indefinite heads can appear with or without *that*). By contrast, the traditional approach, which provided explanation and output practice, was less successful in forcing learners to reconceptualize the feature mapping; TI learners improved where the L1 and L2 overlapped or where they could memorize specific instances, but they did not fully grasp the new feature distribution in the L2 for the toughest cases.

Looking at the results from a hypothesis-testing perspective, the findings lend strong support to Hypothesis 3, which predicted that PI would affect the specific difficult contexts and help learners decrease the L1 crosslinguistic influence. Indeed, after PI, learners could handle those contexts (def/null and indef/that) significantly better, whereas those without PI (especially the control, and to a lesser extent TI) could not. The hypothesis also anticipated that PI learners would improve in both interpretation and production of the target feature in all conditions, which is what we observed: the ERA group's gains on the GJT show improved interpretation in all four conditions, and their gains on production tasks indicate they could produce target-like relative clauses across the board, thereby mitigating L1 influence in both comprehension and production. Meanwhile, the TI group improved mostly in production (and even then, not for all conditions), aligning with the idea that without PI, their underlying interlanguage grammar regarding definiteness and relativizer was not fully resolved.

Furthermore, the interplay between definiteness, complementizer use, and instructional treatment underscores that the nature of instructional input critically determines the extent of L1 crosslinguistic reduction. The results indicated that the effect of definiteness on learners' success was contingent on the type of instruction they received. This was evident from the significant interaction effects observed: PI had a notable impact on those structures that were initially difficult (definite with no *that*, indefinite with *that*), whereas without PI, learners continued to find those specific structures challenging. In essence, PI proved to be a tool that mitigated L1 influence in this domain, supporting its utility in addressing crosslinguistic influence-related difficulties.

The findings here are consistent with and extend prior empirical studies. They align with Abumelha's (2016) findings that Najdi Arabic speakers tend to struggle with [-definite] English relative clauses that have an overt complementizer (a situation that violates their L1 expectation), and, crucially, that with appropriate instruction learners can overcome this difficulty. In our study, after PI, learners handled such cases much more accurately, corroborating Abumelha's observation when instruction is effective. Additionally, our results are in line with research by Alsadi, R. (2013) and Alabdullah, N. (2020), who demonstrated that L1 Arabic learners can be trained to override default processing principles like the First

Noun Principle (FNP, an L1-based strategy) when interpreting L2 English. The PI group's success in the difficult RRC conditions exemplifies learners moving beyond the FNP or any L1-based simplification: they learned to correctly interpret sentences where the first noun is not the subject of the relative clause (a known challenge predicted by FNP) by paying attention to English cues absent in Arabic.

In practical terms, after the PI intervention, learners were able to attain a more target-like distribution in their usage of overt vs. null complementizers with both definite and indefinite head nouns. This indicates a significant restructuring of their interlanguage grammar toward the English norm. By contrast, Traditional Instruction did not yield such a complete restructuring—those learners largely continued to operate with something akin to a "partial transfer" state, where they might explicitly know some rule but haven't fully applied it across contexts. The evidence suggests that PI accelerated learners to adjust to the L2 grammar.

In conclusion, the type of instruction has a profound effect on learners' ability to decrease the L1 crosslinguistic influence and develop their interlanguage grammar in a target-like way. Processing Instruction was more effective than Traditional Instruction in accelerating the gradual process of reducing the influence of Arabic for the target grammatical feature. PI learners showed evidence of internalizing the L2 feature configurations that differ from the L1, whereas TI learners showed only limited evidence of this. Thus, Processing Instruction proved to be the more effective approach for improving the interlanguage grammar in this study, as it enabled learners to transcend their initial L1-based interpretations and approach the L2 norms. By the end of the instructional period (and maintained weeks later), PI learners could handle all four RRC conditions appropriately, indicating that they had accurately use the definiteness and relativizer features according to English rules. These findings meet the expectations of Hypothesis 3, demonstrating that PI not only improves overall performance but specifically helps learners to mitigate L1-induced errors in their comprehension and production, effectively accelerating their progression toward a target-like interlanguage system.

6.5.Overall performance

The current thesis adopts MCF, which treats innately specified constraints as part of the design of the syntax processor and models learning as competition driven consolidation among representations in specialised stores (Truscott & Sharwood Smith, 2019). This study assumes that adult learners retain access to UG-constrained principles in the language module, but that development proceeds via Acquisition by Processing (APT) within MCF: representations in the syntactic/phonological stores strengthen when UG-compatible analyses are successfully built and reused (Sharwood Smith & Truscott, 2019). Framed this way, the results bear on how effectively instruction engages UG-constrained computations, not on a binary "access/no-access" question. The gains indicate that the PI formats, especially those enforcing task-essential computation (ER/ERA), increased the likelihood that learners constructed the UG-licensed SS configurations required by English RRCs, thereby raising their resting activation and stabilizing them over time.

In the literature review, the concept of "access to UG" was foregrounded to frame the role of UG-constrained principles in determining the target representation for English RRCs. Competing positions (e.g., FT/FA vs reduced access) yield different predictions about what instruction can shift. For that reason, the study was situated within this debate. The findings align most closely with continued access to UG together with an MCF/APT mechanism: instruction does not directly install rules but biases processing so that UG-compatible parses are selected and consolidated more often, producing the observed pattern of gains and retention.

Our a priori expectations followed UG/Minimalist feature theory: interpretable features tied to meaning (e.g., animacy for who vs which; D[±definite]) should be easier and faster to exploit than uninterpretable formal features required for structure building (A′-licensing on C; [uCase] valuation). PI made the interpretable contrasts salient and repeatedly available, which helps explain the relatively rapid and durable improvements for those dimensions (Adger, 2003; VanPatten, 1996/2004). By contrast, non-semantic requirements were expected to be fragile unless tasks forced learners to compute them on every trial. Consistent with this, ER/ERA showed better delayed maintenance than EA/TI, precisely because referential SI made the C-dependency and [uCase] valuation essential to success, while EA/TI allowed accurate responses without consistently executing these UG-constrained operations (Ellis, 2005; Ellis, Loewen, & Erlam, 2009).

The observed decline in performance at the delayed post-test aligns with the MCF. Immediately following instruction, both explicit (conscious) and implicit (unconscious) systems contribute to learner performance. However, if learners are not consistently engaged in tasks that make syntactic processing essential, their explicit knowledge gradually weakens, and the new syntactic structures they have built lose strength, allowing older, more established patterns to take over. This dynamic accounts for the superior retention observed in referential structured input, which consistently require learners to compute the very grammatical dependencies that are most vulnerable to attrition.

Variation in learner outcomes across instructional conditions reflects well-established individual difference factors. In particular, working memory capacity could predict success with long-distance syntactic dependencies and the long-term retention of instructed grammatical knowledge. As such, the observed dispersion in performance is expected when instructional tasks vary in how strongly they compel learners to engage with the target syntactic computations (Linck et al., 2014; Juffs & Harrington, 2011; Cunnings, 2022).

While working memory was not directly assessed in this study, its relevance to syntactic processing and retention is well supported. The observed performance variability may reflect underlying differences in working memory capacity. Future research could incorporate working memory measures to more precisely model how cognitive resources interact with instructional design within the MCF framework, particularly in tasks involving representational competition.

Within the MCF, this pattern can be interpreted as a function of representational competition. The ER and ERA conditions consistently directed learners toward the intended syntactic structure (SS) configuration on each trial, thereby reducing variability and promoting more stable outcomes. In contrast, the EA and TI conditions permitted a wider range of processing strategies, some of which allowed learners to circumvent the critical computations. This flexibility contributed to greater variability in performance and more pronounced attrition at the delayed post-test.

6.6. Interpretation of the findings within SLA frameworks

The results of this study can be further illuminated by examining them through the lens of established SLA theories. In this section, we relate our findings to three theoretical perspectives introduced earlier in Chapter Three: (1) the Input Processing (IP) model, (2) the L1 cross linguistic influence framework, and (3) the Modular Cognitive Framework (MCF). Each of these frameworks offers a different vantage point on why and how the observed instructional effects may have occurred.

6.6.1. Within the framework of Input Processing model

The Input Processing model (VanPatten, 2004) provided the foundation for Processing Instruction, and it is highly relevant for interpreting the superior performance of the PI groups observed in this study. According to the IP model, learners have default processing strategies that prioritize meaning over form when they are exposed to input. VanPatten (2015) argues that learners process input for meaning before they process it for form, which often leads them to ignore grammatical forms unless those forms are made salient and necessary for understanding. This underpins the rationale for Structured Input activities – to force learners to notice and process target forms by making meaning contingent on those forms.

Our findings showed that the ERA and ER groups (those who received PI with referential activities, with or without additional affective activities) outperformed both the EA group (affective activities only) and the TI group on most measures. This outcome can be directly interpreted using Input Processing principles. The referential activities in PI were designed to push learners to pay attention to the grammatical form (English relativizer presence/absence and its relationship to meaning) in order to correctly interpret sentences. By doing so, these activities likely altered learners' default processing behavior, making them integrate form and meaning rather than ignore form. The results suggest that these PI activities successfully compelled learners to adjust their processing strategies – precisely as IP theory would predict – resulting in more accurate form-meaning connections.

Before instruction, learners were indeed exhibiting the classic IP problem: they were largely focused on content words and meaning (and relying on L1 strategies) and not processing the English grammatical signals (like the optional that or the absence thereof) in a target-like way. The PI treatments (ERA/ER) effectively anticipated and addressed these processing tendencies. The referential SI tasks provided a structured way for learners to encounter sentences where paying attention to the presence or absence of that (a form) was essential for interpreting who or what the sentence was referring to (meaning). In doing so, the PI tasks reallocated learners' attentional resources toward the grammatical cues that they previously overlooked.

The strong gains of the PI groups on the untimed GJT show improved judgment performance and greater sensitivity to RRC cues under the four conditions conditions. Because untimed

GJTs can draw on explicit, metalinguistic knowledge as well as any automatized representations, these results do not by themselves demonstrate a shift from explicit to implicit knowledge. Instead, they indicate that training increased learners' ability to recognize and evaluate target structures; consistent advantages on both production tasks and comprehension-focused tasks provide stronger evidence that some computations became readily deployable in real use. Essentially, because PI taught them how to process the input differently (combining attention to form with meaning), they were able to internalize the rules better. By contrast, the EA group (affective only) did not require learners to focus on form during input processing – they could get by largely focusing on meanings and using context – so those learners did not form as strong an association between the form and its function, resulting in weaker performance.

Another aspect to consider is how our results relate to the broader debate on instructional focus in SLA. There has been ongoing discussion about the efficacy of form-focused instruction like PI versus more meaning-focused or output-focused approaches. Our study provides empirical data clarifying this: it shows that an approach grounded in Input Processing theory (PI) led to clear advantages. Specifically, when learners' attention was properly oriented to both meaning and form simultaneously (as in referential activities), they were far more likely to detect and eventually acquire the grammar being taught. This resonates with theories emphasizing the importance of attention in learning. DeKeyser & Juffs (2005) stress that learners may fail to acquire certain forms even with plenty of exposure if they do not consciously notice those forms. Our PI groups' success underscores that the PI training got learners to notice the forms (the relativizer usage patterns) in the input. Indeed, research has shown that structured input activities have a significant impact on L2 grammar acquisition (Lee & Benati, 2009), precisely because they manipulate input in ways that make the form salient and meaningful.

The PI approach's effectiveness observed here – with ERA and ER groups performing better than EA and TI – illustrates that when learners are guided to process input such that form and meaning are interconnected, learning is enhanced. PI, by its nature, fights against the learner's tendency to process only for meaning (to the exclusion of form). Our results showed that this method can overcome the "default" processing mechanism. For instance, ERA and ER learners, after training, could not only interpret the target structures correctly but also retain them, suggesting that the form-meaning connections were successfully established in their minds. In contrast, the TI approach did not directly address input processing biases – it gave explicit information and practice, but it did not systematically ensure that learners were processing input differently. As a result, TI learners likely continued to fall back on processing for meaning and might miss the form in comprehension, which is why their comprehension lagged.

We also observed that the only context where TI matched ERA was the immediate production of PCT items. From an IP standpoint, this makes sense: by the time learners are producing language (output), they can employ either learned strategies or monitoring, and the effect of input processing strategies is less direct. TI gave them explicit knowledge that helped with monitored output. But in comprehension tasks and in longer-term retention, PI's advantage was evident. This aligns with VanPatten's view that input-focused training has a more profound effect on the developing system underlying comprehension, whereas output practice might boost performance but not fundamentally change how input is processed.

In summary, the superior outcomes of the PI groups (especially those with referential tasks) provide strong support for the Input Processing model's claims. They show that learners benefit greatly from being taught how to process input. By forcing attention on the grammatical form during input, the PI treatments in our study effectively altered the way learners processed subsequent input, leading to better intake and ultimately better acquisition (as evidenced by better performance and retention). These findings therefore serve as empirical evidence that focusing learners' attention on form-meaning connections in input (the hallmark of PI) is a powerful instructional technique, validating the IP model's central premise. The success of the PI groups in overcoming their previous processing problems exemplifies how VanPatten's theoretical ideas translate into pedagogical success.

6.6.2. Within the L1 cross linguistic influence framework

The question of whether first language (L1) influence decreases as second-language (L2) proficiency increases can be reconsidered by viewing L2 development as a competition between different structural representations (Sharwood Smith & Truscott, 2006). In early stages of acquisition, learners tend to favor L1-based solutions because these representations are more cognitively accessible—they have higher resting activation. As learners receive targeted input and instruction, English-specific representations gain activation and begin to dominate both comprehension and production. In English restrictive relative clauses, three structural components are particularly important:

1. Complementizer Feature: The complementizer (e.g. who, which, that) carries a feature that either attracts or agrees with a relative operator. This feature licenses the dependency between the head noun and the embedded clause.

2. Case on the Operator: The relative pronoun reflects its grammatical role within the clause (e.g. who for subjects, whom for objects, whose for possession). These distinctions are tied to Case valuation.

3. Definiteness Feature on the Head Determiner: The determiner's [±definite] feature (e.g. *the* vs *a*) is semantically interpretable but does not directly affect the relative clause structure. In English, the choice of relative pronoun is guided by animacy and Case—not by definiteness.

Importantly, English _'*that'*_ functions as a complementizer and is not sensitive to definiteness. Learners whose L1 links definiteness closely with overt relativization may initially transfer this association into English. At lower proficiency levels, they may expect relative pronouns to vary depending on whether the head noun is definite or indefinite. Over time, with exposure to English input and explicit instruction, learners adjust to the L2-specific mappings and reduce reliance on L1-based patterns.

Instructional treatments comprised Processing Instruction with combined referential and affective activities (ERA), referential-only PI (ER), affective-only PI (EA), a Traditional Instruction group (TI), and an uninstructed Control (CG). The central difference among PI variants is whether activities are task-essential—requiring a right/wrong meaning decision contingent on processing the target mapping with item-level correctness feedback—or whether they provide additional positive-evidence exposure without a right/wrong outcome.

On the GJT, the combined PI condition (ERA) produced the largest gains in grammatical interpretation and these gains persisted at the delayed post-test, exceeding the improvements achieved by TI and by the Control. The PCT likewise showed ERA and TI outperforming the Control immediately, with ERA retaining a clearer advantage at the delayed post-test, consistent with stronger consolidation of production routines. Translation outcomes placed ERA consistently above both TI and Control at all time points, indicating that the combined PI format better supported the integration of relative-clause structure into connected language use. Together, these results point to a processing-based advantage: when instruction repeatedly obliges learners to compute the relative dependency and operator Case, the resulting representations appear to stabilise and generalise beyond the practice context.

When the three PI variants are separated, a more detailed picture of cross-linguistic influence emerges. All instructed groups improved on GJT, PCT, and TRAN relative to the Control, and gains remained evident seven weeks later. However, the referential-only group (ER) outperformed the affective-only group (EA), the Traditional Instruction group, and the Control across tasks and time points. The EA and TI groups exhibited broadly similar gains—both better than no instruction—yet neither exceeded the other. The most plausible explanation is that affective activities and traditional practice each provide useful exposure and some explicit knowledge, but do not, on their own, consistently force the computations that must defeat L1-driven defaults. By contrast, referential activities make success contingent on computing the target dependencies on every item (establishing the C-dependency, valuing [uCase], and selecting the appropriate relative form). They also pair that demand with immediate correctness feedback, which strengthens the L2-appropriate SS representations and suppresses L1-default analyses more quickly over time.

In the GJT, the definiteness was manipulated by crossing definite vs. indefinite heads with overt *that* vs. a null complementizer. This design makes clearer how L1-based preferences shift toward L2 mappings across treatments: Learners were most accurate on grammatical pairings that are frequent in English input—definite heads with overt *that* and indefinite heads with a null complementizer—and least accurate on grammatical pairings that violate these expectations, namely definite heads with a null complementizer and indefinite heads with overt *that*. Both ERA and TI learned to recognise and accept the frequent grammatical pairings, showing successful uptake of distributional regularities. Crucially, only ERA showed statistically reliable gains on the less expected grammatical combinations. This pattern is the hallmark of weakened L1 pressure: where an L1-based behavior would steer learners toward overt relativization with definite heads and away from overt *that* with indefinite heads, the combined PI treatment appears to have pried apart definiteness from complementizer choice. In practical terms, ERA learners came to accept and produce relative clauses whether or not *that* was present, regardless of the head noun's definiteness, whereas TI learners retained traces of the L1-conditioned bias.

In the Control group, learners rely heavily on their first language (L1), where definiteness typically signals overt relativization. This familiar pattern remains dominant in both comprehension and production. Traditional instruction increases general familiarity and supports explicit knowledge, which can improve performance on certain tasks. However, without engaging in tasks that make syntactic processing essential, these gains (explicit knowledge) tend to diminish over time, allowing older, more established patterns (L1) to take over. Affective-only instruction offers engaging and meaningful exposure, which can enhance learners' comfort with the target structures. Yet, because it lacks corrective feedback and does not require learners to compute key grammatical dependencies (such as Case relations), L1 defaults are only moderately reduced. Referential-only PI, by contrast, makes the computation of dependency and Case relations essential for task success and provides immediate feedback. This format leads to a more substantial reduction in L1 influence across tasks and maintains these improvements over time.

The combined format (ERA) is the most effective overall. Affective activities increase exposure and motivation, while referential activities ensure that each encounter requires accurate grammatical processing. Together, they promote both frequent input and deeper cognitive engagement.

Differential L1 impact is also observable across test-indexed proficiency. At pre-test (lower proficiency), learners display the strongest attraction to the L1 heuristic that links definiteness with overt relativization, and they are more likely to misanalyse *who/which/whom/whose* in ways that sidestep English Case and animacy requirements. At post-test and delayed post-test (higher proficiency), learners in PI groups show a progressive disconnecting of definiteness from complementizer choice and a clearer alignment of form with internal clause relations: *who* appears as the subject operator, *whom* surfaces where Accusative is structurally licensed or after prepositions, *whose* functions as a genitive determiner, and *which* selects non-human antecedents independently of definiteness. In ER and ERA, this re-alignment occurs earlier and is retained longer because the activities repeatedly require the parser to satisfy the complementizer's relational feature and to value operator Case to succeed. In EA and TI, re-alignment is slower and more fragile: learners can often respond without computing those relations, so the L1-based shortcut remains competitive and reasserts itself more readily at the delayed post-test.

The three instruments triangulate the locus of these changes. Judgement data capture learners' willingness to accept target-like mappings and to reject L1-guided misanalyses, revealing the rapidity of ERA gains and their durability. Picture-cued production exposes whether learners can build the structure when prompted by meaning, a setting in which referential PI again shows superior retention relative to TI and EA. Translation tasks, which require selecting and integrating relative clauses in extended output, are the most vulnerable to L1 shortcuts and the most informative about instructional depth: the ERA advantage at all time points indicates that the target computations have become available as default routines rather than as fragile, metalinguistic input.

Taken together, the results support a graded account of L1 cross-linguistic influence in which instructional format determines how quickly and how firmly L2-appropriate mappings replace L1-conditioned heuristics. Processing Instruction that includes referential activities—alone or in combination with affective activities—yields the strongest and most persistent attenuation of L1 influence on English restrictive relatives, including in sentence contexts that contradict frequent expectations about definiteness and the presence of the complementizer *that*. Affective activities and traditional practice contribute, but without a built-in requirement to compute the dependency and operator Case, their effects are more limited and more susceptible to loss. The pattern across groups and tasks therefore fits the broader claim that task-essential processing with immediate correctness feedback is the crucial driver of acquisition, enabling learners to treat English '*that'* as a purely structural element and to select *who, which, whom*, and *whose* according to animacy and Case rather than to the definiteness of the head noun.

In this section, Universal Grammar is taken to be the species-general inventory of categories, features, and operations that any human parser can deploy to build well-formed structures. For English RRCs, the relevant UG-described machinery includes an operation in the C-domain that licenses an A′-dependency between the head noun and a relative operator in Spec-CP, a system of structural Case valuation for that operator by the appropriate governor (T for nominative, v or P for accusative/oblique), and a distinction between interpretable features that contribute meaning (e.g., D[±definite], antecedent animacy) and formal requirements that must be satisfied for convergence (e.g., a licensing feature on C, [uCase] on the operator) (Rizzi, 1997; Chomsky, 2001; Adger, 2003; White, 2003; Huddleston & Pullum, 2002).

"Access" in this context does not mean that instruction writes rules into the mind; it means that adult learners can still recruit these abstract operations during processing when input and tasks require them. The Modular Cognitive Framework (MCF) provides the learning mechanism: the language module's syntactic/phonological processors already embody these operations, and change proceeds by Acquisition by Processing (APT), whereby every successful construction of an English-appropriate configuration increases its resting activation, and every failure leaves it weak so that default L1 routines win the competition (Sharwood Smith & Truscott, 2014, 2019).

Viewed through this lens, the results across the three instruments indicate that adult learners can use the core generative operations when instruction makes them unavoidable on each item. Processing Instruction (PI)—alone (ER) or combined with affective activities (ERA)—

forced the parser to establish the C-domain dependency and to value Case on the operator to obtain a single correct meaning, and it paired that demand with immediate correctness feedback. Learners in ER/ERA therefore built the target syntactic-structure (SS) configuration repeatedly and retained it at the delayed post-test, while affective-only PI (EA) and Traditional Instruction (TI) yielded improvements that were smaller and less durable, consistent with optional recruitment of the same operations. Two diagnostic outcomes make the UG link explicit. First, learners progressively decoupled definiteness from complementizer choice, treating English that as a purely structural linker rather than as a definiteness cue; in these four conditions (definite/indefinite heads crossed with overt that/null), ERA both learned the frequent pairings and showed reliable gains on the pairings that go against the usual pattern, which is exactly what we expect if the parser is executing C-licensing independently of D[±definite]. Second, learners increasingly deployed *who/which/whom/whose* by animacy and structurally licensed Case rather than by head-noun definiteness, presupposing successful valuation of [uCase] and correct operator selection in the left periphery. Put plainly, the observed improvements require the UG-characterized operations posited in generative theory, and they stabilize when task demands ensure that those operations are actually executed often enough for their representations to strengthen via APT (Sharwood Smith & Truscott, 2014, 2019).

This account aligns with Full Transfer/Full Access assumptions about availability. Learners begin with strong L1 routines (transfer), including an L1-conditioned heuristic that links definiteness with overt relativization; under PI, they re-map feature bundles to the L2, severing D[±definite] from dependency licensing, selecting the appropriate operator by animacy and Case, and valuing [uCase] by position/governor (Schwartz & Sprouse, 1996; White, 2003). On this view, the MCF specifies how the change is driven mechanistically: repeated successful processing strengthens the reassembled L2 bundle until it wins the competition by default. The gradient—ERA > ER > EA = TI > Control across tasks and time points—follows directly: the more consistently tasks make the UG-characterized computations essential and reinforce them with feedback, the faster and firmer the shift from L1-preferred solutions to L2-appropriate ones.

6.6.3. Within the Modular Cognitive Framework

This study seeks to assess whether the instructional interventions led to the development of knowledge that can be described as automatic, effortlessly retrieved, and integrated into long-term memory. Addressing this question requires a re-examination of the two instructional approaches and an analysis of how each uniquely influenced the learning outcomes. In MCF, the information we receive through our senses can be used for higher-level processing because of the complex connections in our mind, known as Perceptual Output Structures (POpS), which are responsible for our conscious experiences8. In this study, both groups were provided with textual input only, meaning that the information was received through the visual system, one of the perceptual systems. Although both instructional groups were exposed to the same amount of input, the nature of that input varied qualitatively. Specifically, the input was tailored differently in each case to support L2 learners' engagement and promote effective cognitive processing of the target L2 structure within the second language system.

The TI group received input through the POpS approach, which included exposure to written materials, engagement with mechanical drills, and progression toward activities with meaningful and communicative focus. The notably higher performance of the PI group—particularly the ER subgroup—in comparison to both the EA and TI groups indicates a clear influence of the instructional approach. The treatment package for the EA and TI group comprised a clear and detailed explanation of rules, accompanied by mechanical exercises that gradually progressed towards more meaningful and communicative tasks for the TI and affective activities for the EA group. Therefore, participants were neither obligated or coerced, as in the case of ERA and ER, to engage in further processing of the targeted item to assign meaning, refer back to explicit instruction, or activate the language system to interpret the form. e.g. syntactical structure (SS henceforth) to categorize syntactic structures.

The processing of the target structure in the EA and TI groups can be analysed within the framework of the Modular Cognitive Framework (MCF). It is plausible to propose that perceptual input entering via the visual system initiates the activation of visual, syntactic, and conceptual structures (VS, SS, and CS). Nevertheless, a significant portion of the incoming information could not be accurately associated and linked to a particular representation. Unlike the ERA and ER treatment packages, No explicit demand was placed on participants to process the form to determine its morphosyntactic features at this stage. The TI treatment packages encompassed a comprehensive range of relative clause forms. Participants were instructed to generate all the required forms through practice activities that focused on producing output. These activities were conducted immediately after participants received a grammatical explanation. It may be hypothesised that, for the intended meaning to be accessed through subconscious processing, the target structure ought to have triggered activation in both syntactic and conceptual systems, as was evident in the PI group. However, participants did not succeed in establishing a stable connection that effectively represented the use and features of the target structure—namely, a VS-SS-CS configuration—comparable to that formed by the ERA and ER groups, with the exception of their performance on the PCT tasks. With regard to the superior performance demonstrated by the ERA and ER groups compared to the EA and TI groups, it is essential to highlight that all groups received the same amount of explicit instruction and completed an identical series of tasks. As such, at this point in the intervention, all groups were equivalent in terms of their input exposure. The instructional content was delivered visually through written materials, thereby stimulating the visual processor, which sought to associate this incoming input with information stored within the language system. Attention was directed toward syntactic processing in an attempt to generate an appropriate conceptual representation. From the standpoint of Input Processing (IP) and Processing Instruction (PI), this reflects the process of form analysis aimed at constructing sentence-level meaning. In PI terms, successful processing is characterised by learners accurately mapping linguistic forms onto their intended meanings. Within the Modular Cognitive Framework (MCF), success in processing is defined as the ordered activation of a chain of structures—namely, Visual Structure (VS), Phonological Structure (PS), Syntactic Structure (SS), and Conceptual Structure (CS). The PI learners, particularly those in the ERA and ER groups, engaged in syntactic processing with the primary aim of eliciting activation at the conceptual level to facilitate meaning interpretation. As noted by Agiasophiti (2013), such processing is believed to take place below the threshold of conscious awareness (Carroll, 2007; Jackendoff, 2007).

It could be proposed that the ERA and ER groups underwent greater stimulation within their POpS as a result of engaging with referential activities, which in turn elevated the activation of conscious awareness during the processing of the target structure. Once the written input was processed by the visual system, this input initiated activation in both the language system and the conceptual domain, thereby triggering the process of 'indexing'—that is, the creation of new nodes or the alignment of incoming perceptual structures with existing representations.

The syntactic representations of participants in the ERA and ER groups were strongly activated, owing to the instructional focus on guiding L2 learners to attend closely to the target structure and process it effectively, thereby fostering precise mappings between form and meaning. POpS facilitated the reception of verbal information for subsequent cognitive processing through its visual structure. It can be argued that processing in the referential activities taking place in the language module happens unconsciously, even when there is incoming information from the visual structure, such as written sentences. According to MCF, the extensive interconnectedness of POpS leads to the development of metalinguistic knowledge and, as a result, conscious processing (Carroll, 2007; Schmidt, 2001). Metalinguistic knowledge is stored as conceptual frameworks in the CS. When external input triggers to activate the CS, these activated representations can subsequently trigger corresponding syntactic representations in the language module. This activation process enhances the readiness of these syntactic representations for future use. Metalinguistic knowledge can be seen as the explanation of grammatical rules stored in the CS, which aids L2 learners in comprehending current L2 input more effectively. For instance, a sentence such as " The man who was kicked by the horse was taken to hospital." may lead beginner L2 learners to mistakenly interpret the man as the subject doing the kicking, due to its initial position in the sentence. Metalinguistic input offers learners grammatical explanations that facilitate their understanding of the input. Input Comprehension is crucial for the development of the language module, particularly the syntactic module. By supplying L2 learners with metalinguistic input, both Extra-modular and Modular Second-Language Knowledge can be enhanced. The significance of metalinguistic input in second-language acquisition is twofold: it provides additional resources to address the limitations of modular implicit L2 knowledge and aids learners in grasping L2 input more effectively, which in turn activates processes within the syntactic system.

The performance hierarchy of ERA=ER>EA=TI>CG, established through mean scores and statistical comparisons between groups, may be explained by modifications within the internal stores of individual modules and the establishment of cross-modular co-indexations. This process entails effective indexing, accurate matching (co-indexing), and heightened activation of the target structure, as reflected in the favourable outcomes achieved by the

ERA and ER treatment groups. In ERA and ER groups, L2 learners were able to connect different elements within a sentence. This involves establishing relationships between words or phrases that have similar grammatical properties. For example, coindexing occur when a relative pronoun such as (who) refer back to previously mentioned (human) nouns in order to maintain coherence and clarity in communication. The disparities in performance among the groups suggest that the referential activities in PI achieved greater success in establishing an index for the targeted structure.

The ER instructional intervention effectively facilitated the processing of the target structure, leading to elevated levels of current activation and more frequent boosts in its resting activation state. In essence, the PI approach employing solely referential activities enhanced the processing of the structure, as demonstrated by its capacity to trigger activation, surpass competing forms, and maintain sustained levels of activation. Consequently, the likelihood of the target structure being processed more frequently in the future was increased. One may also argue that the ER has increased the conscious awareness of the target structure during online processing. The process of involving the correlation of perceptual structures, known as coindexing, has been found to be more efficient when stimulated often. This leads to the formation of accurate linkages between form and meaning.

When compared with the EA and TI groups, the ERA and ER groups exhibited greater instructional effectiveness, indicating that referential activities are more beneficial in the early stages of second language acquisition than the output-oriented practices used in TI or the affective tasks employed in EA. Notably, the ER group demonstrated particular effectiveness—not only in stimulating processing but, more crucially, in supporting the alignment of incoming input with syntactic and conceptual structures through co-indexation. In the initial phases of L2 development, the strategic redirection of learner attention toward specific linguistic features—while minimising potential distractions and ensuring comprehensive input, as advocated by Processing Instruction (PI)—appears to be more successful than approaches that expose learners to multiple instances of the target form (as in EA) or rely on the application of explicit rules (as in TI). Nonetheless, the results of this study suggest that both EA and TI remain more beneficial than receiving no instruction at all. MCF offers a theoretical basis for clarifying the function of Processing Instruction (PI), the mechanisms involved in its application, and its effects on language processing and acquisition. Beyond accounting for the performance hierarchy observed in the mean scores of the present study, MCF also introduces an innovative viewpoint on how language is processed.

This section offers an in-depth evaluation of the overall outcomes demonstrated by the experimental groups. The discussion centres primarily on the theoretical frameworks that shaped the four instructional approaches employed in the study, alongside the psycholinguistic principles underpinning Input Processing (IP) and Processing Instruction (PI). The Modular Cognitive Framework (MCF) served as a theoretical lens through which the effectiveness of the instructional treatments could be interpreted and explained, particularly in accounting for the greater success of certain methods over others. With its integrative, modular, and cross-disciplinary orientation, MCF/MOGUL provided a robust and comprehensive account of the findings observed in this investigation.

6.7.Summary

In conclusion, Chapter Six has provided a thorough discussion of how the data from this study fit with our research questions and hypotheses. The evidence strongly favors the efficacy of Processing Instruction, especially the use of referential structured input activities, in promoting significant and lasting L2 development in the domain of English restrictive relative clauses. The study's findings confirm that directing learners' attention to form-meaning connections in input can yield improvements in both comprehension and production that endure over time, and that this approach helps learners break free from L1-constrained processing strategies. Traditional output-focused instruction, while not without benefit, was less comprehensive in its impact and resulted primarily in short-term or explicit knowledge gains. These conclusions not only answer the posed research questions but also contribute to the larger body of SLA research by highlighting the importance of how input is processed during instruction. The next and final chapter will synthesize these findings, draw pedagogical implications, acknowledge limitations, and suggest avenues for future research.

Chapter Seven: Conclusion

7.1. Summary of the study

The present research set out to evaluate how effective Processing Instruction (PI) is in facilitating second language English acquisition, with particular focus on the role of different types of Structured Input (SI) activities (specifically, referential vs. affective). Previous studies on PI have typically treated SI as a single, unified construct, and relatively few have examined referential and affective SI activities separately. Accordingly, the primary aim of this study was to compare the effectiveness of referential activities (ER) versus affective activities (EA) and to determine whether each type of SI activity independently promotes the use of second-language grammatical knowledge in learners.

To achieve this aim, a controlled experiment was conducted using a between-groups design with pre-tests, post-tests, and delayed post-tests to track learners' progress after four distinct instructional interventions. The study compared four instructional conditions—Explicit + Referential + Affective activities (ERA), Explicit + Affective activities (EA), Explicit + Referential activities (ER), and Traditional Instruction (TI)—and measured their impact on learners' performance with English restrictive relative clauses (RRCs) involving wh-words and definiteness. In this design, the type of instructional treatment served as the independent variable, while learners' performance on interpretative and productive tasks was the dependent measure.

The participants were adult Arabic-speaking learners of English studying in a classroom setting in Saudi Arabia. The experimental procedure unfolded in four phases: a pre-test phase, an instructional intervention phase, an immediate post-test, and a delayed post-test several weeks later. Learners' gains were assessed using a battery of three tasks: a Grammaticality Judgment Task (GJT), a Picture-Cued Task (PCT), and a Translation task. This combination of tasks is commonly used in PI research to evaluate both interpretation and production skills (Salaberry, 1997; Benati, 2001). For each of the four groups, a dedicated set of teaching materials was developed. The materials for the ERA, ER, and EA groups were input-oriented, processing-focused activities requiring learners to process input for meaning, whereas the TI group's materials were output-oriented, involving more traditional production exercises. In all cases, the PI-oriented groups received structured input practice, while the TI group served as a comparison using conventional output practice.

7.1.1. Major Findings

Research Questions and Summary of Results

Research question 1: *Are there any differences between the instructed groups (Processing Instruction conditions and Traditional Instruction) and an uninstructed control group in their improvement on (a) comprehension and (b) production of the target grammatical feature (English RRCs)?*

For the first research question, the results indicated clear benefits of instruction on both interpreting and producing the target relative clause structures. All three instructional groups – the PI groups (taken collectively) and the TI group – showed significantly greater improvement from pre-test to post-test than the control group, which received no instruction. In particular, the ERA treatment led to a dramatic increase in learners' accuracy across all assessment measures. When comparing the ERA group with the TI group, no statistically significant differences were found on certain outcome measures (e.g. some comprehension and production tasks), suggesting that both types of instruction yielded considerable immediate gains in those areas. Importantly, however, only the group that received the ERA treatment was able to maintain its improved performance at the delayed post-test.

Research question 2: *What leads to greater improvement in learner performance: PI with only referential SI activities or PI with only affective SI activities (given the same explicit information)?*

The findings for the second research question revealed that the type of Structured Input activity had a substantial impact on learning outcomes. The group that received explicit instruction followed by referential activities (the ER group) outperformed the group that received explicit instruction followed by affective activities (the EA group) on all measures. Both the ER and EA groups showed significant gains in comprehension and production of the relative clauses after the intervention, and both outperformed the control group. However, the ER group's improvement was markedly larger and more robust than that of the EA group. In fact, when examining overall performance, a clear hierarchy emerged: the ER condition proved to be the most effective of all, yielding higher scores than the EA and TI conditions, which in turn were each substantially more effective than no instruction. After the training, the ER group demonstrated the highest accuracy, while the EA and the traditional (TI) groups had roughly equivalent outcomes that were still well above those of the control. This pattern held true not only immediately after instruction but also seven weeks later on the delayed post-test: the ER group retained a superior advantage, whereas the EA and TI groups showed similar levels of residual improvement. These results confirm that providing learners with referential SI practice leads to greater sustained gains than providing only affective SI practice or traditional output practice. In summary, explicitly directing learners' attention to form through referential input activities was more beneficial for developing both the interpretation and production of the target structure than using affective input activities, which yielded more modest and short-lived gains.

Research question 3: *Which type of instruction (PI or traditional) is more effective in developing the interlanguage grammar of the target feature and in decreasing L1 cross-*

linguistic influence as L2-specific representations increased in resting activation under UG-constrained processing?

The third research question addressed whether Processing Instruction (with structured input practice) or Traditional Instruction leads to greater improvement in learners' interlanguage grammar for English RRCs, particularly concerning the L1 crosslinguistic influence of definiteness, and whether either approach can accelerate the restructuring of L1-based representations. The results focused on learners' acquisition of the definiteness differences in English relative clauses (definite *the* vs. indefinite *a/an* relativizers with overt or null complementizers). The data from the GJT showed that the PI-based instruction had a greater overall impact on learners' accuracy across all tested sentence conditions, in both the immediate and long-term assessments. Learners in the PI groups were able to correctly process all of the target subtypes of relative clauses (including those that do not exist or differ in Arabic) after the training, and they largely retained this ability at the delayed post-test. In contrast, when learners received only traditional output-focused instruction, they succeeded in accurately processing only the easier conditions – specifically, those where the English and Arabic structures overlapped (for example, the condition with an overt complementizer in a definite clause, and the condition with a null complementizer in an indefinite clause). The TI group struggled with the other two conditions (definite clause with no complementizer, and indefinite clause with an overt complementizer), even after instruction. This disparity suggests that the PI treatment was able to help learners accurately use the relevant grammatical feature (definiteness in relative clauses) more completely than the TI treatment. In other words, the process of restructuring the learners' internal grammar to accommodate the L2 definiteness distinctions – was triggered and expedited by the structured input practice in the PI approach. Taken together, these findings provide evidence that combining insights from a generative perspective with the Input Processing model offers a powerful explanatory account for these results. The PI approach, by explicitly addressing form-meaning connections through input activities, enabled learners to decrease the L1 crosslinguistic influence, whereas traditional output practice was less successful in this regard. Thus, PI proved to be the more effective instructional approach for developing the target grammar and mitigating the cross language influence on these English structures.

7.2. Implications of the study

This study contributes to the second language acquisition literature by shedding light on the instructional treatment of a complex grammatical structure—English restrictive relative clauses—an area that, despite extensive investigation into its inherent difficulty, has seen comparatively less research on how teaching can facilitate its acquisition. The findings provide empirical support for the effectiveness of one particular instructional paradigm, Processing Instruction, along with its associated Structured Input activities, in improving learners' mastery of English RRCs. In doing so, the study underscores that the referential type of SI activity was especially successful in enhancing learning outcomes for English RRCs. Notably, the present work extended analysis beyond basic relative clause structures to also examine the [+definiteness] feature of the relative pronoun/complementizer—a nuanced aspect of English RRCs that had not been fully addressed in earlier Input Processing studies. By including the definiteness contrast (which is marked differently in the learners' L1, Arabic), the study was able to identify specific areas where learners struggle and to demonstrate that targeted input-focused instruction can alleviate those difficulties.

As discussed in earlier chapters, certain persistent errors with English RRCs can be attributed to the default processing strategies outlined by Input Processing (IP) theory (VanPatten, 2004). The current findings reinforce this connection: when learners consistently make errors that align with IP principles (for instance, overlooking a relativizer that carries low semantic weight in an indefinite context), it signals that their processing strategies are ineffective for those forms. Fortunately, IP theory not only diagnoses such processing problems but also suggests a pedagogical solution. VanPatten (2007, p.1) argued that insights about IP can be used to design activities that push learners to process form and not rely solely on default strategies. The success of the PI treatment in this study confirms that using IP-informed activities can indeed improve learners' processing of troublesome forms. In practical terms, the results indicate that our knowledge of how learners process English RRCs can inform the creation of instructional materials that help students pay attention to critical grammatical cues (such as definiteness) and thereby enhance acquisition. The significant gains observed, particularly in the ER group, demonstrate that when learners are guided to process form-meaning connections that they would otherwise ignore, their performance improves substantially. Thus, the study provides a concrete example of how theory-driven instructional design (in this case, activities engineered to induce processing of the target feature) can yield positive outcomes in the classroom.

Beyond addressing theoretical questions, the detailed examination of the four experimental groups (ERA, ER, EA, and TI) across multiple tasks offers valuable practical insights. By comparing how each group performed on interpretation and production measures, the study contributes to a finer-grained understanding of which aspects of PI are most beneficial. The evidence from this experiment suggests that the presence of explicit information combined with referential input activities was a particularly potent mix for developing both receptive and productive knowledge of the target structure. This finding is in line with prior research showing that referential activities tend to be the driving force behind PI's effectiveness. In the current study, the ER condition yielded robust short-term and long-term gains, whereas the affective-only condition (EA) led to improvements that were noticeable but not as enduring. This implies that not all Structured Input activities have equal impact; instructors and material designers should therefore place greater emphasis on referential activities when aiming to achieve durable learning of form-meaning connections. The results here help generalize earlier PI findings to a new grammatical domain (relative clauses) and a new learner population (Arabic L1), thereby broadening the scope of PI's demonstrated efficacy.

Furthermore, the findings highlight the need for continued research to pinpoint the precise factors that make PI effective. While this study affirms the advantage of referential activities, it raises further questions: for example, what element of the referential practice (e.g. the presence of right-or-wrong feedback, or the task-essential nature of the input processing) is most responsible for the superior outcomes? The fact that the EA group in our study only showed short-term gains suggests that simply making input activities "affective" or meaningful in a personal sense is not enough—at least not for sustained acquisition of the form. It may be that referential activities inherently provide immediate feedback and push learners to interpret the input in a specific way, thus forging stronger form-meaning links. A follow-up implication is that incorporating those characteristics (task-essential processing and feedback) into affective activities might enhance their effectiveness. In sum, the present study not only demonstrates the overall success of PI for this grammatical target, but also points toward the importance of the type of structured input practice as a key variable in instructional design.

Another important implication of this research is the benefit of integrating perspectives from generative second language acquisition (GenSLA) theory with processing-oriented instruction like PI. The study makes a novel contribution by using the Modular Cognitive Framework (MCF) as a lens to interpret the results, thereby bridging formal linguistic theory and functional processing instruction. By adopting a modular cognitive view, we were able to account for both the underlying grammatical representations (as emphasized in generative approaches) and the role of input and attention (as emphasized in processing approaches) in one coherent explanatory model. This transdisciplinary approach (combining PI with

GenSLA insights) proved useful in explaining why one instructional approach outperformed another. It suggests that theories of L2 acquisition that identify what is hard or easy to learn can inform pedagogical strategies by pinpointing which linguistic features require focused instruction. In our case, the Feature Reassembly Hypothesis from GenSLA predicted that the definiteness feature would be difficult to acquire due to the L1 crosslinguistic influence, and the IP model provided a means to address this difficulty through structured input. The success of the PI groups in reassembling this feature supports the idea that combining these perspectives leads to more effective teaching interventions. Thus, a broader implication is that language teachers and curriculum designers might draw on generative SLA research to identify target structures prone to error and then apply processing-oriented techniques to help learners overcome those specific hurdles.

The findings of this thesis are also relevant to a wider context of SLA research. The study contributes to the growing body of GenSLA work on the acquisition of English by speakers of diverse first languages by offering new evidence from learners with an Arabic background. English RRC acquisition has been under-researched for Arabic L1 learners, and our results provide a fresh perspective on how these learners deal with relative clause features such as definiteness. Notably, it demonstrates that instructional techniques developed and tested largely on speakers of Indo-European languages can be successfully applied to learners from a typologically different L1. It is well acknowledged that some theoretical approaches in SLA (particularly pure generative approaches) do not directly address how instruction should be conducted, often focusing on what learners *know* rather than how they learn. As Slabakova (2013) observes, generative SLA research tends to highlight acquisition phenomena that may not be immediately obvious to practitioners. However, there is a growing interest in connecting such research with pedagogical practice. Recent studies on what makes certain L2 forms difficult or easy to acquire (e.g., DeKeyser, 2005; Housen et al., 2016) are beginning to bridge this gap. The current study's findings align with the argument that drawing learners' attention to specific grammatical features is critical for success. Input Processing model asserts that certain form-meaning connections (for instance, definiteness in RRCs) require learners to overcome default processing tendencies and L1 biases. Our results showed that traditional communicative exposure alone (as in the TI condition) was not sufficient for learners to fully master those connections. Instead, an instructional approach that explicitly targeted the problematic feature (through PI) was necessary for learners to develop a mental representation of the L2 that diverged from their L1. In practical terms, this implies that instructed SLA can greatly benefit from focusing on features that are semantically subtle or redundant from the learner's perspective. By doing so, instruction can compensate for what learners might otherwise never notice in casual exposure, thereby leading to more complete acquisition. Overall, the implications of this work support a more nuanced view of form-focused instruction: one that is informed by linguistic theory (to identify *what* to teach) and by cognitive processing principles (to determine *how best* to teach it).

7.3. Limitations of the study

Like any empirical investigation, this study has several limitations that should be acknowledged. First, there may have been an issue with the *task-essentialness* of the affective Structured Input activities used in the EA condition. In those affective SI tasks, participants were asked to make preference-based choices (e.g. indicating personal opinions) which did not strictly require them to process the target grammatical form to complete the task. Because learners could respond based on personal inclination without paying close attention to the relative clause form, it is uncertain whether those activities truly strengthened their understanding of RRCs. In contrast, the referential activities in the ER condition *did* require the learners to focus on the form-meaning relationship (each response had a right or wrong outcome based on the grammar). The lack of an obligatory focus on form in the affective tasks could help explain why the EA group's gains were smaller and less durable. Future research should address this by designing affective activities that incorporate task-essential elements, ensuring that learners must attend to the target structure to complete the task. Providing immediate feedback in those activities could also improve their effectiveness. A comparative study that tweaks the affective activities to make form processing obligatory (and then compares ER and modified EA conditions) would shed light on whether the difference observed in this study was due to the nature of the activities (referential vs. affective) or due to these task design factors.

A second limitation of the present study is that it did not include a direct measure of the learners' awareness or noticing of the target feature. While we inferred processing changes from performance gains, we did not empirically verify whether learners in the various groups became consciously aware of the definiteness feature or other aspects of the RRCs as a result of instruction. Ideally, post-instruction interviews or stimulated recall sessions would have been conducted to gauge the degree to which participants noticed the target forms or could articulate rules about their use. Due to practical constraints (such as limited time and the scope of the study), we were unable to incorporate such qualitative measures of awareness. Consequently, we cannot be certain whether the superior performance of the PI groups was accompanied by a higher level of explicit awareness of the grammar, or if it was achieved largely implicitly. Future studies might include think-aloud protocols during tasks or retrospective interviews after the tests to capture learners' conscious awareness and thus provide a fuller picture of the cognitive changes resulting from instruction.

Third, the study focused exclusively on written modes of assessment and did not evaluate learners' spoken production or listening comprehension of the target structure. All of our tests (GJT, PCT, translation) were text-based, in part because the participants' oral proficiency in English was quite low. This exclusive reliance on written tasks, while practical for our context (and indeed commonly used in PI research), means that the results speak only to learners' ability to process and produce RRCs in writing. We do not know if similar gains would be observed in speaking or if PI would have an effect on learners' spontaneous oral production of relative clauses. For pedagogical implications, this is an important consideration: an instructional approach might succeed in improving test performance without immediately translating to fluent spoken usage. Therefore, a valuable direction for future research would be to examine the impact of Processing Instruction on learners with higher spoken proficiency, or to include oral production measures for lower-proficiency learners. Such studies could determine whether PI-based training on RRCs also improves learners' ability to use these structures in speech or to understand them in real-time listening, thereby testing the approach's influence on spontaneous language use in addition to controlled tasks.

Fourth, and relatedly, the grammaticality judgment task in this study was untimed, and we did not record reaction times or processing speed. While an untimed GJT can tell us whether learners know a form is grammatical or not, it does not reveal how quickly or effortlessly they can make that judgment. Including a timed dimension (for example, measuring how long learners take to judge each sentence, or using an online self-paced comprehension task) would have enabled a more nuanced analysis of processing efficiency. If one group of learners requires significantly less time or effort to process the target structure after instruction, that would indicate a deeper level of processing automatization. Due to logistical limitations, we did not incorporate reaction time measures in our design. Future research would benefit from adding a timed component to tasks or employing psycholinguistic measures (such as eye-tracking or self-paced reading) to complement accuracy scores. This would allow researchers to compare not just *whether* learners got items right, but *how* they processed them – for instance, whether PI training leads to faster processing of RRCs than traditional training. Such data could shed light on differences in cognitive processing and task engagement across instructional approaches, potentially revealing subtler effects of L1 background or proficiency on how learners internalize the target grammar.

In summary, while this study offers important insights into the effectiveness of PI for teaching English relative clauses, the above limitations suggest caution in generalizing the results. Addressing these limitations in future studies (through improved task designs, additional awareness measures, spoken language assessments, and processing speed metrics) would provide a more comprehensive understanding of how and why PI works, and how its benefits translate to different modalities of language use.

7.4. Conclusion

In conclusion, this research was undertaken to deepen our understanding of how effective Processing Instruction and its various Structured Input techniques are in facilitating the acquisition of a complex grammatical construction (English restrictive relative clauses) by L2 learners. The findings have shown that PI, especially when implemented with carefully designed referential input activities, can substantially improve learners' interpretation and production of difficult target forms. The study's outcomes support the view that an input-focused, processing-oriented pedagogical approach can lead to significant gains in learner performance, even for features that are prone to first language interference. Moreover, this work broadens the evidence for PI's efficacy beyond the contexts in which it has traditionally been explored: it demonstrates that learners whose first language is typologically different from English (in this case, Arabic, as opposed to the Romance-language backgrounds often seen in previous PI studies) can also greatly benefit from structured input practice. By successfully applying PI in a new linguistic setting, the study helps to generalize and extend the applicability of this instructional approach. Overall, the research reinforces the value of integrating theoretical insights about language processing into practical teaching interventions. It highlights that when instruction is informed by an understanding of learners' processing tendencies and tailored to address specific form-meaning mappings, it can accelerate language development in ways that might not occur through exposure or traditional practice alone. This enhanced understanding of PI's effectiveness and scope lays the groundwork for further innovations in instructed SLA, encouraging educators and researchers alike to continue exploring how targeted input manipulation can drive the acquisition of language in the classroom.

References

Abu-Jarad, Hassan A. (1986). English Interlanguage of Palestinian University Students inGaza Strip: An Analysis of Relative Clause and Verb Tense. Ball State University PhD Thesis. Muncie, Indiana.

Alabdullah, N. (2020). Discourse Effects on the Acquisition of the English Causative Forms: Structured Input vs. Structured Output Practice (Doctoral dissertation).

Abudalbuh, M. (2016). The acquisition of English articles by Arabic L2–English learners: A semantic approach. Arab World English Journal, 7(2), pp. 104–117.

Adger, D. (2003). Core Syntax. OUP. Chomsky, N. (2001). Derivation by Phase. In Kenstowicz (Ed.), Ken Hale: A Life in Language. MIT Press.

Agiasophiti, Z. (2013). Exploring possible effects of gender and enhanced vs unenhanced processing instruction on the acquisition of case marking in L2 German. In J. Lee and A. Benati (Eds.), Individual differences and Processing Instruction. (pp153-184). Bristol: Equinox.

Algady, D. (2013). The Acquisition of Relative Clauses: How Do Second Language Learners of Arabic Do It? (Unpublished Doctoral Dissertation). The University of Wisconsin-Milwaukee, USA.

Al Ghussain, Reem A. (2003). Areas of Cultural and Linguistic Difficulty in English- Arabic Translation. Unpublished PhD thesis. Durham: Durham University.

AlKhalaf, M. A. H. (2018). Modular and extra-modular second language knowledge of unaccusativity and unergativity by Najdi Arabic L2 learners of English (Doctoral dissertation, University of Leeds).

Al-Maani, A. (2020). Abstract Syntactic Representation in a Second Language: Processing and Acquisition of Wh-dependencies and Definiteness in L2 English (Doctoral dissertation, University of York).

Al-Momani, I. (2010). Direct object relative clauses in Jordanian Arabic: A minimalist approach. International Journal of Academic Research, 2, 226-237.

Aldosari, S. (2015). The Role of Individual Differences in the Acceptability of Island Violations in Native and Non-native Speakers (Doctoral dissertation, University of Kansas).

Aldwayan , S. N. (2008). The acquisition and processing of wh-movement by Najdi learners of English. Ph. D. thesis, University of Kansas.

Aldwayan, S., Fiorentino, R., and Gabriele, A. (2010). Evidence of syntactic constraints in the processing of wh-movement: A study of Najdi Arabic learners of English. In Bill Van

Patten and Jill Jegerski (Eds.), Research in Second Language Processing and Parsing 53, (pp. 65-86). Amsterdam: John Benjamins Publishing Company.

Al Goot, A. And Ahmed, M. (2015). Relativization in Arabic and English. A case of Translation Problems with Sudanese Students - A contrastive study -.

Allen, L. Q. (2000). Form-meaning connections and the French causative: An experiment in processing instruction. Studies in Second Language Acquisition, 22(1), 69-84.

Alraddadi, B. M. J. (2019). An Analysis of the Effects of Explicit Teaching on the Acquisition of Structural Discourse Markers in EFL Speaking Classes in Saudi Arabia (Doctoral dissertation, University of Central Lancashire).

Alroudhan, Hayat (2016). The Acquisition of English Restrictive Relative Clauses by Arab Adult EFL Learners. Advances in Language and Literary Studies, 7(1), 33-53.

Alsadi, R. (2013). An investigation into the effects of processing instruction on the acquisition of English relative clauses by Syrian learners. Doctoral dissertation. Aston University, Birmingham

Al-Thubaiti, K. (2007). Age effects on the acquisition of uninterpretable features by proficient Saudi Arabic speakers of English. In N. Hilton, R. Arscott, K. Barden, A. Krishna, S. Shah, and M. Zellers (Eds.) Proceedings of the 5th University of Cambridge Postgraduate Conferences in Language Research. (pp.1-8). Cambridge.

Al-Wossabi, S. A. N. (2024). Instructed Second Language Acquisition Research and Its Relevance to Classroom Practices. World Journal of English Language, 14(1), 100–110. https://doi.org/10.5430/wjel.v14n1p100

Badawi, E., Carter, M., & Gully, A. (2004). Modern written Arabic: A comprehensive grammar. London: Routledge.

Baker. (2002). Agreement, Dislocation and Partial Configurationality. Ms., Rutgers University.

Bardovi-Harlig, K. (1992). The use of adverbials and natural order in the development of temporal expression. International Review of Applied Linguistics, 30 (4): 299–320.

Bates, E., & MacWhinney, B. (1981). Second language acquisition from a functionalist perspective: Pragmatic, semantic and perceptual strategies. In H. Winitz (Ed.), Annals of the New York Academy of Sciences conference on native and foreign language acquisition (pp. 190–214). New York: New York Academy of Sciences.

Bataineh, R. (2005). Jordanian Undergraduate EFL Students' Error in the Use of Indefinite Article. Asian EFL Journal, 7(1), 1-17.

Benati, A. (2001). A comparative study of the effects of processing instruction and output-based instruction on the acquisition of the Italian future tense. Language Teaching Research, 5(2), 50–127. http://doi.org/10. 1177/136216880100500202

Benati, A. (2004a). The effects of structured input and explicit information on the acquisition of Italian future tense. In VanPatten, B. (Ed.), Processing instruction: Theory, research, and commentary (pp. 207–255). Mahwah, NJ: Erlbaum.

Benati, A. (2004b). The effects of processing instruction and its components on the acquisition of gender agreement in Italian. Language Awareness, 13, 67–80.

Benati, A. (2005). The effects of processing instruction, traditional instruction and meaning— output instruction on the acquisition of the English past simple tense. Language Teaching Research, 9(1), 67–93.

Benati, A. (2007). The effects of Processing Instruction on the lexical preference principle: generalizability of findings. RiPLA Rivista di Psicolinguistica Applicata Journal of Applied Psycholinguistics, 1(2), 93–104.

Benati, A. (2020). The effects of structured input and traditional instruction on the acquisition of the English causative forms: An eye-tracking study measuring accuracy in responses and processing patterns. (under review - Language Teaching Research).

Benati, A. (2023). The effects of structured input and working memory on the acquisition of English causative forms. Ampersand, 10, 100113.

Benati, A., & Angelovska, T. (2015). The effects of Processing Instruction on the acquisition of English simple past tense: Age and cognitive task demands. IRAL in Language Teaching, 53, 249-269.

Benati, A., Batziou M. (2019a) The effects of structured-input and structured-output tasks on the acquisition of English causative. IRAL in Language Awareness, 57, 265-288.

Benati, A., Batziou M. (2019b) Discourse and long-term effects of structured-input and structured-output tasks in combination and isolation on the acquisition of passive English causative forms. Accepted and forthcoming in Language Awareness, 28, 1-18.

Benati, A., Lee, J. (2008). Grammar acquisition and processing instruction: Secondary and cumulative effects. Bristol: Multilingual Matters.

Benati, A., Lee, J. (2010). Processing instruction and discourse. London: Continuum.

Berken, J. A., Chai, X., Chen, J.-K., Gracco, V. L., & Klein, D. (2016). Effects of Early and Late Bilingualism on Resting-State Functional Connectivity. The Journal of Neuroscience, 36(4), 1165–1172.

Bley–Vroman, R. (1990). The Logical Problem of Foreign Language Learning. Linguistic Analysis, 20, 3–49. https://doi.org/10.1017/CBO9781139524544.005

Blom, E. & Paradis, J. & Duncan, T.S. (2012) Effects of input properties, vocabulary size, and L1 on the development of third person singular -s in child L2 English. Language Learning, 62. pp.965-994

Blumberg, B., Cooper, D. R., & Schindler, P. S. (2008). Business research methods (Vol. 2). London: McGraw-Hill Higher Education.

Bolotin, N. (1996). Arabic speakers' resetting of parameters. In M. Eid (Ed.), Perspectives on Arabic linguistics VIII (pp. 135–155). Philadelphia, PA: John Benjamins.

Bowles, M. A. (2011). Measuring implicit and explicit linguistic knowledge. Studies in Second Language Acquisition, 33(2), 247–271.

Bransdorfer, R. (1989). Processing function words in input: Does meaning make a difference? Paper presented at the annual meeting of the American Association of Teachers of Spanish and Portuguese, San Antonio, Texas.

Brown, J. D., & Rodgers, T. S. (2002). Doing second language research. Oxford, England: Oxford University Press.

Bybee, J. (2008). Usage-Based Grammar and Second Language Acquisition. In P. Robinson & N. Ellis (eds.), Handbook of Cognitive Linguistics and Second Language Acquisition. New York: Routledge, pp. 216–236.

Cabrelli, Jennifer & Rothman, Jason & De Bot, Kees. (2013). Third Language Acquisition. Cambridge Handbook of Second Language Acquisition. West Nyack, NY: Cambridge University Press.

Cadierno, T. (1995). Formal instruction from a processing perspective: An investigation into the Spanish past tense. The Modern Language Journal, 79, 179–193.

Cameron, R. (2011). Native and Nonnative Processing of Modality and Mood in Spanish. Ph.D. Thesis, Florida State University, Talahassee, FL, USA.

Campbell, D. T., & Stanley, J. C. (1966). Experimental and quasi-experimental designs for research. Chicago: Rand McNally.

Carnie, A. (2013). Syntax: A Generative Introduction (3rd ed.). Oxford: Wiley Blackwell.

Cattani, A. & Abbott-Smith, K. & Farag, R. & Krott, A. & Arreckx, F. & Dennis, I. & Floccia, C. (2014) How much exposure to English is necessary for a bilingual toddler to perform like a monolingual peer in language tests? International Journal of Language and Communication Disorders, 49. pp.649-71

Carnie, A. (2013). Syntax: A Generative Introduction (3rd ed.). Oxford: Wiley Blackwell.

Carroll, S. (1996) Parameter-setting in second language acquisition: explanans and explanandum. Brain and Behavioral Sciences, 19. pp.720-1

Carroll, S. (2001). Input and evidence: The raw material of second language acquisition. Amsterdam, Netherlands: John Benjamins.

Carroll, S. (2007). Autonomous Induction Theory. In VanPatten B. and Williams J. (Eds.) Theories in Second Language Acquisition, pp. 155-173. New Jersey: Lawrence Erlbaum and Associates.

Celik-Yazici, I. (2007). A study of the effects of processing instruction on the development of English WH-questions by Turkish EFL learners. Interlinguistica, 17, 250-260.

Chai, X. J., Berken, J. A., Barbeau, E. B., Soles, J., Callahan, M., Chen, J.-K., & Klein, D. (2016). Intrinsic Functional Connectivity in the Adult Brain and Success in Second-Language Learning. The Journal of Neuroscience, 36(3), 755–761.

Cheng, A. C. (2002). The effects of processing instruction on the acquisition of ser and estar. Hispania, 85(2), 308-323.

Cheng, A. C. (2004). Processing instruction and Spanish ser and estar: Forms with semantic-aspectual values. In B.VanPatten (Ed.), *Processing Instruction*: *Theory, research, and commentary*. (pp. 119-141). Mahwah, NJ: Lawrence Erlbaum.

Chiuchiø, G. (2021). Structured Input Versus Textual Enhancement in the Interpretation of the Italian Subjunctive of Doubt: An Online and Offline Analysis of Accuracy, Time Response and Retention (Doctoral dissertation, University of Portsmouth).

Choi, M., & Lardiere, D. (2006). Acquiring the interpretation of wh–expressions in Korean as a second language. *8th Generative Approaches to Second Language Acquisition Conference (GASLA 2006),* Banff, Alberta, Canada.

Cho, J., & Slabakova, R. (2014). Interpreting definiteness in a second language without articles: The case of L2 Russian. Second Language Research, 30(2), 159–190. https://doi.org/10.1177/0267658313509647

Chomsky, N. (1986). Knowledge of Language. New York: Praeger.

Chomsky, N. (1981). Lectures on Government and Binding. Dordrecht: Foris.

Chomsky, N. (1995). The Minimalist Program. Cambridge: MIT Press.

Chomsky, N. (1955/1975). *The logical structure of linguistic theory*. New York: Plenum Press; University of Chicago Press

Chomsky, N. (1978). A naturalistic approach to language and cognition. *Cognition and Brain Theory*, 4. pp. 3–22

Chomsky, N. (1967). The formal nature of language IN: LENNEBERG, E.H. (ed.) *Biological foundations of language.* New York: Wiley and Sons. pp. 397–442.

Chomsky, N. (2001). Derivation by phase. In: Kenstowicz, M. (ed.), Ken Hale: a life in language. MIT Press, Cambridge, MA

Clahsen, H., & Muysken, P. (1986). The availability of universal grammar to adult and child learners – A study of the acquisition of German word order. *Second Language Research*, *2*(2), 93–119.

Clahsen H., Felser C. (2006). Grammatical processing in language learners. Appl. Psycholinguist. 27 3–42. 10.1017/s0142716406060024.

Cohen, L., Manion, L., Morrison, K., & Bell, R. (2011). *Research methods in education* (7th ed.). London: Routledge.

Collentine, J.G. (1998). Processing Instruction and the Subjunctive. Hispania, 81, 576–587.

Comer, W. J., & deBenedette, L. (2011). Processing Instruction and Russian: Further Evidence Is IN. Foreign Language Annals, 44(4), 646-673.

Corder, P. (1967). The significance of learner's errors. International Review of Applied Linguistics, 5, 161–170.

Cowan, N. (1995). Attention and Memory. An Integrated Framework. Oxford Psychology Series No. 26. New York: Oxford University Press.

Cowan, N. (1999). An embedded-processes model of working memory. In A. Miyake, & P. Shah (Eds.), Models of Working Memory: Mechanisms of active maintenance and executive control (pp. 62–101). Cambridge: Cambridge University Press.

Cowan, N. (2015). Sensational memorability: Working memory for things we see hear, feel, or somehow sense. In C. LeFebvre, P. Jolicoeur, & J. Martinez-Trujillo (Eds.), Mechanisms of Sensory Working Memory. Attention and Perfomance XXV (pp. 5–22). Elsevier.

Cox, J.G., & Sanz, C. (2015). Deconstructing PI for the ages: Expliciti instruction vs practice in young and older adult bilinguals. International Review of Applied Linguistics in Language Teaching, 53(2), 225-248.

Creswell, J. (2014). Research Design: Qualitative, Quantitative and mixed methods approaches (4th ed.). Thousand Oaks: SAGE Publications.

Crotty, M. (2003). The foundations of social research: meaning and perspectives in the research process. (3rd ed.). London: Sage.

Crown, R. (2008). The teacher's Grammar of English. New York: Cambridge University Press. Hogbin, Elizabeth and Sony Jae Jung (2007) " The Accessibility Hierarchy in Relativization: The Case of Eighteenth – and Twentieth – Century written English Narrative" SKY Journal of Linguistics Vol 20, pp.203-233.

Culman, H., Henry, N., & VanPatten, B. (2009). The role of explicit information in instructed SLA: An online study with processing instruction and German accusative case inflections. *Die Unterrichtspraxis, 42*(1), 19-31.

Cunnings, I. (2022). Working Memory and L2 Sentence Processing. In J. Schwieter & Z. Wen (Eds.), The Cambridge Handbook of Working Memory and Language (Cambridge Handbooks in Language and Linguistics, pp. 593-612). Cambridge: Cambridge University Press. doi:10.1017/9781108955638.033

Crystal, David (2003). Rediscover Grammar. 3rd ed. Essex: Pearson Longman.

DeKeyser, R. (2017). Knowledge and skill in SLA. In S. Loewen & M. Sato (Eds.), The Routledge Handbook of Instructed SLA (pp. 15–32). Routledge.

DeKeyser, R. M., & Sokalski, K. J. (1996). The Differential Role of Comprehension and Production Practice. Language Learning, 46(4), 613–642.

DeKeyser, R. M.& Prieto Botana, G. (2014). The effectiveness of processing instruction in L2 grammar acquisition: A narrative review. Applied Linguistics, 36(3), 290-305.

Dekydtspotter, L., Sprouse, R. A., & Anderson, B. (1997). The interpretive interface in L2 acquisition: The process–result distinction in English–French interlanguage grammars. Language Acquisition, 6, 297–332.

De Bot, K. (2015) Moving where? A reaction to Slabakova et al. (2014). Applied Linguistics, 36. pp.261-4

De Vries, M. (2002). The Syntax of Relativization. LOT, Utrecht.

Dixon, R. (1992). A New Approach to English Grammar on Semantic Principles. Oxford: Oxford University Press.

Dörnyei, Z. (2007). Research methods in applied linguistics: Quantitative, qualitative, and mixed methodologies. Oxford, England: Oxford University Press.

Doughty, C. (2003). Instructed SLA: Constraints, compensation, and enhancement. In C. Doughty, & M. H. Long (Eds.), Handbook of second language acquisition: Blackwell handbooks in linguistics (pp. 256-310). New York: Basil Blackwell.

Doughty, C. (2004). Commentary: When PI is focus on form it is very, very good, but when it is focus on forms. In VanPatten, B. (Ed.). Processing instruction: Theory, research, and commentary. (pp.210-220) New Jersey: Routledge.

Dracos, M., & Nick, H., (2018). The effects of task-essential training on L2 processing strategies and the development of Spanish verbal morphology. Foreign Language Annals 51: 344–68.

Easterby-Smith, M., Thorpe, R., & Jackson, P. (2012). Management Research: Theory and Practice (fourth edition). London: Sage.

Ellis, N. (1993). Rules and instances in foreign language learning: Interactions of explicit and implicit knowledge. European Journal of Cognitive Psychology, 5(3), 289-318.

Ellis, N. (2002). Frequency effects in language processing. Studies in Second Language Acquisition, 24(2), 143-188.

Ellis, N., and Sagarra, N. (2010a). Learned attention effects in L2 temporal reference: The first hour and the next eight semesters. Language Learning 60: 85–108.

Ellis, N. and Sagarra, N. (2010b) 'The bounds of adult language acquisition', Studies in Second Language Acquisition, 32(4), pp. 553–580.

Ellis, R. (2002). The place of grammar instruction in the second/ foreign language curriuculum. In E. Hinkel & S. Fotos (Eds.), New perspectives on grammar teaching in second language classrooms, pp. 17-34. Mahwah, N.J.: Lawrence Erlbaum.

Ellis, R. (2005). Measuring implicit and explicit knowledge of a second language: A psychometric study. Studies in Second Language Acquisition, 27(2), 141-172.

Ellis, R. (2006). Modelling Learning Difficulty and Second Language Proficiency: The Differential Contributions of Implicit and Explicit Knowledge. Applied Linguistics, 27(3), 431-463.

Ellis, R. (2008). The study of Second language acquisition (second ed). Oxford: Oxford University Press.

Ellis, R. (2009). Implicit and explicit knowledge in second language learning, testing and teaching. Second Language Research, 25(2), 141–172.

Ellis, R., Loewen, S., Elder, C., Erlam, R., Philip, J., & Reinders, H. (2009). Implicit and explicit knowledge in second language learning, testing and teaching. Clevedon, UK: Multilingual Matters.

Elman, J. L. (1997). Rethinking Innateness: A Connectionist Perspective on Development (Second Edition). Cambridge, MA: MIT Press.

Erlam, R. (2003b). Evaluating the Relative Effectiveness of Structured-Input and Output-Based Instruction in Foreign Language Learning (Results from an experimental study). Studies in Second Language Acquisition, 25(4), 559–82.

Epstein, S. D., Flynn, S., & Martohardjono, G. (1996). Second language acquisition: Theoretical and experimental issues in contemporary research. Behavioral and Brain Sciences, 19(4), 677–714.

Epstein, S. D., Flynn, S., & Martohardjono, G. (1998). The strong continuity hypothesis: Some evidence concerning functional categories in adult L2 acquisition. In The generative study of second language acquisition (pp. 75–92). Psychology Press.

Eubank, L. (1993). On the transfer of parametric values in L2 development. Language Acquisition, 3(3), 183–208.

Eubank, L. (1994). Optionality and the initial state in L2 development. Language Acquisition Studies in Generative Grammar, 8, 369–369.

Eubank, L. (1996). Negation in early German–English interlanguage: More valueless features in the L2 initial state. Second Language Research, 12(1), 73–106.

Farley, A. (2001). Authentic processing instruction and the Spanish subjunctive. Hispanis, 84, 289-99.

Farley, A.P. (2004). The relative effects of processing instruction and meaning-based output instruction. In B. VanPatten (Ed.), Processing Instruction: theory, research and commentary. (pp. 143-168). Mahwah, NJ: Lawrence Erlbaum.

Farley, A. (2005). Structured input: Grammar instruction for the acquisition-oriented and language teaching. Oxford: Oxford University Press.

Fernández, C. (2008). Reexamining the role of explicit information in processing instruction. Studies in Second Language Acquisition, 30(3), 277-305.

Field, A. (2009). Discovering statistics using SPSS (Third ed.). London: Sage.

Felix, S. (1986) Cognition and language growth. Dordrecht: Foris

Flynn, S. (1987). A parameter-setting model of L2 acquisition. Dordrecht: Reidel.

Fodor, Janet Dean. 1998. Parsing to learn. Journal of Psycholinguistic Research 27: 339–74.

Givón, T. (1993). English grammar: A function-based introduction (Vol. 2). Amestrdam: John Benjamins Publishing Company.

Galal, M. M. (2004). A minimalist approach to relative clauses in modern standard Arabic. Unpublished doctoral dissertation, University of Kansas, Kansas.

Gass, S. (1997). Input, interaction, and the second language learner (1st ed.). Mahwah, NJ: Lawrence Erlbaum.

Gass, S. (1987). The resolution of conflicts among competing systems: A bidirectional perspective. Applied Psycholinguistics, 8 (4): 329-350.

Gass, S. (1988). Integrating research areas: A framework for second language studies. Applied Linguistics, 9, 198–217.

Gass, M. (2013). Second Language Acquisition: An Introductory Course. Florence, KY: Taylor and Francis.

Gregg, K.R. (1996) The logical and developmental problems of second language acquisition IN: RITCHIE, W.C. & BHATIA, T.K. (eds.) Handbook of second language acquisition. San Diego, CA: Academic Press. pp.49-81

Gathercole, S. (2008). Working Memory and Learning: A Practical Guide for Teachers. Los Angeles, CA; London: Sage Publications

Gathercole, V.C.M. (2002) Command of the mass/count distinction in bilingual and monolingual children: An English morphosyntactic distinction IN: Oller, D.K. & Eiliers, R.E. (eds.) Language and literacy in bilingual children. Clevedon: Multilingual Matters. pp.175-206

Guba, E. G. & Lincoln, Y. S. (1989). Fourth Generation Evaluation. Newbury Park, CA: Sage.

Harley, H., & Ritter, E. (2002). Person and number in pronouns: A feature– geometric analysis. Language, 78, 482–526.

Hawkins, R., & Chan, Y. (1997). The partial availability of Universal Grammar in second language acquisition: The “failed functional features hypothesis.” Second Language Research, 13(3), 187–226. https://doi.org/10.1191/026765897671476153

Hawkins, R., & Hattori, H. (2006). Interpretation of English multiple wh-questions by Japanese speakers: A missing uninterpretable feature account. Second Language Research, 22(3), 269-301.

Henry, N, et al. (2009). “More on the Effects of Explicit Information in Structured SLA: A Partial Replication and a Response to Fernández (2008).” Studies in Second Language Acquisition, vol. 31, pp. 559–75.

Henry, N. (2015). Morphosyntactic Processing, Cue Interaction, and the Effects of Instruction: An Investigation of Processing Instruction and the Acquisition of Case Markings in L2 German. Ph.D. Thesis, The Pennsylvania State University, State College, PA, USA

Henshaw, F. (2012). How effective are affective activities? Relative benefits of two types of structured input activities as part of a computer-delivered lesson on the Spanish subjunctive. Language Teaching Research, 16(3), 393-414.

Hikima, N. (2010). The effects of processing instruction and re-exposure on interpretation discourse level tasks: the case of Japanese passive forms. University of Greenwich. Unpublished PhD Dissertation.

Howell, D. C. (2010). Statistical methods for psychology (7th ed.). California: Wadsworth.

Hopp, H., Bail, J. and Jackson, C. N. (2020) ‘Frequency at the syntax–discourse interface: A bidirectional study on fronting options in L1/L2 German and L1/L2 English’, Second Language Research, 36(1), pp. 65–96. doi: 10.1177/0267658318802985.

Huddleston, R. and G. Pullum (2002). The Cambridge Grammar of the English Language. Cambridge: Cambridge University Press.

Hulstijn, J. H., & de Graaf, R. (1994). Under what conditions does explicit knowledge of a second language facilitate the acquisition of implicit knowledge? A research proposal. *AILA Review, 11*(1), 97-112.

Hwang, S. H., & Lardiere, D. (2013). Plural–marking in L2 Korean: A feature–based approach. Second Language Research, 29(1), 57–86. https://doi.org/10.1177/0267658312461496

Jackendoff, R. (2007). A parallel architecture perspective on language processing. Brain Research, 1146: 2-22.

Jablin, F. and Putnam, L. (2000) The New Handbook of Organizational Communication: Advances in Theory, Research, and Methods Sage Publications: Thousand Oaks, California.

Juffs, A., & Harrington, M. (1996). Garden Path Sentences and Error Data in Second Language Sentence Processing. Language Learning, 46(2), 283–323.

Judy, T. (2011) L1/L2 parametric directionality matters: More on the null subject parameter in L2 acquisition. EUROSLA Yearbook, 11(1). pp.165-90

Juffs, A., & Harrington, M. (2011). Working memory in L2 learning. Language Teaching, 44, 137–166.

Just, M. A., Carpenter, P. A., & Woolley, J. D. (1982). Paradigms and processes in reading comprehension. Journal of Experimental Psychology: General, 111, 228-238.

Ibrahim, Z., Kassabgy, N., &Aydeliott, S. (2000) Diversity in language: contrastive studies in English and Arabic. theoretical applied linguistics. American University in Cairo (AUC).

Isurin, L. (2013). Memory and first language forgetting. In J. Altarriba, & L. Isurin (Eds.), Memory, Language, and Bilingualism. Theoretical and Applied Approaches (pp. 319– 348). Cambridge and New York: Cambridge University Press.

Kanno, K. (1997). The acquisition of null and overt pronominals in Japanese by English speakers. Second Language Research, 13(3), 265–287.

Kanno, K. (1998). The stability of UG principles in second language acquisition. Linguistics, 36(6), 1125–1146.

Kanno, K. (1996). The status of a nonparameterized principle in the L2 initial state. Language Acquisition, 5(4), 317–332.

Kasprowicz, R., & Marsden, E. (2017). Towards ecological validity in research into input-based practice: Form spotting can be as beneficial as form-meaning practice. Applied Linguistics, 39(6), 886–911. https://doi.org/10.1093/applin/amw051

Keating, G.D. & Farley, A.P. (2008). Processing instruction, meaning-based output instruction and meaning-based drills: Impacts on classroom L2 acquisition of Spanish object pronouns. Hispania, 91(3), 639-650.

Khalil, A. (2000). Analysis of Errors Made by Arab EFL learners. Bethlehem: Al- Jerashi Press.

Khan, S. & Namer., L. (2017). The Comprehension of English Relative Clauses by Arabic - Speaking EFL Learners. International Journal of Education, 9(1), 192-207.

Kharma, N & Hajjaj, A. (1985). Errors in English Among Arabic Speakers: Analysis and Remedy. London: Longman.

Kuno, S. (1974). The position of relative clauses and conjunctions. Linguistic Inquiry 5 (1): 117-136.

Lado, R. (1957). Linguistics Across Cultures. University of Michigan Press.

Lardiere, D. (1998a). Case and Tense in the ‘fossilized’ steady state. Second Language Research 14: 1–26.

Lardiere, D. (1998b). Dissociating syntax from morphology in a divergent L2 end–state grammar. Second Language Research, 14(4), 359–375.

Lardiere, D. (2000). Mapping features to forms in second language acquisition. In J. Archibald. (Ed.), Second Language Acquisition and Linguistic Theory (pp. 102–129). MA: Blackwell.

Lardiere, D. (2005). On morphological competence. Proceedings of the 7th Generative Approaches to Second Language Acquisition Conference, Gasla 2004, 178–192.

Lardiere, D. (2007). Acquiring (or assembling) functional categories in second language acquisition. Proceedings of the 2nd Conference on Generative Approaches to Language Acquisition North America (GALANA), 233–244.

Lardiere, D. (2008). Feature–Assembly in Second Language Acquisition. In J. Liceras, H. Zobl, & H. Goodluck (Eds.), The role of formal features in second language acquisition (pp. 106–140). Lawrence Erlbaum Associates.

Lardiere, D. (2009). Some thoughts on the contrastive analysis of features in second language acquisition. Second Language Research, 25(2), 173–227. https://doi.org/10.1177/0267658308100283

Larson-Hall, J. (2010). A guide to doing statistics in second language research using SPSS. New York: Routledge.

Lasnik, H. & Lidz, J.L. (2016) The Argument from the Poverty of the Stimulus IN: ROBERTS, I. (ed.) The Oxford Handbook of Universal Grammar. Oxford: OUP.

Lee, J. (1998). The relationship of verb morphology to second language reading comprehension and input processing. The Modern Language Journal, 82 (1): 33-48.

Lee, J. (1999). On levels of processing and levels of comprehension. In J. Gutiérrez- Rexach and F. Martínez-Gil (Eds.), Advances in Hispanic Linguistics (42-59). Somerville, MA: Cascadilla Press.

Lee, J., (2015). The milestones in twenty years of processing instruction research. International Review of Applied Linguistics in Language Teaching 53: 111–26.

Lee, J., Benati, A. (2007a). Delivering processing instruction in classrooms and in virtual contexts: Research and practice. London: Equinox.

Lee, J., Benati A. (2007b). Second language processing. An analysis of Theory, Problems and Possible Solutions. London: Continuum.

Lee, J., Benati, A. (2009). Research and perspectives on processing instruction. Berlin: Mouton de Gruyter.

Lee, J. ,VanPatten, B. (2003). Making communicative Teaching happen 2nd ed New York: Mraw-Hill

Lee, S., & Huang., (2008). Visual input enhancement and grammar learning. Studies in Second Language Acquisition, 30(3), 307-331.

Legate, J.A. & Yang, C.D. (2002) Empirical re-assessment of stimulus poverty arguments. The Linguistic Review, 19. pp.151-62

Lidz, J. & Gagliardi, A. (2015) How Nature Meets Nurture: Universal Grammar and Statistical Learning. Annual Review of Linguistics, 1. pp.333-53. doi:10.1146/annurev-linguist-030514-125236

Leow, R. P., Hsieh, H.-C., & Moreno, N. (2008). Attention to Form and Meaning Revisited. Language Learning, 58, 665–695.

Lenneberg, E.H. (1967) Biological foundations of Language. John Wiley and Sons, New York. https://doi.org/10.1080/21548331.1967.11707799

Lightbown, P. and N. Spada. (2006). How Languages are Learned. Oxford: Oxford University Press.

Linck, J. A., Osthus, P., Koeth, J. T., & Bunting, M. (2014). WM and L2: Meta analysis. Psychonomic Bulletin & Review, 21, 861–883.

lock, G. (2002), Functional English Grammar. Cambridge, university press.

Loewen, S. (2011). Focus on form instruction. In E. Hinkel (Ed.), Handbook of Research in Second Language Teaching and Learning (Vol. 2, 576-592). New York: Routledge.

Long M. (1983). "Does second language instruction make a difference" in TESOL Quarterly 17 1983:359-82

Long, M., 8c Robinson, P. (1998). Focus on form: Theory, research, and practice. In C. Doughty 8c J. Williams (Eds.), Focus on form in classroom second language acquisition (pp. 15-41). Cambridge: Cambridge University

Loschky, L., & Bley-Vroman, R. (1993). Grammar and task-based methodology. In G. Crookes & S. Gass (Eds.), Tasks and language learning (pp. 123-167). London: Multilingual Matters.

Mackey, A. & Gass, S.M. (2005). *Second Language Research: Methodology and Design*, Mahwah. NJ: Lawrence Erlbaum.

Mackey, A., & Gass, S. (2005). Second language research: Methodology and design. New Jersey: Lawrence Erlbaum Associates, Inc.

Mai, Z. & Yuan, B. (2016) Uneven reassembly of tense, telicity and discourse features in L2 acquisition of the Chinese shi… de cleft construction by adult English speakers. Second Language Research, 32(2). pp.247-276

Mangubhai, F. (1991). The Processing Behaviours of Adult Second Language Learners and their Relationship to Second Language Proficiency. Applied Linguistics, 12 (3): 268-298.

Marefat, H. and Rahmany, R. (2009). Acquisition of English Relative Clauses by Persian EFL Learners. Journal of Language and Linguistic Studies, 5(2), 21-48.

Marsden, E. (2004). Teaching and learning of French verb inflections: a classroom experiment using processing instruction, unpublished Ph.D. thesis, University of Southampton.

Marsden, E. (2006). Exploring input processing in the classroom: An experimental comparison of processing instruction and enriched input. Language Learning, 56(3), 507–566. http://doi.org/10.1111/j.1467- 9922.2006.00375.x

Marsden, E. (2007). Can educational experiments both test a theory and inform practice?. British Educational Research Journal, 33(4), 565-588.

Marsden, E., & Chen, H. (2011). The roles of structured input activities in processing instruction and the kinds of knowledge they promote. Language Learning, 61(4), 1058- 1098.

Marsden, E., & Torgerson, C. (2012). Single group, pre- and post-test research designs: Some methodological concerns. Oxford Review of Education, 5, 583-616.

Marsden, E., Morgan-Short, K., Trofimovich, P., & Ellis, N. C. (2018). Replication in second language research: Narrative and systematic reviews and recommendations for the field. Language Learning, 68(2), 321–391.

Morgan-Short, K., & Wood Bowden, H. (2006). Processing Instruction and Meaningful Output- Based Instruction: Effects on Second Language Development. Studies in Second Language Acquisition, 28(1), 31–65.

Meisel, J. M. (2011). First and Second Language Acquisition: Parallels and Differences. Cambridge University Press.

Mertler, C. A. (2019). Introduction to educational research (Second edition. ed.). Los Angeles: SAGE Publications, Inc

Miller, K.L. & Schmitt, C. (2012) Variable Input and the Acquisition of Plural Morphology. Language Acquisition, 19(3). pp.223-261

Muijs, D. (2004). Doing Quantitative Research in Education: with SPSS. London: Sage.

Norris, J. M., & Ortega, L. (2000). Effectiveness of L2 instruction: A research synthesis and quantitative meta-analysis. Language learning, 50(3), 417-528.

Paradis, J. (2010) Bilingual children’s acquisition of English verb morphology: Effects of language exposure, structure complexity, and task type. Language Learning, 60. pp.651-80

Pérez–Leroux, A. T., & Glass, W. (1997). OPC effects in the L2 acquisition of Spanish. In A. T. Pérez Leroux & W. Glass (Eds.), Contemporary perspectives on the acquisition of Spanish. Developing Grammars. (Vol. 1, pp. 149–165). Cascadilla Press.

Pérez–Leroux, A. T., & Glass, W. (1999). Null anaphora in Spanish second language acquisition: Probabilistic versus generative approaches. Second Language Research, 15, 220–249.

Pienemann, M., & Lenzing, A. (2015). Processability theory. In B. VanPatten & J. Williams (Eds.), Theories in second language acquisition: An introduction (2nd ed.) (pp. 159–179). Routledge

Platzack, C. (1996). The Initial Hypothesis of Syntax: A Minimalist Perspective on Language Acquisition and Attrition. In H. Clahsen (Ed.), Language Acquisition and Language Disorders (Vol. 14, p. 369). John Benjamins Publishing Company. https://doi.org/10.1075/lald.14.15pla

Pleh, C. (1989). The development of sentence interpretation in Hungarian. In B. MacWhinney and E. Bates (Eds.), The Crosslinguistic Study of Sentence Processing (158-185). Cambridge: Cambridge University Press.

Pullum, G. & Scholz, B. (2002) Empirical assessment of stimulus poverty arguments. The Linguistic Review, 19. pp.8-50

Qin, J. (2008). The effect of processing instruction and dictogloss tasks on acquisition of the English passive voice. Language Teaching Research, 12(1), 61–82. http://doi.org/10.1177/1362168807084494

Rankin,T. & Unsworth, S. (2016) Beyond poverty: Engaging with input in generative SLA. Second Language Research, 32(4). pp.563-572.

Rehman, A. A., & and Alharthi, K. (2016) An introduction to research paradigms. International Journal of Educational Investigations, 3(8), pp.51–59.

Rizzi, L., (1997). The fine structure of the left periphery. In: Haegeman, L. (Ed.), Elements of Grammar. Kluwer, Berkeley, pp. 281–337.

Robayna, T. T. (2020). Teaching Grammar Online: The Intersection of Computer Assisted Language Learning and Processing Instruction in Spanish as a Second Language. Retrieved from https://purl.lib.fsu.edu/diginole/2020_Summer_Fall_Robayna_fsu_0071E_16050

Rothman, J. & Slabakova, R. (2018) The generative approach to SLA and its place in modern second language studies. Studies in Second Language Acquisition, 40. pp.417-442

Russell, Victoria. 2012. Learning Complex Grammar in the Virtual Classroom: A Comparison of Processing Instruction, Structured Input, Computerized Visual Input Enhancement, and Traditional Instruction. Foreign Language Annals 45: 42–71.

Sagarra, N. (2007). Working memory and L2 processing of redundant grammatical forms. In Understanding Second Language Process. Edited by Zhaohong Han. Clevedon: Multilingual Matters, pp. 133–47.

Sanz, C. (2005). Adult SLA: The interaction between external and internal factors. In C. Sanz, Mind and context in adult second language acquisition: Methods, Theory, and Practice (pp. 3–21). Washington, DC: Georgetown University Press.

Sanz, C. & Kara Morgan-Short (2004). Positive Evidence versus Explicit Rule Presentation and Explicit Negative Feedback: A Computer-Assisted Study. Language Learning, 54 (3): 5–79.

Sanz, C., & Morgan-Short, K. (2004). Positive evidence versus explicit rule presentation and explicit negative feedback: A computer-assisted study. Language Learning, 54(1), 35-78.

Sasaki, Y. (1998). Processing and learning of Japanese double-object active and causative sentences: An Error-Feedback Paradigm. Journal of Psycholinguistic Research, 27 (4): 453-479.

Salaberry, R. (1997). The role of input and output practice in second language acquisition. Canadian Modern Language Review 53, 422–451.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Research Methods for Business Students, (5th ed.). Harlow, Pearson Education.

Schachter, J. (1989). Linguistic Perspectives on Second Language Acquisition. Cambridge University Press.

Schmidt, R. (1990). The role of consciousness in second language learning. Applied Linguistics, 11(2), 129-158.

Schmidt, R. (1995). Consciousness and foreign language learning: A tutorial on the role of attention and awareness in learning. In R. Schmidt, Attention and awareness in foreign language learning (pp. 1–63). Honolulu: Second Language Teaching and Curriculum Center, University of Hawai‘i.

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), Cognition and second language instruction (pp. 3-32). Cambridge: Cambridge University Press.

Schwartz, B. D., & Sprouse, R. A. (1994). Word order and nominative case in nonnative language acquisition: A longitudinal study of (L1 Turkish) German interlanguage. In T. Hoekstra & B. D. Schwartz (Eds.), Language acquisition studies in generative grammar (pp. 317–368). John Benjamins.

Schwartz, B. D., & Sprouse, R. A. (1996). L2 cognitive states and the full transfer/full access model. Second Language Research, 12(1), 40–72.

Schwartz, B.D. & Sprouse, R.A. (2013) Generative approaches and the poverty of the stimulus In: Young-Scholten, M. & Herschensohn, J.R. (eds.) The Cambridge Handbook of Second Language Acquisition. Cambridge: CUP. pp.137- 159

Shaheen, B. (2013). A comparative study of restrictive relative clauses in Latakian Syrian Arabic and English restrictive relative clauses by first language speakers of Latakian Syrian Arabic. (Doctoral dissertation). University of Essex. Retrieved from http://ling.auf.net/lingbuzz/001769

Sharwood Smith, M. (1993). Input enhancement in instructed SLA: theoretical bases. Studies in Second Language Acquisition. 15(2), pp.165-179.

Sharwood Smith, M. (2004). In two minds about grammar: On the interaction of linguistic and metalinguistic knowledge in performance. Transactions of the Philological Society, 102(2), 255–280.

Sharwood Smith, M. (2013). Only Connect: The Interface Debate. In K. Droździał-Szelest, & M. Pawlak, Psycholinguistic and Sociolinguistic Perspectives on Second Language Learning and Teaching (pp. 27–39). Berlin & Heidelberg: Springer.

Sharwood Smith, M., & Truscott, J. (2005). Stages or Continua in Second Language Acquisition: A MOGUL Solution. Applied Linguistics, 26, 219–240.

Sharwood Smith, M., & Truscott, J. (2014). The Multilingual Mind. A Modular Processing Perspective (1st ed.). Cambridge: Cambridge University Press.

Shintani, N. (2015). The Effectiveness of Processing Instruction and Production-based Instruction on L2 Grammar Acquisition: A Meta-Analysis. Applied Linguistics 36: 306–25.

Shimanskaya, E. M. (2015). Feature reassembly of semantic and morphosyntactic pronominal features in L2 acquisition. [Unpublished doctoral dissertation]. University of Iowa.

Shimanskaya, E. M., & Slabakova, R. (2014). Re-assembling objects: A new look at the L2 acquisition of pronominal clitics. Bilingualism: Language and Cognition, 1–18.

Slabakova, R. (2008) Meaning in the Second Language. Berlin: Mouton de Gruyter

Slabakova, R. (2009). Features or parameters: which one makes second language acquisition easier, and more interesting to study? Second Language Research, 25(2), 313–324.

Slabakova, R. (2018) Back to our roots. Linguistic Approaches to Bilingualism, 8(6). pp.776-781

Slobin, D. I. (1985). Crosslinguistic evidence for the language-making capacity. In D. I. Slobin(Ed.), The crosslinguistic study of language acquisition, Vol. 1.

Slomp, N. K. (2023). An investigation into the effects of processing instruction on the acquisition of subject–verb agreement by Spanish-speaking second language learners of English (Doctoral dissertation, University of Southampton).

Spada, N., & Tomita, Y. (2010). Interactions between type of instruction and type of language feature: A meta-analysis. Language Learning, 60(2), 263-308.

Stageberg, C. (1971). An Introductory English Grammar. 2nd edn. New York: Holt, Rinehart and Winston.

Stafford, C. A., Bowden, H. W., & Sanz, C. (2012). Optimizing language instruction: Matters of explicitness, practice and cue learning. Language Learning, 62(3), 741-768.

Tanner, D., & Van Hell, J. G. (2014). ERPs reveal individual differences in morphosyntactic processing. Neuropsychologica, 56, 289–301.

Tanner, D., Inoue, K., & Osterhout, L. (2014). Brain-based individual differences in online L2 grammatical comprehension. Bilingualism: Language and Cognition, 17(2), 277–293.

Thomas, M. (1991). Universal Grammar and the interpretation of reflexives in a second language. Language, 67, 211–239.

Thomas, M. (1993). Knowledge of reflexives in a second language. John Benjamins.

Tomlin, R. and Villa, V. (1994). Attention in cognitive science and second language acquisition. Studies in Second Language Acquisition 16(2): 183–203. https://doi.org/10.1017/S0272263100012870

Thordardottir, E. (2011) The relationship between bilingual exposure and vocabulary development. The International Journal of Bilingualism, 15. pp.426-45

Thordardottir, E. (2015) The relationship between bilingual exposure and morphosyntactic development. International Journal of Speech-Language Pathology, 17. pp.97-114

Thomas, E.M. & Williams, N. & Jones, L.A. & Davies, S. & Binks, H. (2014) Acquiring complex structures under minority language conditions: Bilingual acquisition of plural morphology in Welsh. Bilingualism: Language and Cognition, 17. pp.478- 94

Toth, P.D. (2006). Processing instruction and a role for output in second language acquisition. Language Learning, 56(2), 319-385.

Truscott, J., & Sharwood Smith, M. (2004). Acquisition by processing: A modular perspective on language development. Bilingualism: Language and Cognition, 7, 1–20.

Truscott, J., & Sharwood Smith, M. (2011). Input, Intake, and Consciousness. The Quest for a Theoretical Foundation. Studies in Second Language Acquisition, 33, 497– 528.

Truscott J, & Sharwood Smith M (2019) The internal context of bilingual processing. Amsterdam: John Benjamins.

Tsimpli, I. M., & Dimitrakopoulou, M. (2007). The Interpretability Hypothesis: Evidence from wh-interrogatives in Second Language Acquisition. Second Language Research, 23(2), 215–242.

Unsworth, S. (2014) Comparing the role of input in bilingual acquisition across domains IN: Grüter, T. & Paradis, J. (eds.) Input and experience in bilingual development. Amsterdam: John Benjamins. pp.181-201

Van Patten. B. (1990). Attending to content and form in the input: An experiment in consciousness. Studies in Second Language Acquisition , 12, 287– 301.

VanPatten, B. (1994). Evaluating the Role of Consciousness in Second Language Acquisition: Terms, linguistic features, and research methodology. In J. H. Hulstijn, & R. Schmidt (Eds.), AILA Review 11: Consciousness in Second Language Learning, 27–36.

VanPatten, B. (1996). Input Processing and Grammar Instruction in Second Language Acquisition (2nd ed.). New Jersey: Ablex.

VanPatten, B. (2002). Processing Instruction: An update. Language Learning, 52, 755–803.

VanPatten, B. (Ed.) (2004a). Processing instruction: Theory, research, and commentary. Mahwah, NJ: Lawrence Erlbaum.

VanPatten, B. (Ed.) (2004b). Input processing in second language acquisition in B. Van Patten, Processing instruction: Theory, research, and commentary (5-31). Mahwah, NJ: Lawrence Erlbaum.

VanPatten, B. (2005). Processing Instruction. In C. Sanz, Mind and Context in Adult Second Language Acquisition. Methods, Theory, and Practice (pp. 267–281). Washington, DC: Georgetown University Press.

VanPatten, B. (2007). Input Processing in Adult Second Language Acquisition. In VanPatten, B. and Williams, J. (Eds). Theories in Second Language Acquisition, pp. 115-135. Mahwah, NJ: Lawrence Erlbaum.

VanPatten, B. (2009). Processing Matters in Input Enhancement. In Piske, T. and Young-Scholten, M. (Eds.). Input Matters in SLA, pp. 47–61. Clevedon, UK: Multilingual Matters.

VanPatten, B. (2015a). Input processing in adult SLA. In B. VanPatten & J. Williams (Eds.), Theories in second language acquisition (113-135). New York: Routledge.

VanPatten, B. (2015b). Foundations of processing. International Review of Applied Linguistics, 53, 91-109.

VanPatten, B., & Borst, S. (2012). The role of explicit information and grammatical sensitivity in processing instruction: Nominative-accusative case marking and word order in German L2. Foreign Language Annals, 45(1), 92-109.

VanPatten, B., & Cadierno, T. (1993). Explicit instruction and input processing. Studies in Second Language Acquisition, 15, 225–243.

VanPatten, B., Collopy, E., Price, J., Borst, S., & Qualin, A. (2013). Explicit Information, Grammatical Sensitivity, and the First-Noun Principle: A Cross-Linguistic Study in Processing Instruction. The Modern Language Journal, 97(2), 506-527.

VanPatten, B., & Lee, J. (2003). Making Communicative Language Teaching Happen. McGraw-Hill Companies.

VanPatten, B., Farmer, J.L. and Clardy, C.L (2009). Processing instruction and meaning-based output instruction: A response to Keating and Farley (2008). Hispania, 92(1), 116-126.

VanPatten, B, and Keating, D. (2007). Getting Tense: Lexical Preference, L1 Transfer, and Native and Non-Native Processing of Temporal Reference. Paper presented at the Annual Meeting of the American Association for Applied Linguistics, Costa Mesa, CA, USA, April 21–24.

VanPatten, B., & Oikkenon, S. (1996). Explanation versus structured input in processing instruction. Studies in Second Language Acquisition, 18(4), 495-510.

VanPatten, B. and Rothman, J. (2014) ‘Against Rules’, in The Grammar Dimension in Instructed Second Language Learning : Advances in Instructed Second Language Acquisition Research. Bloomsbury Academic, pp. 15–35. doi: 10.5040/9781472542113.ch-001.

VanPatten, B., & Sanz, C. (1995). From input to output: Processing instruction and communicative tasks. In F. Eckman, D. Highland, P. Lee, J. Mileham & R. Rutowski Weber (Eds.), Second language acquisition theory and pedagogy. New Jersey: Erlbaum.

VanPatten, B., Smith, M., Benati, A., (2019). Key Questions in Second Language Acquisition: An Introduction (Cambridge University Press).

VanPatten, B., & Uludag, O. (2011). Transfer of training and processing instruction: From input to output. System, 39, 44–53.

VanPatten, B., Williams, J., and Rott, S. (2004). Form-Meaning Connections in Second Language Acquisition. In B. VanPatten, J. Williams, S. Rott, and M. Overstreet (Eds.), Form-Meaning Connection in Second Language Acquisition (1-26). Mahwah, NJ: Lawrence Erlbaum Associates, Inc

VanPatten, B., & Wong, W. (2004). Processing instruction and the French causative: Another replication. In VanPatten, B. (Ed.), Processing instruction: Theory, research, and commentary (pp. 97–118). Mahwah, NJ: Erlbaum.

Versteegh, K , M. Eid, A. Elgibali, M. Woidich & A. Zaborski (eds.). (2011). Encyclopedia of Arabic Language and Linguistics. Leiden & Boston: Brill.

White, L. (1989) Universal Grammar and second language acquisition. Amsterdam; Philadelphia: John Benjamins

White, L. (2003a). Second Language Acquisition and Universal Grammar. Cambridge, Cambridge University Press.

White, L. (2003b). On the Nature of Interlanguage Representation. The Handbook of Second Language Acquisition. Malden, MA: Blackwell.

White, L. (2012). Research timeline: universal grammar, crosslinguistic variation and second language acquisition. Language Teaching (3), 309-328.

White, J., & Ranta, L. (2002). Examining the interface between metalinguistic task performance and oral production in a second language. Language Awareness, 11(4), p. 259-290.

White, L., Spada, N., Lightbown, P. M., & Ranta, L. (1991). Input enhancement and question formation. Applied Linguistics, 12(4), 416-432.

Whong, M. (2007). Seeking Consensus: Generative Linguistics and Language Teaching. Leeds Working Papers in Linguistics and Phonetics, 12, 143–155.

Whong, M. (2013). Applied Generative SLA: The need for an agenda and a methodology. In M. Whong, K. Gil & H. Marsden (Eds.), Universal Grammar and the Second Language Classroom (Vol. 16, pp. 231-248). Dordrecht: Springer.

Winter, G. (2000). A comparative discussion of the notion of validity in qualitative and quantitative research. The qualitative report, 4(3), 1-14.

Wong, W. (2004a). The nature of processing instruction. In B. VanPatten (Ed.), Processing instruction: Theory, research, and commentary (pp. 33-64). New Jersey: Lawrence Erlbaum Associates, Inc.

Wong, W. (2004b). Processing instruction in French: The roles of explicit information and structured input. In B. VanPatten (Ed.), Processing instruction: Theory, research, and commentary (187-205) Mahwah, NJ: Erlbaum.

Wong, W. (2005). Input enhancement: From theory and research to the classroom. New York: McGraw-Hill.

Wong, W., & Ito, K. (2018). The effects of processing instruction and traditional instruction on L2 online processing of the causative construction in French: An eye-tracking study. Studies in Second Language Acquisition, 40, 241–268.

Xiaorong, Z. (2007). Resumptive Pronouns in the Acquisition of English Relative Clauses by Chinese EFL Learners. (Unpublished MA Thesis), The Chinese University of Hong Kong, Hong Kong, China.

Yang, C. (2002) Knowledge and Learning in Natural Language. Oxford: Oxford University Press

Yang, C. (2006) The infinite gift: How children learn and unlearn the languages of the world. New York: Scribner

Yang, C. (2018) A formalist perspective on language acquisition. Linguistic Approaches to Bilingualism, 8(6). pp.665-706

Vainikka, A., & Young–Scholten, M. (1994). Direct access to X'–theory: Evidence from Korean and Turkish adults learning German. In T. Hoekstra & B. D. Schwartz (Eds.), Language acquisition studies in generative grammar (pp. 265–316). John Benjamins.

Vainikka, A., & Young-Scholten, M. (1996a). Gradual development of L2 phrase structure. Second Language Research, 12(1), 7–39.

Vainikka, A., & Young-Scholten, M. (1996b). The early stages in adult L2 syntax: Additional evidence from Romance speakers. Second Language Research, 12(2), 140–176.

Yuan B., Zhao Y. (2005). Resumptive pronouns in English-Chinese and Arabic-Chinese interlanguages. International Review of Applied Linguistics in Language Teaching, 43, 219–237.

Zagood, J. (2012). A Contrastive Study of Relativization in English and Arabic with Reference to Translation Pedagogy. (Unpublished Doctoral Dissertation), Durham University, Durham, England.

Zhong, Z., & Benati, A. G. (2024). An Investigation into the Effects of Structured Input, Referential Activities, and Affective Activities on the Acquisition of English Causative Forms. Languages, 9(2). doi:10.3390/languages9020039

Appendices

Appendix 1 Permission Letter

الرقم: ص خ-443-16-1369 التاريخ: 09/06/1443

KINGDOM OF SAUDI ARABIA
Ministry of Education
Najran University
Scholarship and training department

المملكة العربية السعودية
وزارة التعليم
جامعة نجران
إدارة الابتعاث والتدريب

سعادة الملحق الثقافي في بريطانيا **حفظه الله**

السلام عليكم ورحمة الله وبركاته

بناءً على توصية لجنة الابتعاث والتدريب في جلستها الثانية عشر والمنعقدة في ١٤٤٣/٠٥/٢٤هـ بالموافقة على طلب رحلة علمية للمبتعث / **فرج أحمد فرج الهمامي** وذلك لمدة ثلاثة أشهر لجمع البيانات المتعلقة بمشروع بحثه للدكتوراه اعتباراً من ٢٠٢١/١١/١٠م، على أن يباشر أبحاثه تحت إشراف قسمه بجامعة نجران، وتزويد القسم المعني بتقرير الرحلة العملية ومخرجاتها.

علي

وتقبلوا تحياتي وتقديري ...

وكيل الجامعة
للدراسات العليا والبحث العلمي

د. سعيد بن علي السريعي

Appendix 2.a Participant Information sheet

UNIVERSITY OF
Southampton

Participant Information Sheet

Study Title: The Role of Input Processing in the Processing of English Restrictive Relative Clause by L1 Saudi Arabic Speakers

Researcher: Faraj Alhamami
ERGO number: 67336

You are being invited to take part in the above research study. To help you decide whether you would like to take part or not, it is important that you understand why the research is being done and what it will involve. Please read the information below carefully and ask questions if anything is not clear or you would like more information before you decide to take part in this research. You may like to discuss it with others but it is up to you to decide whether or not to take part. If you are happy to participate you will be asked to sign a consent form.

What is the research about?

This research is about investigating the role of processing input in the acquisition process of English relative clauses by Saudi learners of English. The main aim is to find the students' achievement as a result of the use of a pedagogic intervention in language teaching. This work will be towards obtaining my doctoral degree at the University of Southampton.

Why have I been asked to participate?

You are being invited to take part in this study as you are an L2 learner of english at Najran University and being studying in your first year. All students in their first year of study at Najran university might be asked to participate in this research.

What will happen to me if I take part?

If you intent to participate in this research, there will be extra classes to attend tow to three days a week. Your participation will last for two months.
You will be taught in a different way in which you will be asked to do certain activities in class. The researcher will explain the detailed nature of the activities. I will be the main instructor for these classes.

Are there any benefits in my taking part?

There may be no direct benefit to you other than the sense of helping the public and contributing to the knowledge in the area of understanding learners' engagement and the development of teaching English for Saudi Higher Education, particularly for those who are studying English as a second language. Your participation is highly appreciated.

Are there any risks involved?

There will no risk involved to the participants. All your personal information, names, and your comments will be made anonymous.

What data will be collected? (pre-questionaire).

I will collect from you three tests through Grammaticality-judgement Task, Translation Task and Picture-cued Task three times: pre-test, post-test and delayed post-test. I will not save your names in the tests. I will not share any data collected from you with anyone except my thesis supervisor. All data collected in association with this study will be stored in a locked file cabinet and/or on a password protected computer.

Will my participation be confidential?

Your participation in this study will be kept strictly confidential. All data will be stored on the secure University of Southampton OneDrive System accessed via university email and on external hard drive that is password-protected and on encrypted computer.

Only members of the research team and responsible members of the University of Southampton may be given access to data about you for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your data. All of these people have a duty to keep your information, as a research participant, strictly confidential.

Do I have to take part?

No, it is entirely up to you to decide whether or not to take part. If you decide you want to take part, you will need to sign a consent form to show you have agreed to take part.

What happens if I change my mind?

You have the right to change your mind and withdraw at any time without giving a reason and without your participant rights (or routine care if a patient) being affected. You can contact me in person or at Fafa1u19@soton.ac.uk to inform me of your withdrawal and in the event that you do

withdraw from this study, the information you have already provided will be kept in a confidential manner.
Your participation or non-participation in this study does not jeopardize your grades, nor does it affect your relationships with the faculty or university relationships.

What will happen to the results of the research?

Your personal details will remain strictly confidential. Research findings made available in any reports or publications will not include information that can directly identify you without your specific consent.

Where can I get more information?
If you have further questions about this study or would like to have a copy of the thesis, you may contact me Faraj Alhamami at Fafa1u19@soton.ac.uk.

What happens if there is a problem?

If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your questions.
If you remain unhappy or have a complaint about any aspect of this study, please contact the University of Southampton Research Integrity and Governance Manager (023 8059 5058, rgoinfo@soton.ac.uk). Or contact the main researcher at (0538187008, Fafa1u19@soton.ac.uk).

Data Protection Privacy Notice
The University of Southampton conducts research to the highest standards of research integrity. As a publicly-funded organisation, the University has to ensure that it is in the public interest when we use personally-identifiable information about people who have agreed to take part in research. This means that when you agree to take part in a research study, we will use information about you in the ways needed, and for the purposes specified, to conduct and complete the research project. Under data protection law, 'Personal data' means any information that relates to and is capable of identifying a living individual. The University's data protection policy governing the use of personal data by the University can be found on its website (https://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page).

This Participant Information Sheet tells you what data will be collected for this project and whether this includes any personal data. Please ask the research team if you have any questions or are unclear what data is being collected about you.

Our privacy notice for research participants provides more information on how the University of Southampton collects and uses your personal data when you take part in one of our research

projects and can be found at
http://www.southampton.ac.uk/assets/sharepoint/intranet/ls/Public/Research%20and%20Integrity%20Privacy%20Notice/Privacy%20Notice%20for%20Research%20Participants.pdf

Any personal data we collect in this study will be used only for the purposes of carrying out our research and will be handled according to the University's policies in line with data protection law. If any personal data is used from which you can be identified directly, it will not be disclosed to anyone else without your consent unless the University of Southampton is required by law to disclose it.

Data protection law requires us to have a valid legal reason ('lawful basis') to process and use your Personal data. The lawful basis for processing personal information in this research study is for the performance of a task carried out in the public interest. Personal data collected for research will not be used for any other purpose.

For the purposes of data protection law, the University of Southampton is the 'Data Controller' for this study, which means that we are responsible for looking after your information and using it properly. The University of Southampton will keep identifiable information about you for ten years after the study has finished after which time any link between you and your information will be removed.

Thank you.
Your participation is much appreciated.

Appendix 2.b Consent form for the partcipants

Southampton

CONSENT FORM

Study title: The Role of Input Processing in the Processing of English Restrictive Relative Clause by L1 Saudi Arabic Speakers

Please initial the box(es) if you agree with the statement(s):

I have read and understood the information sheet and have had the opportunity to ask questions about the study.	
I agree to take part in this research project and agree for my data to be used for the purpose of this study.	
I understand my participation is voluntary and I may withdraw (at any time) for any reason without my participation rights being affected.	
I understand that should I withdraw from the study then the information collected about me up to this point may still be used for the purposes of achieving the objectives of the study only.	
I agree to take part in this research project and agree for my data to be used for the purpose of this study.	
I understand that I will not be directly identified in any reports of the research.	

Name of participant (print name) ....

Signature of participant...

Date.. ....

Name of researcher (print name) ___Faraj Alhamami.........

Signature of researcher ... .

Appendix 3 Data collection timetable

14^{th} Nov to 15^{th} Nov 2021	Placement tests
16^{th} Nov to 18^{th} Nov 2021	Consent form + Questionnaire
21^{st} Nov to 24^{th} Nov 2021	Pilot study
28^{th} Nov to 29^{th} Nov 2021 - Group (1). 28^{th} (1pm – 3pm). - Group (2). 28^{th} (4pm – 6pm). - Group (3). 29^{th} (8am – 10am). - Group (4). 29^{th} (1pm – 4pm). - Group (5). 29^{th} (4pm – 6pm).	Pre-tests
7^{th} Dec to 16^{th} Dec 2021 - Group (1). 7^{th} (1pm – 4pm) - Group (2). 7^{th} (4pm – 7pm) 8^{th} (4pm – 7pm) - Group (3). 9^{th} (4pm – 7pm) 12^{th} (1pm – 4pm) 13^{th} (4pm – 7pm) - Group (4). 12^{th} (4pm – 7pm) 13^{th} (1pm – 4pm) 14^{th} (1pm – 4pm) - Group (5). 14^{th} (4pm – 7pm) 15^{th} (4pm – 7pm) 16^{th} (1pm – 4pm)	Instructional period
8^{th} Dec to 16^{th} Dec 2021 - Group (1), 8^{th} Dec 2021 (8pm to 10am). - Group (2), 9^{th} Dec 2021 (8pm to 10am). - Group (3), 14^{th} Dec 2021 (8pm – 10am). - Group (4), 15^{th} Dec 2021 (8pm – 10am). - Group (5), 16^{th} Dec 2021 (4pm – 6pm).	Post-tests
7^{th} Feb to 10^{th} Feb 2022 - Group (1). 7^{th} Feb 2022. (1pm – 3pm). - Group (2). 7^{th} Feb 2022. (4pm – 6pm). - Group (3). 8^{th} Feb 2022. (4pm – 6pm) - Group (4). 9^{th} Feb 2022. (4pm – 6pm) - Group (5). 10^{th} Feb 2022. (2pm – 4pm)	Delayed post-tests

Appendix 4 Background Questionnaire

UNIVERSITY OF Southampton

Questionnaire

Thank you very much for participating in this study. This is a general background questionnaire that asks you questions concerning your experience with learning English. I deeply appreciate your cooperation in filling out the questionnaire as accurately as possible. The information gathered through this survey will be critical to the analysis of the data I obtain from this study. Again, I thank you very much.

A	**Background Questionnaire** معلومات عامة
1	How old were you when you first started to learn English? ________________
2	Where did you first start learning English? 1. Saudi Arabia 2. English-speaking country (e.g., UK, USA, Australia, Canada)
3	How long have you been learning English in school? 1. Kindergarten 2. Elementary school (specify grade____) 3. Secondary school
4	Beside learning English at school, did you take English courses in language institute or/and through private tutoring? 1. YES 2. NO
5	Have you lived in a country where the native language is English? 1. YES 2. NO
6	If your answer is yes, which country? __________________________
7	Is English the first language of one of your parents? 1. YES 2. NO
8	Do you know a third language other than English and Arabic? 1. YES 2. NO
9	If your answer is yes what is this third language ______________________
10	Do you contact with any English-native speakers after school? 1. YES 2. NO
11	If yes, where is s/he from? _______________
12	How do you contact with him/her? Face to Face, Skype, email, others _____________
13	How often do you talk/write to him/her in English? (e.g. once a week, once a month and so on).

Appendix 5 The results of Kolmogorov-Simrnov and Shapiro-Wilk tests on all three versions of achievement test to investigate the validity.

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	group	Statistic	df	Sig.	Statistic	df	Sig.
GJT_1	group 1	.172	7	.200*	.956	7	.788
	group 2	.214	6	.200*	.931	6	.590
GJT_2	group 1	.409	7	<.001	.643	7	<.001
	group 2	.190	6	.200*	.940	6	.661
GJT_3	group 1	.142	7	.200*	.972	7	.914
	group 2	.262	6	.200*	.920	6	.505
PIC_1	group 1	.203	7	.200*	.877	7	.215
	group 2	.258	6	.200*	.940	6	.659
PIC_2	group 1	.345	7	.012	.732	7	.008
	group 2	.213	6	.200*	.948	6	.721
PIC_3	group 1	.296	7	.063	.840	7	.099
	group 2	.258	6	.200*	.940	6	.659
TRAN_1	group 1	.214	7	.200*	.858	7	.144
	group 2	.392	6	.004	.701	6	.006
TRAN_2	group 1	.258	7	.174	.818	7	.062
	group 2	.333	6	.036	.814	6	.078
TRAN_3	group 1	.360	7	.007	.664	7	.001
	group 2	.333	6	.036	.814	6	.078

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Appendix 6 The results of Levene test on all three versions of achievement test to investigate the validity.

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
GJT_1	Based on Mean	6.294	1	11	.029
	Based on Median	4.311	1	11	.062
	Based on Median and with adjusted df	4.311	1	6.469	.080
	Based on trimmed mean	6.103	1	11	.031
GJT_2	Based on Mean	1.323	1	11	.274
	Based on Median	1.344	1	11	.271
	Based on Median and with adjusted df	1.344	1	10.935	.271
	Based on trimmed mean	1.591	1	11	.233
GJT_3	Based on Mean	5.942	1	11	.033
	Based on Median	2.090	1	11	.176
	Based on Median and with adjusted df	2.090	1	6.146	.197
	Based on trimmed mean	5.549	1	11	.038
PIC_1	Based on Mean	1.504	1	11	.246
	Based on Median	.573	1	11	.465
	Based on Median and with adjusted df	.573	1	8.251	.470
	Based on trimmed mean	1.355	1	11	.269
PIC_2	Based on Mean	8.003	1	11	.016
	Based on Median	5.256	1	11	.043
	Based on Median and with adjusted df	5.256	1	9.914	.045
	Based on trimmed mean	7.999	1	11	.016
PIC_3	Based on Mean	6.144	1	11	.031
	Based on Median	3.087	1	11	.107
	Based on Median and with adjusted df	3.087	1	6.482	.126
	Based on trimmed mean	5.642	1	11	.037
TRAN_1	Based on Mean	4.087	1	11	.068
	Based on Median	.415	1	11	.532
	Based on Median and with adjusted df	.415	1	6.222	.542
	Based on trimmed mean	3.273	1	11	.098
TRAN_2	Based on Mean	.884	1	11	.367
	Based on Median	.923	1	11	.357
	Based on Median and with adjusted df	.923	1	6.071	.373
	Based on trimmed mean	1.028	1	11	.332
TRAN_3	Based on Mean	1.892	1	11	.196
	Based on Median	1.933	1	11	.192
	Based on Median and with adjusted df	1.933	1	6.282	.212
	Based on trimmed mean	2.150	1	11	.171

Appendix 7 Research design

Pre-tests Interpretation and production tasks Final pool of participants				
Randomization Procedure				
1. PI+SI group	2. PI+RA group	3. PI+AA group	4. TI group	5. Control group
Explicit explanation Explanation about strategies Structured Input Activities	Explicit explanation explanation about strategies Referential Activities	Explicit explanation explanation about strategies Affective Activities	Explicit explanation Output practice (mechanical drills e.g. fill-in-the-blank-type questions, finishing the sentence etc)	No instruction
INSTRUCTIONAL PERIOD				
IMMEDIATE POST-TEST Interpretation and production tasks				
DELAYED POST-TEST Interpretation and production tasks				

Appendix 8 Oxford Quick Placement Test (OQPT) cover page

Oxford University Press
and
University of Cambridge Local Examinations Syndicate

Name: ....

Date: ....

quick placement test

Version 2

This test is divided into two parts:

Part One (Questions 1 – 40) – All students.

Appendix 8. Referential Activities

ACTIVITY 1

Cross out the noun phrase/pronoun which should be substituted by a relative pronoun. Then, choose either a, b, c, or d to substitute that noun. Write the relative pronoun you choose in the space provided then write down the full sentence.

E.g. I know the book which – You mentioned the ~~book~~.
a) to which b) to whom c) which d) for which
I know the book which you mentioned

1) I saw the man……… – you talked with him.
a) whom b) who c) whose d) which

…………………………………………………………………………………….

2) The student is my classmate ……… – You met him yesterday.
a) who b) which c) whom d) who she

………………………………………………………………………………………

3) You know the teacher………… – He teaches French.
a) whom b) which c) who d) whose

………………………………………………………………………………………

4) He likes the film ……..….. _ you recommended the film.
a) who b) which c) whom d) whose

………………………………………………………………………………………

5) The man is from Saudi Arabia…………. – Ali is looking for the man.
a) whom b) who c) which d) to whom

………………………………………………………………………………………

6) His father is rich…………. – his house was damaged yesterday.
a) who her b) who c) whose d) whom

………………………………………………………………………………………….

7) I know a student …………. – he speaks three languages.
a) Ø b) who c) whom

………………………………………………………………………………………….

8) There is a book …………. – its cover was torn.
a) Ø b) whose c) whom

………………………………………………………………………………………….

9) Ahmed bought a car …………. – his friends preferred.
a) Ø b) whose c) whom

………………………………………………………………………………………….

ACTIVITY 2

Look at the dialogue below and circle the grammatically correct relative clauses.

a. Two students are talking about their teachers:

1. Did you see our teacher
   a) who you met yesterday in the library?
   b) whom you met yesterday in the library?

2. You mean the teacher
   a) whom teaches us English.
   b) who teaches us English.

3. No, the teacher
   a) whose son studies with us.
   b) whom son studies with us.

4. Oh, I know, he is the one
   a) whose is always smiling.
   b) who is always smiling.

5. Yeh, he is the author of the book
   a) who you told me about.
   b) which you told me about.

b. Mother talking to her son:

6. I found a toy
   a) you love
   b) who you love.

7. I like the toy
   a) whose my friend had.
   b) my friend had.

8. You mean the friend
   a) who his grandmother died last year.
   b) whose grandmother died last year.

9. Yes, he is the one
   a) who always visits me
   b) always visits me.

10. OK, now bring the new vase
    a) who your father bought today
    b) your father bought today.

ACTIVITY 3

Look at the pictures below. You are going to listen to ten relative clauses. Listen to them and decide whether they are grammatically true or not. If it is true, write T. if it is false, write F.

1.

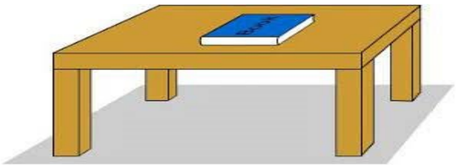
2.

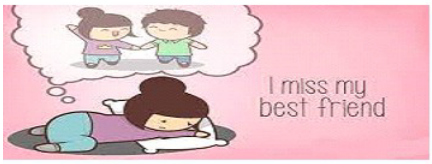
3.

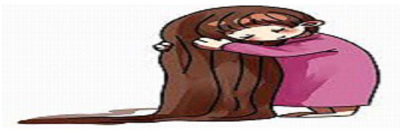
1.

2.

3.







Instructor's script

1. This is the boy who is reading the book.
2. She is the woman which was driving fast.
3. Ali talked to the man who he lost his keys.
4. I hate that dog who bit the boy yesterday. (distractor)
5. I saw a car you have never seen before.
6. Please, do not touch the book on the table. (distractor)
7. Did you see the girl whom the boy hit her?
8. I know the boy who the girl is taller than.
9. Fatmah missed her friend whom she was studying with.
10. I met the teacher whom you talked to.
11. I sit next to a girl who her hair is very long.
12. I visited the woman whose child was sick.
13. I rode that horse who its colour is black.

ACTIVITY 4

Teacher's sheet

Listen to the teacher saying some Arabic sentences.
Choose either (a) or (b) as the best translation.

.انا اقصد القصر اللي زواره من السياح

.انا اعرف الولد اللي ابوه توفى

.انا اشتريت السياره اللي لونها اسود

.انا قابلت علي اللي اخوه درسنا انجليزي

.هل شاهدت اللاعب اللي سجل الهدف أمس

.انا ساعدت طالب يدرس رياضيات

.منى اشترت فستان ابوها يحبه

.علي استلم خطاب صديقه كتبه له

.فاطمة وجدت الشنطة اللي فقدتها اختها

1.أحمد قرأ الكتاب اللي استعاره اخوه

Students' sheet

a) I mean the palace whose visitors are mainly tourists.

b) I mean the palace which its visitors are mainly tourists.

1. a) I know the boy who father died.
   b) I know the boy whose father died.

2. a) I bought a car which its colour was black.
   b) I bought the car whose colour was black.

3. a) I met Ali whose father taught us English.
   b) I met Ali who his father taught us English.

4. a) Did you see the player who scored the goal yesterday.
   b) Did you see the player which scored the goal yesterday.

5. a) I helped a student who studies mathematics.
   b) I helped a student which studies mathematics.

6. a) Mona bought a dress her father likes.
   b) Mona bought a dress who my father likes.

7. a) Ali received a letter whose his friend wrote.
   b) Ali received a letter that his friend wrote.

8. a) Fatema found the bag her sister lost.
   b) Fatema found the bag who her sister lost.

9. a) Ahmed read the book that her brother borrowed.
   b) Ahmed read the book whom her brother borrowed.

ACTVITY 5

Underline the relative pronoun which should be used to complete the following sentences. The antecedent (head noun) is the same for all the sentences.

Head noun: THE TEACHER
E.g. ..... who/<u>whom</u>/whose/which you saw to in the mall yesterday is a very kind.

1. ...... who/whom/whose/which car was stolen yesterday.

2. ...... who/whom/whose/which gave us cookies last year.

3. ...... who/whom/whose/which you talked to.

4. ...... who/whom/whose/which son graduated last year.

5. ...... who/whom/whose/which we talked about yesterday.

6. ...... who/whom/whose/which speaks English and Spanish.

Head noun: A BOY

7. ...... who/whom/which/ Ø/ plays tennis is smart.

8. ...... who/whom/ whose/ Ø/ father was sick.

9. ...... who/whom/ whose/ Ø/ you visited last week.

ACTVITY 6

Teacher's Sheet

Listen to the teacher saying the first part of an English sentence. Choose either a) or b) to complete the teacher' statement

Teacher's statements:

1. The car
2. I know the students
3. My neighbour
4. The cat
5. I like the teacher
6. I found the ring
7. Ali sold a car
8. Hind found a book
9. The child closed a window

Students' sheet

a) The car which you bought is very nice.

b) The car who you bought is very nice.

a) I know the student who his mother is a policewoman.

b) I know the student whose mother is a policewoman.

a) My neighbour who his house was burned last night is sick.

b) My neighbour whose house was burned last night is sick.

a) The cat which is under the table is sleeping

b) The cat who is under the table is sleeping

a) I like the teacher who taught me English last semester.

b) I like the teacher which taught me English last semester.

a) I loved the pizza which my mother cooked last night

b) I loved the pizza who my mother cooked last night

a) Ali sold a car his brother wanted

b) Ali sold a car who his brother wanted.

a) Hind found a book who her daughter lost.

b) Hind found a book her daughter lost.

a) The child closed a window his mother opened.

b) The child closed a window that his mother opened.

Appendix 9. Affective Activities

Activity 1.

Read the following statements. Decide whether you agree or disagree with the following statements by underlying either (AGREE) or (DISAGREE)

(notice the use of relative clauses in each sentence).

Check if your friend gave the same answer.

	AGREE	DISAGREE
1. People who smoke in closed spaces should be fined		
2. A student who always comes to class late should not be permitted to enter the classroom.		
3. Taking picture with people whom you see on TV.		
4. a library which has group study rooms should be closed on weekends		
5. The teacher who is teaching us English is not kind		
6. English teachers whose first language is not English should not teach us		
7. Going to the coffee shop which is next to the college.		
8. Students whose English language is not good should receive extra classes training them.		
9. A subject which you do not like should be taught online.		

Activity 2

Read the following statements. These are some commands in which the speaker uses relative clauses To whom do you expect each command is told.

Check your answers with the student next to you, and see if you have the same letter checked.

1. Give Rosie the red book which is beside the black one.	
a) Mother to her child.	b) Teacher to a student.
2. Put the glass on the table which is in the middle of the room.	
a) A father talking to his child.	b) A child talking to his father.
3. Hand the book to the student who is standing by the door.	
a) a mother talking to her child.	b) A teacher talking to his student.
4. Read the poem which is on page 83.	
a) Your neighbour talking to you.	b) A teacher talking to students.
5. Speak to your teacher whom you gave the report to.	
a) Friends talking to each other.	b) a principal talking to a student
6. Give support to people whose houses were affected by the earthquake.	
a) A government ordering people.	b) a preacher talking to people.
7. Show me the book you borrowed last week.	
a) A policeman talking to a student.	b) A librarian talking to a student.
8. Do not buy a car your father does not like.	
a) A mother talking to her son.	b) A doctor talking to a patient.
9. Try to eat foods you make at home	
a) A doctor talking to a patient	b) An engineer talking to a supervisor

Activity 3

Read the following sentences. Check whether you have been involved in these things before or not by underlying either YES or NO.

Check your answers with the student next to you, and see if you have the same responses.

1. You felt sorry for the girl who failed her exam.	YES	NO
2. The teacher who teaches you maths was not happy about your exam results.	YES	NO
3. You give free to people who ask for help.	YES	NO
4. You looked after a child whose mother was sick.	YES	NO
5 Your neighbour whom you knew shouted at you.	YES	NO
6. You visited a country which has almost the same culture as yours.	YES	NO
7. You do not prefer going to the coffee shop which is next to the college.	YES	NO
8. Students whose English language is not good should receive extra classes	YES	NO
9. A subject which you do not like should be taught online.	YES	NO

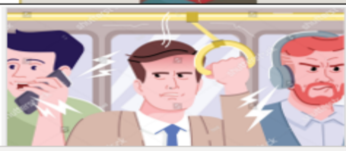
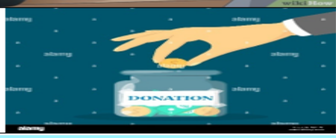
Activity 5

Work in pairs. Look at these statements. In your culture, which statements are appropriate? Which are not appropriate? Compare your choices with your classmate next to you.

	Appropriate	Not appropriate
A person... Who drinks alcohol.		
You invite a person… Whom your father does not like.		
Eating food… Which include bacon.		
A person… Whose partner does not contribute financially.		
A person… Who drives fast.		
You marry a person... Whom you never know.		
A person... Whose parents abandoned.		
A person… Who is playing gambling.		
Declining an invitation from someone… Whom you love.		
Living in a house… Which has glass front door.		
Marring a person… Whose religion is different from yours.		

Activity 6

Read the following sentences and look at the pictures. Check whether you like or not if you will involve in these situations in the future by underlying either YES or NO.

		YES	NO
Be a friend with someone who smoke regularly.			
Eating food which is expired.			
Dancing with someone whom you hate.			
Supporting a child whose parents are separating.			
Blaming people who speak loudly in public.			
Driving a car which side is left.			
Donate money to people whom you do not know.			
Helping those people whose houses were damaged.			

Appendix 10. Traditional activities:

Instructional Materials
Traditional Instruction

Instructional pack for the traditional treatment.

Activity 1

Fill in the blanks using the correct relative pronoun (who, whom, which, or whose).

E.g. I know the student whom you talked with.

1. This is the car ………. she bought.
2. I met the teacher ……___ sit behind you.
3. I have read the book ………… the teacher has recommended.
4. I know the girl ……….. the teacher talked about.
5. I know the girl …………. you met at the party last night.
6. I know the shop ………. you gave the journal to.
7. Do you know the girl ………. showed you the way?

Activity 2

Join each pairs of sentences below using relative clauses.

E.g. I know the book. – You mentioned the book.
I know the book which you mentioned.

1) The man is my neighbour. – You talked with him.
……………………………………………………………………

2) The girl is my classmate – You met her at the party yesterday.
……………………………………………………………………

3) I know the teacher. – He teaches Science in your school.
……………………………………………………………………

4) The man is working in a job agency. _ I gave the book to the man.
……………………………………………………………………

5) The woman is from China. – Bill is looking for the woman.
……………………………………………………………………

6) The teacher is very sad. – Her car was stolen yesterday.
……………………………………………………………………

Activity 3.

Complete the following conversations by combining the second sentence in parentheses as a relative clause.

a. Two students are talking about their teachers:

1. Did you see our teacher________________________?
   1. (you met him yesterday in the library?)
2. You mean the teacher________________________
   2. (he teaches us English.)
3. No, the teacher________________________
   3. (his son studies with us.)
4. Oh, I know, he is the one________________________
   4. (he is always smiling.)
5. Yeh, he is the author of the book________________________
   5. (you told me about the book.)

b. Mother talking to her son:

6. I found a toy________________________
   6. (you love a toy.)
7. I like the toy ________________________
   7. (my friend has a toy.)
8. You mean the friend________________________
   8. (his grandmother died last year.)
9. Yes, he is the one ________________________
   9. (he always visits me.)
10. OK, now bring the new vase ________________________
    11. (your father bought a new vase today.)

Activity 4.

Read the sentences and then combine them by using relative pronouns.

1. **a. This is a boy.**
   b. He is reading a book.

2. This is the woman
   She was driving fast.

3. Ali talked to the man.
   The man lost his keys.

4. This is the dog.
   It bit the boy

5. This is a car.
   You have never seen before.

6. This is the book
   It is the table.

7. This is the girl.
   The boy hit her.

8. This is the boy.
   The girl is taller than him.

9. Fatmah missed her friend.
   She was studying with her.

10. This is a teacher.
    You talked to him.

11. This is a girl.
    Her hair is very long.

12. This is a mother.
    Her child is sick.

13. This is a horse.
    Its colour is black.

Activity 5.

Decide whether each of the following sentences is correct or not by underlying either the word (yes or no).
If the relative pronoun used is incorrect, rewrite the sentence using the correct form in the space provided.

E.g. I know the film whom you mentioned. YES/NO
I know the film which you mentioned.

1. The report contains statements whose factual truth is doubtful. Yes/No

…………………………………………………………………………………

2) I am talking about the girl who her hair is covering her face. Yes/No

…………………………………………………………………………………

3) A thief is a person which takes the property of others without permission.

Yes/ No

…………………………………………………………………………………

4) A book which its pages are not complete should not be bought. Yes/No

…………………………………………………………………………………

5) The book whose cover is torn is not mine. Yes/No

…………………………………………………………………………………

6 The thief which stole the book ran out quickly Yes/No

Activity 6

Listen to the teacher saying incomplete sentences.
Work with a partner and try to complete the sentences using relative clauses.
Write down the sentences you agree on to discuss with the teacher.

1. I met the teacher ……………………………………………………

3. I took the book ……………………………………………………

4. I know the girl ……………………………………………………

5. I mean the palace ……………………………………………………

6. Could you please tell me ……………………………………………

4) A book ……………………………………………………………

5). The house ……………………………………………………………

6) The thief ……………………………………………………………

7) The teacher ……………………………………………………………

8) She saw Tom ……………………………………………………………

9) I found the ring ……………………………………………………

10). The bird ……………………………………………………………

11) I met a woman ……………………………………………………

Activity 7

Read the following sentences. Work with a partner and complete the sentences using the correct relative pronoun (who, whom, which, or whose) and the words below each sentence.

e.g. The teacher WHO teaches us science is kind.
science/ us/ teaches

1.The teacher ………………………. is sad.

Was/ stolen/ car/

2. A person ………………… should not be respected.

Of/ steels/ the/others/ property/

3. I do not like the cheese sandwich ……………………

Is/ sold/ in/ school/ our

4. I do not like the teacher ……………………………

Shouting/ always/ is/

5. I do not like going to the restaurant ………………………...

Is/ school/ near/ our/

6. Shops ………………………………… should be closed.

Sell/ teenagers/ cigarettes/ to/

Activity 8

Listen to your partner saying some statements.
Try to judge if the Relative Pronoun is used correctly or not in each statement.
If the Relative Pronoun is used incorrectly, write the correct form (who, whom, which, or whose) in the space provided.

1. People who disobey the law should be punished.

…………………………………………………………………………………

2. The girl who I study with is always complaining.

…………………………………………………………………………………

3. The books whose the school gave to me are torn.

…………………………………………………………………………………

4. A student who his marks are good should be given a prize.

…………………………………………………………………………………

5. People whose houses were damaged in the flood are given new houses by the government.

…………………………………………………………………………………

6. The teacher whom teaches us English is from Egypt.

…………………………………………………………………………………

7) The report contains statements who factual truth is doubtful.

…………………………………………………………………………………

8) I am talking about the girl who her hair is covering her face.

…………………………………………………………………………………

9) The thief which stole the book ran out quickly.

…………………………………………………………………………………

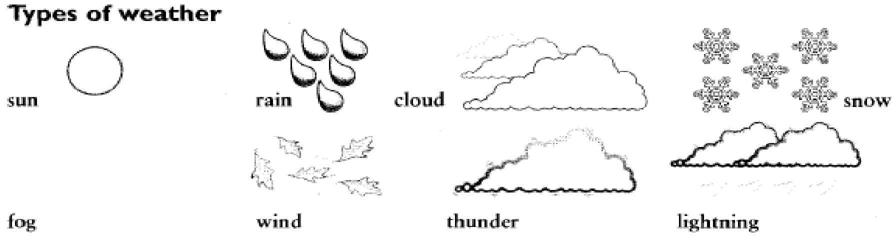
10) The teacher who teaches us Maths is from Egypt.

…………………………………………………………………………………

Appendix 11. Control activities:

37 Weather

A Types of weather



B Adjectives and verbs

noun	*adjective*
sun	sunny
rain	rainy
wind	windy
cloud	cloudy
snow	snowy
fog	foggy
thunder	thundery
lightning	–

It's a sunny day in Tokyo today, but it's cloudy in Hong Kong.
It's foggy in Sydney and it's snowing / it's snowy in Moscow.
It's raining in Barcelona but the sun is shining in Granada.

It's lovely weather today, isn't it! [NOT It's ~~a~~ lovely weather.]
It's a horrible day, isn't it!

You cannot say It's ~~winding~~ / ~~clouding~~ / ~~fogging~~ / ~~sunning~~.

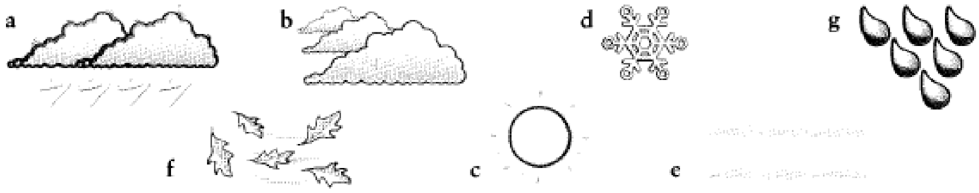
C Other useful weather words

It is very **hot** in Mexico – it is often **45 degrees** there in summer.
It is very **cold** in the Arctic – it is often **minus 50 degrees** there.
It is very **wet** in London – carry an umbrella when you go sightseeing there.
It is very **dry** in the Sahara – it doesn't often rain there.
A **hurricane** is a very strong wind.
A **storm** is when there is a strong wind and rain together.
A **thunderstorm** is when there is thunder, lightning, rain and sometimes wind together.

Exercises

37.1 **Match the words and the symbols.**

1 snow 2 sun 3 rain 4 fog 5 lightning 6 wind 7 cloud



37.2 **Look at the types of weather in A. Write them down in order from your most favourite to your least favourite.**

37.3 **Look at the chart. Write sentences about the towns in the chart.**

Hanoi	1	It is sunny in Hanoi. ....
Hong Kong	2	It is raining in Hong Kong. ....
La Paz	3	It is ....
Paris	4	It ....
Tashkent	5	....
Seoul	6	....
Warsaw	7	....
Washington	8	....

37.4 **Complete these sentences with a word from the opposite page.**

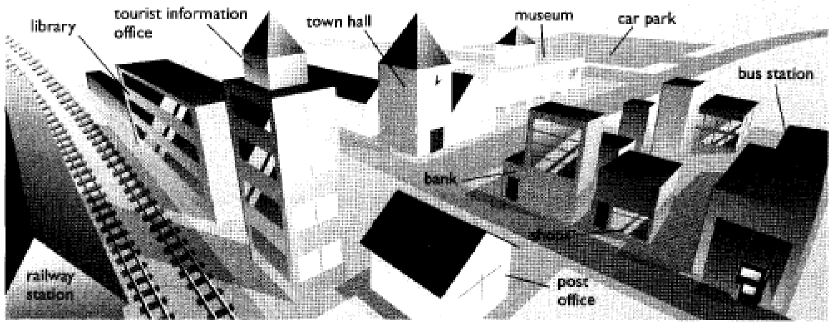
1 The sun .... every day last month.
2 When it ...., I take my umbrella.
3 It is lovely .... today, isn't it.
4 When it ...., we can go skiing.
5 You see .... before you hear thunder.
6 It is 24 .... here today.
7 It is dangerous to be in a small boat at sea in a ....
8 It is very .... in Siberia in winter.

37.5 **Are these sentences true about the weather in your country? If not, correct them.**

1 It often snows in December.
2 It is usually 40 degrees in summer and minus 20 degrees in winter.
3 There are thunderstorms every day in August.
4 It is very wet in spring.
5 We never have hurricanes.
6 Summer is my favourite season because it is usually hot and dry.

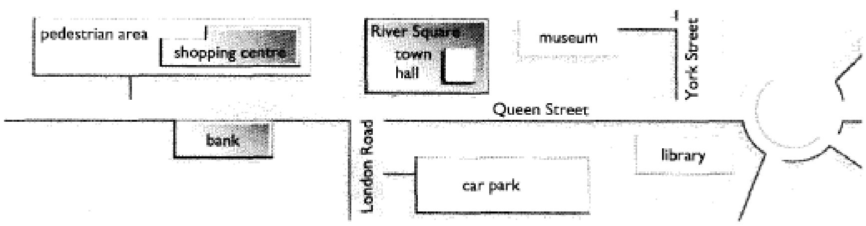
38 In the town

A The town centre



You can get a train at the railway station.
You can change money at the bank.
You can read books and newspapers at the library. *or*
You can park your car in/at the car park.

B Streets and roads



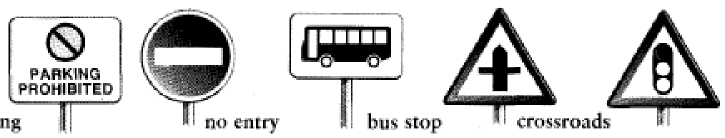
Asking for help

Where is the main square? How do I get to X street? Is there a pedestrian area here? Can I park here? Excuse me, I'm looking for the museum.

C People in the town

police officer traffic warden shop assistant librarian bank clerk

D Signs



no parking no entry bus stop crossroads traffic lights

Exercises

38.1 Answer the questions.

1 Where can I get a bus to London? At the bus station.
2 Where can I get information about hotels?
3 Where can I change money?
4 Where can I park?
5 Where can I see very old things?
6 Where can I post a letter?

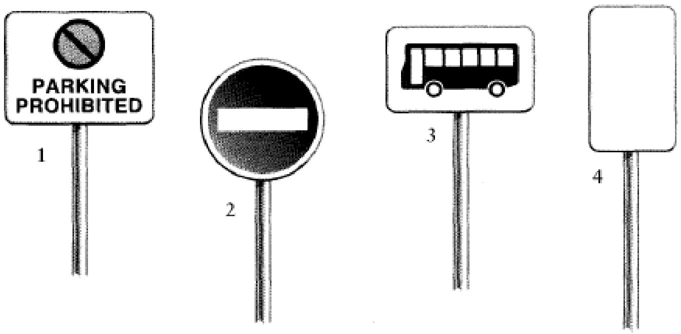
38.2 Look at the map on the opposite page. Ask questions.

1 ..Where's the library?...... Near the roundabout.
2 .... In the square.
3 .... Go left at York Street.
4 .... In the pedestrian area.
5 .... London Road car park is best.
6 .... There's a bank in Queen Street.

38.3 What words are these?

1 sumuem museum
2 nowt hlal
3 brilyra
4 rac prak
5 ywrlaai nttoisa
6 dtaeepsrin raae
7 frtafci dnearw

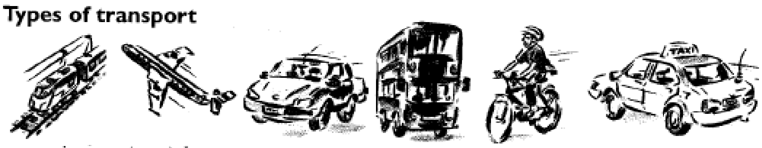
38.4 What are these signs?



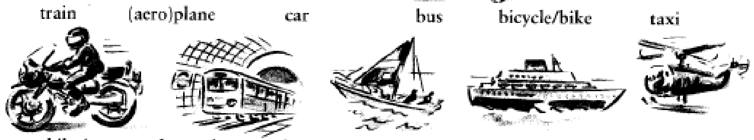
38.5 Write a paragraph about your town. Use the words opposite.

41 Travelling

A Types of transport



train (aero)plane car bus bicycle/bike taxi



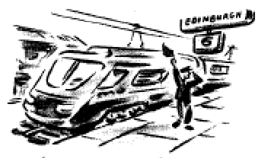
motorbike/motorcycle underground boat ship helicopter

B Useful travel words

map timetable customs luggage passport

Can I have a **single/return** (ticket) to Barcelona please? (single = Madrid → Barcelona; return = Madrid ⇄ Barcelona)
I'd like to **book/reserve a seat in advance.** (to make sure you have a seat)
How much is the (train / bus / taxi / air) **fare**?
Was the **journey** long? [NOT Was the ~~travel~~ long?]

C By train

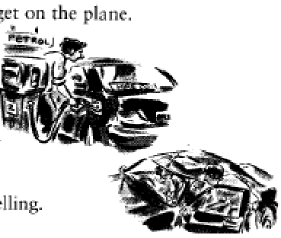


The train **arriving** at platform 3 is the 16:50 train to Paris.
The Edinburgh train **departs/leaves from** platform 6.
Is there a **buffet/restaurant car** on this train?
Do I have to **change trains** for Toulouse? (= get off one train and go onto another)

D By plane

You have to **check in** an hour before the plane **takes off** (= leaves the ground).
I **went through customs** but nobody **checked** my passport. [NOT ~~controlled~~ my passport] (See Unit 27.)
Give your **boarding card** to the **flight stewards** when you get on the plane.
Have a good **flight**.
The plane **landed** in New York at 5.30.

E By car



We **hired a car** for a week. We had to **fill it up with** petrol.
Can I **give** you **a lift**? I'm going into town.

Unit 14 (Moving) has some more useful words about travelling.

Exercises

41.1 **Match the words on the left with their definitions on the right. Draw lines.**

1 land	a a place to eat on a train
2 fare	b bags and suitcases
3 buffet car	c it says when trains depart and arrive
4 ship	d what you must pay when you travel
5 timetable	e planes do this at airports
6 platform	f it travels on water e.g. the *Titanic*
7 luggage	g where you stand when you are waiting for a train

41.2 **Can you answer these questions about the vocabulary of travel?**

1 What is the difference between a single ticket and a return ticket?
2 What does a customs officer do?
3 Does a plane take off at the end of a journey?
4 What do you do with a boarding card?
5 What is the difference between hiring a car and buying a car?
6 If you ask someone for a lift, do you want to go to the top floor?

41.3 **Here are instructions to get to John's house from the airport.**

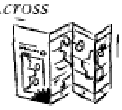
When you arrive at the airport, take a number 10 bus to the railway station. Then take a train to Bigtown. The journey takes half an hour and you get off the train at the second stop. Take a taxi from the station to John's house.

Now write instructions for someone to get to your house from the airport.

41.4 **Make cards to test yourself. Write the word on one side of the card and a picture (or a definition or translation) on the other side. Look at the pictures (or definitions or translations). Can you remember the English words?**

41.5 **Complete the crossword.**

Across

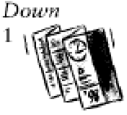
3 

6 

7 

8 

Down

1 

2 

3 

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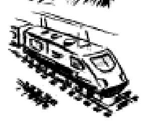
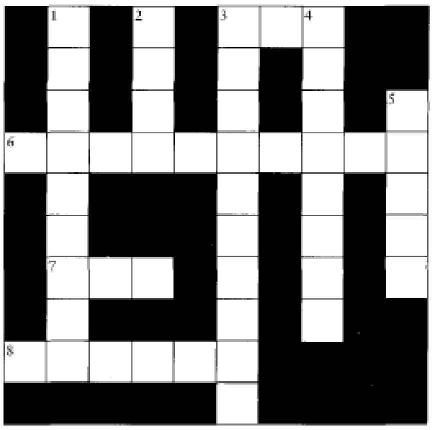
5 



Appendix 12. The Grammaticality Judgment Task: Version A

The Grammaticality Judgement Task

Thank you for helping me with this study. I am collecting information about the kinds of sentences that speakers of English, both native and non-native speakers, find natural and those that they do not. Results from the study should help me understand better how people learn English, and this might eventually lead to improving methods for learning and teaching English.

Instructions

In the task you are about to do, you will be asked to read some sentences, and to 'rate' each one for how natural it sounds to you. There are 3 rating categories:

Perfect – the sentence feels like a perfectly natural sentence of English.

Possible – the sentence does not feel perfectly natural. You probably wouldn't say it yourself, but you might hear native speakers saying it.

Impossible – the sentence is no one you would say, and you don't expect to hear other native speakers saying it either.

EXAMLE:

	Perfect	Possible	Impossible
- **I found a book who you recommended**			√

	Perfect	Possible	Impossible
1.			
a. Ali liked the car his father bought.			
b. Ali liked the car that his father bought.			
c. Ali liked a car his father bought.			
d. Ali liked a car that his father bought.			
2.			
a. Hind read the letter her sister sent.			
b. Hind read the letter that her sister sent.			
c. Hind read a letter her sister sent.			
d. Hind read a letter that her sister sent.			
3.			
a. Fahad visited the place that you visited.			
b. Fahad visited a place that you visited.			
c. Fahad visited the place you visited.			
d. Fahad visited a place you visited.			
4.			
a. Amal ate the apple her mother cut.			
b. Amal ate the apple that her mother cut.			
c. Amal ate an apple her mother cut.			
d. Amal ate an apple that her mother cut.			
5.			
a. Susan met the boy her son hit.			
b. Susan met the boy that her son hit.			
c. Susan met a boy her son hit.			
d. Susan met a boy that her son hit.			
6.			
a. Nasser used the laptop his father bought.			
b. Nasser used the laptop that his father bought.			
c. Nasser used a laptop his father bought.			
d. Nasser used a laptop that his father bought.			
7.			
a. Majed watched the movie you recommended.			
b. Majed watched the movie that you recommended.			
c. Majed watched a movie you recommended.			
d. Majed watched a movie that you recommended.			
8.			
a. I know the garden you visited.			
b. I know the garden that you visited.			
c. I know a garden you visited.			
d. I know a garden that you visited.			
9.			
a. Sultan found the key you lost.			
b. Sultan found the key that you lost.			
c. Sultan found a key you lost.			
d. Sultan found a key that you lost.			
10.			
a. Salem broke the phone you bought.			
b. Salem broke the phone that you bought.			
c. Salem broke a phone you bought.			
d. Salem broke a phone that you bought.			
11.			
a. Fatema did not find the book her sister wanted.			
b. Fatema did not find the book that her sister wanted.			
c. Fatema did not find a book her sister wanted.			
d. Fatema did not find a book that her sister wanted.			
12			
a. Ahmed fixed the car you crashed.			
b. Ahmed fixed the car that you crashed.			
c. Ahmed fixed a car you crashed.			
d. Ahmed fixed a car that you crashed.			
13.			
a. Manal liked the flower you brought.			
b. Manal liked the flower that you brought.			
c. Manal liked a flower you brought.			
d. Manal liked a flower that you brought.			
14.			
a. Mohamed caught the bus his friend missed.			
b. Mohamed caught the bus that his friend missed.			
c. Mohamed caught a bus his friend missed.			
d. Mohamed caught a bus that his friend missed.			
15.			
a. The manager appreciated the employee came early.			
b. The manager appreciated the employee who came early.			
c. The manager appreciated an employee came early.			
d. The manager appreciated an employee who came early.			
16.			
a. He caught the mouse ate the cheese.			
b. He caught the mouse which ate the cheese.			
c. He caught a mouse ate the cheese.			
d. He caught a mouse which ate the cheese.			
17.			
a. Ali welcomed the guy you helped.			
b. Ali welcomed the guy whom you helped.			
c. Ali welcomed a guy you helped.			
d. Ali welcomed a guy whom you helped.			
18.			
a. The kids loved the toy their parents bought for them.			
b. The kids loved the toy which their parents bought for them.			
c. The kids loved a toy their parents bought for them.			
d. The kids loved a toy which their parents bought for them.			
19.			
a. The audience saluted the boy goal was achieved.			
b. The audience saluted the boy whose goal was achieved.			
c. The audience saluted a boy goal was achieved.			
d. The audience saluted a boy whose goal was achieved.			
20.			
a. The doctor called the patient blood pressure was high.			
b. The doctor called the patient whose blood pressure was high.			
c. The doctor called a patient blood pressure was high.			
d. The doctor called a patient whose blood pressure was high.			
21.			
a. The professor excused the student came late.			
b. The professor excused the student who came late			
c. The professor excused a student came late.			
d. The professor excused a student who came late.			
22.			
a. My mother removed the trash was in front of her house.			
b. My mother removed the trash which was in front of her house.			
c. My mother removed a trash was in front of her house.			
d. My mother removed a trash which was in front of her house			
23.			
a. I know the man you spoke with.			
b. I know the man whom you spoke with.			
c. I know a man you spoke with.			
d. I know a man whom you spoke with.			
24.			
a. This is the river you preferred to swim in.			
b. This is the river which you preferred to swim in.			
c. This is a river you preferred to swim in.			
d. This is a river which you preferred to swim in.			
25.			
a. I always help the older man who he walks around.			
b I always help the older man who walks around.			
c. I always help an older man who he walks around.			
d. I always help an older man who walks around.			
26.			
a. The president chose the lady whom we did not know.			
b. The president chose the lady whom we did not know her.			
c. The president chose a lady whom we did not know.			
d. The president chose a lady whom we did not know her.			
27.			
a. The police arrested the suspect whose face was shown on camera.			
b. The police arrested the suspect who his face was shown on camera.			
c. The police arrested a suspect whose face was shown on camera.			
d. The police arrested a suspect who his face was shown on camera.			
28.			
a. The father scolded the son whose room was messy.			
b. The father scolded the son who his room was messy.			
c. The father scolded a son whose room was messy.			
d. The father scolded a son who his room was messy.			

The Grammaticality Judgment Task: Version B

1.			
a. Sarah read the book her father bought.			
b. Sarah read the book that her father bought.			
c. Sarah read a book her father bought.			
d. Sarah read a book that her father bought.			
2.			
a. John ate the sandwich his son made.			
b. John ate the sandwich that his son made.			
c. John ate a sandwich his son made.			
d. John ate a sandwich that his son made.			

8.			
a. Mark bought the computer his mum recommended.			
b. Mark bought the computer that his mum recommended.			
c. Mark bought a computer his mum recommended.			
d. Mark bought a computer that his mum recommended.			
9.			
a. Sally kissed the cat her brother hit.			
b. Sally kissed the cat that her brother hit.			
c. Sally kissed a cat her brother hit.			
d. Sally kissed a cat that her brother hit.			
10.			

a. Katie used the laptop her husband repaired.			
b. Katie used the laptop that her husband repaired.			
c. Katie used a laptop her husband repaired.			
d. Katie used a laptop that her husband repaired.			

16.			
a. The committee rewarded the actor played the main part.			
b. The committee rewarded the actor who played the main part.			
c. The committee rewarded an actor played the main part.			
d. The committee rewarded an actor who played the main part.			
17.			

3.			
a. Mary closed the door that her colleague repaired.			
b. Mary closed a door that her colleague repaired.			
c. Mary closed the door her colleague repaired.			
d. Mary closed a door her colleague repaired.			
4.			
a. Tom received the letter his friend wrote.			
b. Tom received the letter that his friend wrote.			
c. Tom received a letter his friend wrote.			
d. Tom received a letter that his friend wrote.			
5.			
a. Susan bought the house her cousin built.			
b. Susan bought the house that her cousin built.			
c. Susan bought a house her cousin built.			
d. Susan bought a house that her cousin built.			
6.			
a. Jack used the camera his aunt bought.			
b. Jack used the camera that his aunt bought.			
c. Jack used a camera his aunt bought.			
d. Jack used a camera that his aunt bought.			
7.			
a. Victoria visited the village her friend recommended.			
b. Victoria visited the village that her friend recommended.			
c. Victoria visited a village her friend recommended.			
d. Victoria visited a village that her friend recommended.			

a. Edward broke the van his brother rented.			
b. Edward broke the van that his brother rented.			
c. Edward broke a van that his brother rented.			
d. Edward broke a van that his brother rented.			
11.			
a. Emily found the bag her sister lost.			
b. Emily found the bag that her sister lost.			
c. Emily found a bag her sister lost.			
d. Emily found a bag that her sister lost.			
12			
a. Adam read the poem his mother wrote.			
b. Adam read the poem that his mother wrote.			
c. Adam read a poem his mother wrote.			
d. Adam read a poem that his mother wrote.			
13.			
a. Anna watched the cartoon DVD her aunt brought.			
b. Anna watched the cartoon DVD that her aunt brought.			
c. Anna watched a cartoon DVD her aunt brought.			
d. Anna watched a cartoon DVD that her aunt brought.			
14.			
a. Bill ate the meal his mother made.			
b. Bill ate the meal that his mother made.			
c. Bill ate a meal his mother made.			
d. Bill ate a meal that his mother made			

a. They liked the house is in the village.			
b. They liked the house which is in the village.			
c. They liked a house is in the village.			
d. They liked a house which is in the village			
18.			
a. I changed the baby-sitter the child did not like.			
b. I changed the baby-sitter whom the child did not like.			
c. I changed a baby-sitter the child did not like.			
d. I changed a baby-sitter whom the child did not like.			
19.			
a. The students didn't read the book the teacher wrote for them.			
b. The students didn't read the book which the teacher wrote for them.			
c. The students didn't read a book the teacher wrote for them.			
d. The students didn't read a book which the teacher wrote for them.			
20.			
a. The audience pitied the tennis player leg was broken in the match.			
b. The audience pitied the tennis player whose leg was broken in the match.			
c. The audience pitied a tennis player whose leg was broken in the match.			
d. The audience pitied a tennis player whose leg was broken in the match.			
21.			
a. The optician phoned the man eye sight was weak.			
b. The optician phoned the man whose eye sight was weak.			
c. The optician phoned a man eye sight was weak.			

a. The police caught the thief stole my purse.			
b. The police caught the thief that stole my purse.			
c. The police caught a thief stole my purse.			
d. The police caught a thief that stole my purse.			
23.			
a. My brother baked the cake made us ill.			
b. My brother baked the cake that made us ill.			
c. My brother baked a cake made us ill.			
d. My brother baked a cake that made us ill.			
24.			
a. I invited the girl that I always played with.			

b. I invited the girl that I always played with.			
c. I invited the girl that I always played with.			
d. I invited the girl that I always played with.			
25.			
a. She painted the wall you hung the picture on.			
b. She painted the wall that you hung the picture on.			
c. She painted a wall you hung the picture on.			
d. She painted a wall that you hung the picture on.			
26.			
a. I finally saw the man who he lives next door.			
b. I finally saw the man who lives next door.			
c. I finally saw a man lives next door.			
d. I finally saw a man lives next door.			
27.			
a. The man introduced the girl whom he admired a lot.			
b. The man introduced the girl whom he admired her a lot.			
c. The man introduced a girl whom he admired a lot.			
d. The man introduced a girl whom he admired her a lot.			
28.			
a. They elected the leader whose future plans are feasible.			
b. They elected the leader who his future plans are feasible.			
c. They elected a leader whose future plans are feasible.			
d. They elected a leader who his future plans are feasible.			

The Grammaticality Judgment Task: Version C

The Grammaticality Judgement Task

Thank you for helping me with this study. I am collecting information about the kinds of sentences that speakers of English, both native and non-native speakers, find natural and those that they do not. Results from the study should help me understand better how people learn English, and this might eventually lead to improving methods for learning and teaching English.

Instructions

In the task you are about to do, you will be asked to read some sentences, and to 'rate' each one for how natural it sounds to you. There are 3 rating categories:

Perfect – the sentence feels like a perfectly natural sentence of English.

Possible – the sentence does not feel perfectly natural. You probably wouldn't say it yourself, but you might hear native speakers saying it.

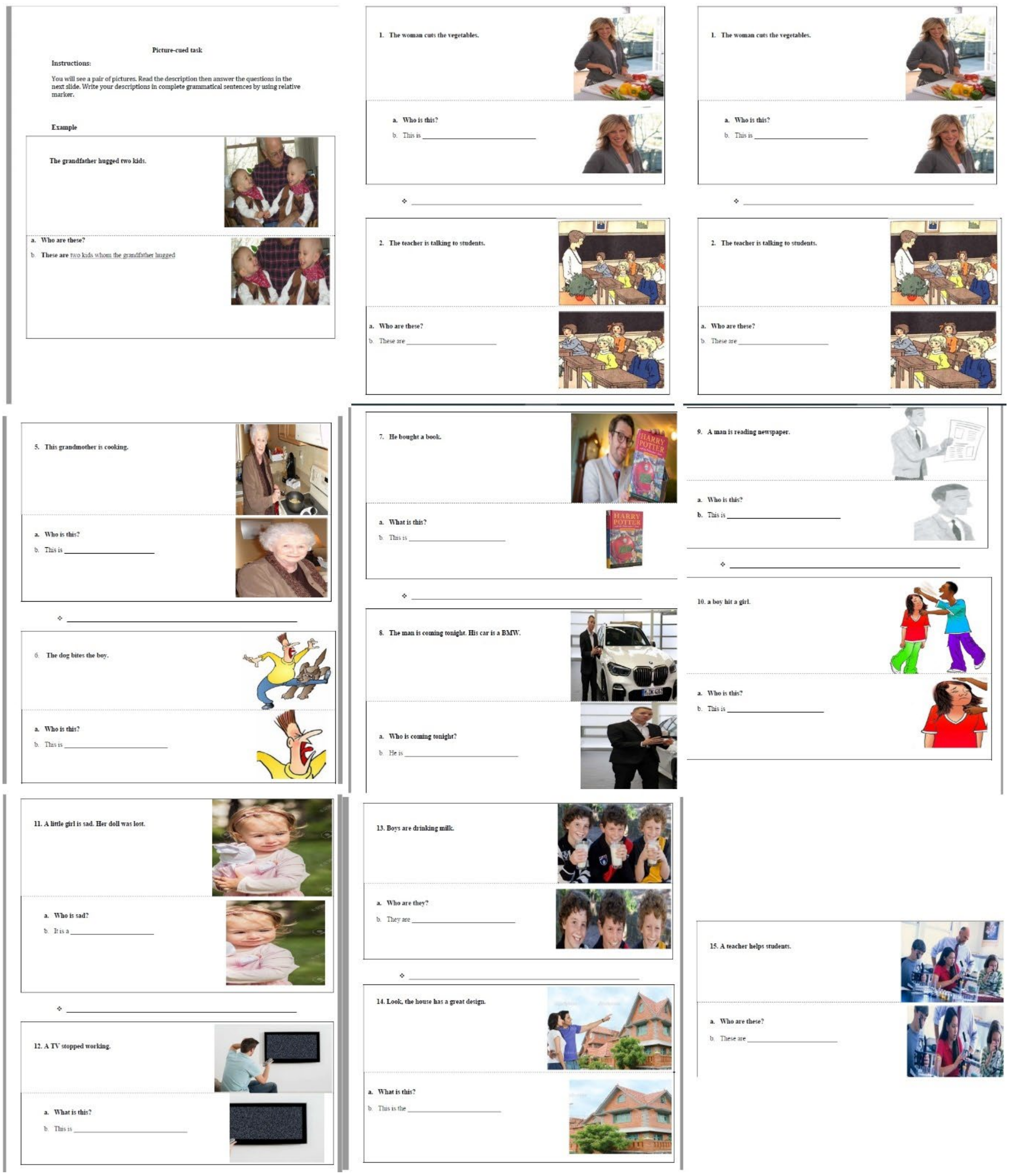
Impossible – the sentence is no one you would say, and you don't expect to hear other native speakers saying it either.

EXAMLE:

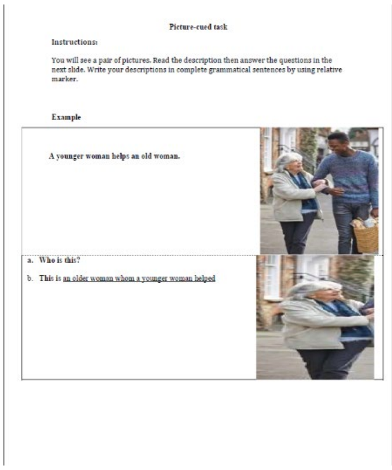
	Perfect	Possible	Impossible
- **I found a book who you recommended**			√

	Perfect	Possible	Impossible
1.			
a. I know the boy who his passport was lost.			
b. I know the boy his passport was lost.			
c. I know the boy whose passport was lost.			
d. I know a boy whose passport was lost.			
2.			
a. The company rewarded the employee you met.			
b. The company rewarded the employee whom you met.			
c. The company rewarded an employee whom you met.			
d. The company rewarded an employee you met him.			
3.			
a. Mohammed loved the pizza that his mom cooked.			
b. Mohammed loved a pizza that his mom cooked.			
c. Mohammed loved a pizza his mom cooked.			
d. Mohammed loved the pizza his mom cooked.			
4.			
a. My father caught the man hit me.			
b. My father caught the man who hit me.			
c. My father caught a man hit me.			
d. My father caught a man who hit me.			
5.			
a. Fahad wore the watch his father bought.			
b. Fahad wore the watch that his father bought.			
c. Fahad wore a watch his father bought.			
d. Fahad wore a watch that his father bought.			
6.			
a. I did not know the teacher you met.			
b. I did not know a teacher whom you met.			
c. I did not know the teacher whom you met.			
d. I did not know a teacher you met him.			
7.			
a. My family welcomed the neighbour visited us.			
b. My family welcomed a neighbour visited us.			
c. My family welcomed a neighbour who visited us.			
d. My family welcomed the neighbour who visited us.			
8.			
a. Ali bought the ring his sister loves.			
b. Ali bought the ring that his sister loves.			
c. Ali bought a ring his sister loves.			
d. Ali bought a ring that his sister loves.			
9.			
a. The coach excluded the player who his role was important.			
b. The coach excluded a player whose role was important.			
c. The coach excluded a player his role was important.			
d. The coach excluded the player whose role was important.			
10.			
a. My mother fixed the TV I broke.			
b. My mother fixed the TV that I broke.			
c. My mother fixed a TV I broke.			
d. My mother fixed a TV that I broke.			
11.			
a. These are my friends whom I went with.			
b. These are my friends I went with.			
c. These are my friends whom I went with them.			
d. These are my friends I went with them.			
12			
a. Nader broke the fence his father built.			
b. Nader broke the fence that his father built.			
c. Nader broke a fence his father built.			
d. Nader broke a fence that his father built.			
13.			
a. This is the house which Faisal built.			
b. This is a house Faisal built.			
c. This is a house which Faisal built.			
d. This is the house Faisal built.			
14.			
a. The kids enjoyed the game you brought.			
b. The kids enjoyed the game that you brought.			
c. The kids enjoyed a game you brought.			
d. The kids enjoyed a game that you brought.			
15.			
a. The sandwich which you ate is tasty.			
b. The sandwich you ate is tasty.			
c. a sandwich which you ate is tasty.			
d. a sandwich you ate is tasty.			
16.			
a. Sami loved the museum he visited.			
b. Sami loved the museum that he visited.			
c. Sami loved a museum he visited.			
d. Sami loved a museum that he visited.			
17.			
a. I found the person you apologized to.			
b. I found the person whom you apologized to.			
c. I found a person you apologized to.			
d. I found a person whom you apologized to.			
18.			
a. Ahmed sold the car his friend wanted.			
b. Ahmed sold the car that his friend wanted.			
c. Ahmed sold a car his friend wanted.			
d. Ahmed sold a car that his friend wanted.			
19.			
a. The government helped the residents houses were affected.			
b. The government helped residents houses were affected.			
c. The government helped the residents whose houses were affected.			
d. The government helped residents whose houses were affected.			
20.			
a. Norah watched the show her sister presented.			
b. Norah watched the show that her sister presented.			
c. Norah watched a show her sister presented.			
d. Norah watched a show that her sister presented.			
21.			
a. The girl caught the mouse ate the cheese.			
b. The girl caught the mouse which ate the cheese.			
c. The girl caught a mouse ate the cheese.			
d. The girl caught a mouse which ate the cheese.			
22.			
a. Fatima sold the house her son designed.			
b. Fatima sold the house that her son designed.			
c. Fatima sold a house her son designed.			
d. Fatima sold a house that her son designed.			
23.			
a. I received the letter my brother wrote.			
b. I received the letter which my brother wrote.			
c. I received a letter my brother wrote.			
d. I received a letter which my brother wrote.			
24.			
a. I visited the shop my uncle opened.			
b. I visited the shop that my uncle opened.			
c. I visited a shop my uncle opened.			
d. I visited a shop that my uncle opened.			
25.			
a. I called the librarian whom I borrowed the book from.			
b. I called the librarian I borrowed the book from.			
c. I called a librarian I borrowed the book from.			
d. I called a librarian whom I borrowed the book from.			
26.			
a. Hamad found the phone his mother hided.			
b. Hamad found the phone that his mother hided it.			
c. Hamad found a phone his mother hided.			
d. Hamad found a phone that his mother hided.			
27.			
a. Rashid ate the sweet his sister made.			
b. Rashid ate the sweet that his sister made.			
c. Rashid ate a sweet his sister made.			
d. Rashid ate a sweet that his sister made.			
28.			
a. Majed broke the cup his father washed.			
b. Majed broke the cup that his father washed.			
c. Majed broke a cup his father washed.			
d. Majed broke a cup that his father washed.			
29.			
a. Huda decorated the flat her husband rented.			
b. Huda decorated the flat that her husband rented.			
c. Huda decorated a flat her husband rented.			
d. Huda decorated a flat that her husband rented.			

Appendix 13. The Picture-cues Task: Version A



The Picture-cues Task: Version B



Picture-cued task

Instructions:

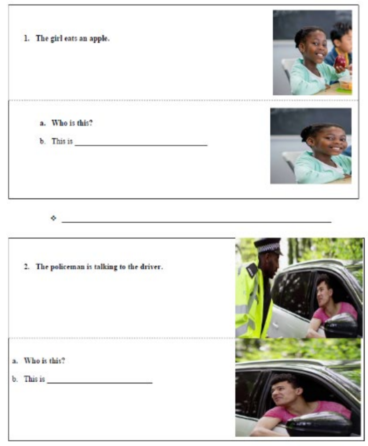
You will see a pair of pictures. Read the description then answer the questions in the next slide. Write your descriptions in complete grammatical sentences by using relative marker.

Example

A younger woman helps an old woman.

a. **Who is this?**

b. **This is** an older woman whom a younger woman helped



1. **The girl eats an apple.**

a. **Who is this?**

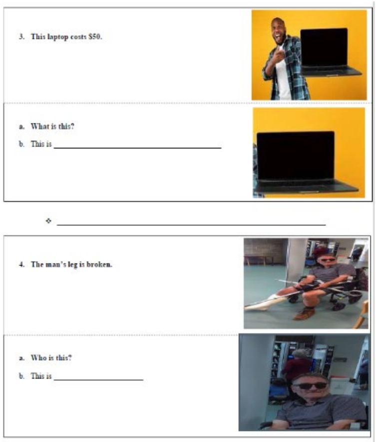
b. This is ____________________

❖ ____

2. **The policeman is talking to the driver.**

a. Who is this?

b. This is ____________________



3. **This laptop costs $50.**

a. **What is this?**

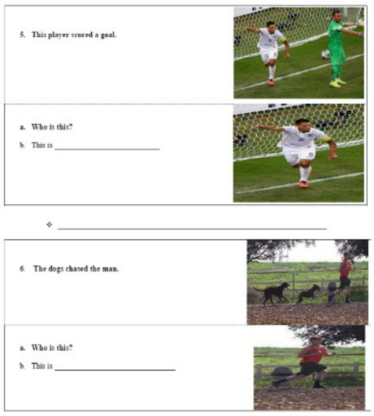
b. This is ________________________________

❖ ____

4. **The man's leg is broken.**

a. **Who is this?**

b. This is ________________



5. **This player scored a goal.**

a. **Who is this?**

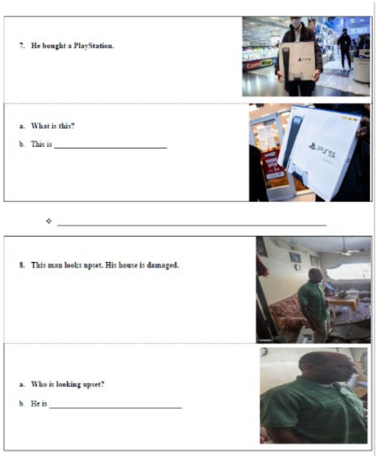
b. This is ____________________

❖ ____

6. **The dogs chased the man.**

a. **Who is this?**

b. This is ______________________



7. **He bought a PlayStation.**

a. **What is this?**

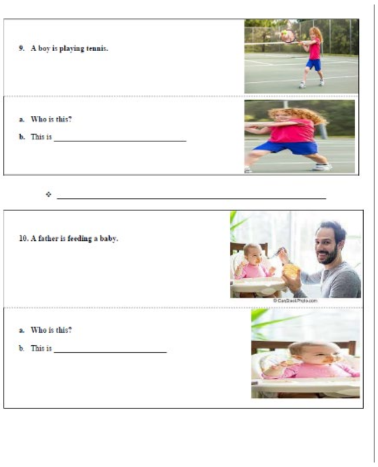
b. This is ____________________

❖ ____

8. **This man looks upset. His house is damaged.**

a. **Who is looking upset?**

b. He is ________________________



9. **A boy is playing tennis.**

a. **Who is this?**

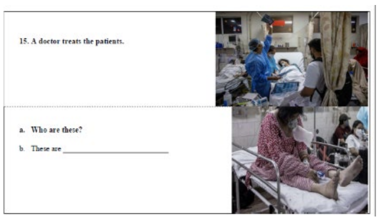
b. This is ________________________

❖ ____

10. **A father is feeding a baby.**

a. **Who is this?**

b. This is ____________________

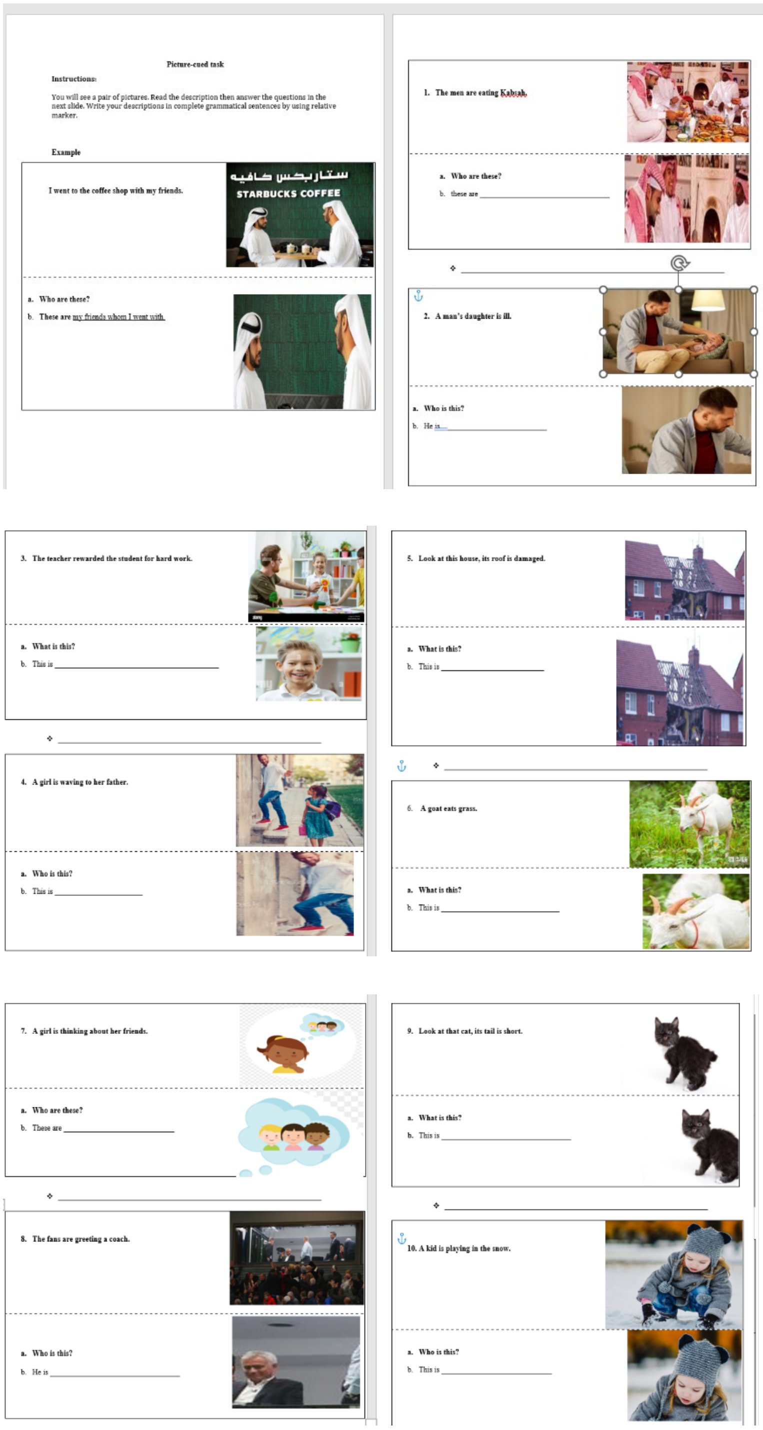


15. **A doctor treats the patients.**

a. **Who are these?**

b. These are ____________________

The Picture-cues Task: Version C



Picture-cued task

Instructions:

You will see a pair of pictures. Read the description then answer the questions in the next slide. Write your descriptions in complete grammatical sentences by using relative marker.

Example

I went to the coffee shop with my friends.

a. Who are these?
b. These are my friends whom I went with.

1. The men are eating Kabsah.

a. Who are these?
b. these are ______________

2. A man's daughter is ill.

a. Who is this?
b. He is ______________

3. The teacher rewarded the student for hard work.

a. What is this?
b. This is ______________

4. A girl is waving to her father.

a. Who is this?
b. This is ______________

5. Look at this house, its roof is damaged.

a. What is this?
b. This is ______________

6. A goat eats grass.

a. What is this?
b. This is ______________

7. A girl is thinking about her friends.

a. Who are these?
b. These are ______________

8. The fans are greeting a coach.

a. Who is this?
b. He is ______________

9. Look at that cat, its tail is short.

a. What is this?
b. This is ______________

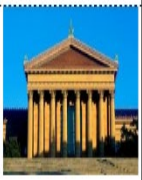
10. A kid is playing in the snow.

a. Who is this?
b. This is ______________

11. A couple is going to a museum.

a. What is this?

b. This is ______________



◊ ______________________________

12. This carpet costs $100,000.

a. What is this?

b. This is ________________

13. Kids like puzzles.

a. What is this?

b. This is ________________

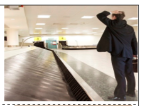
◊ ______________________________

14. I met a blind man in the store.

a. Who is this?

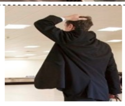
b. This is ________________

15. A man lost his luggage.



a. Who is this?

b. This is ________________



Appendix 14. Translation Task: Version A

TRANSLATION TASK

Translate the Arabic sentences into English one

1. المعلم كافأ (rewarded) الطالب اللي درجاتة مرتفعة.

1..

2. انا اشتريت السياره التي تكلف ($100 (costs.

2 ....

3. الولد ضرب (hit) زميله اللي يدرس معه.

3-..

4. اكلت الطعام اللي طبخه علي.

4-..

5- أحمد يعرف (know) مهندس صمم (design) بيته.

5..

6- قابلت طالب رحب فيه المدرس .

6..

7- اللاعبون ساعدوا رجل بيته احترق.

7..

8- قابلنا المرأه اللي ساعدت الاطفال.

8..

9- الولد كره البائع اللي تعامل معه بقلة ادب.

9..

10- أحمد يمارس رياضه مايحبها.

10..

11- المدرس لم يعرف الطفل اللي الطلاب ضربوه.

11..

12- انا فقدت فلوس اللي اعتمدت عليها.

12..

13- انا اعرف الطالب اللي [illegible]

12..

Translation Task: Version B

TRANSLATION TASK

Translate the Arabic sentences into English ones.

1. المدير عاقب النادل (waiter) اللي كانت ملابسه وسخه.

_1____

2. انا بعت الكمبيوتر اللي تحطم (break down) الأسبوع الماضي.

_2____

3. مضر ساعد الرجل اللي يسكن بجواره (next door).

_3____

4. حضرت حلقه البحث (seminar) اللي نظمها (organize) دكتوري.

_4____

5. المدرس شرح فكره اعتقد انها مهمه.

_5____

6. انا شكرت الصديق اللي استعرت (borrow) كتابه.

_6____

7. رايت رجل رحب (welcome) فيه النادل بقوه.

_7____

8. المعلمين حسدوا (envied) مضر اللي طلابه يدرسون بجد (hard).

_8____

9. كلمنا (call) الدكتور اللي عالج (treat) مرضاه بكفاءه (efficiently).

_9____

10. البنت حبت الولد اللي اشتري لها ورده.

_10____

11. ماهر اشتري سياره اللي ماتستخدم(use) بترول كثير.

_11____

12. امي لم تعرف الولد اللي البنت تحبه.

_12____

13. انا اشتريت الأرض اللي بنيت عليها بيتي.

_13____

Translation Task: Version C

TRANSLATION TASK

Translate the Arabic sentences into English ones:

1. أحمد يحب حيوان يأكل حشائش

1. ____

2. هؤلاء زملائي اللي ضحكت معهم

2.____

3.أنا أحب البيوت اللي تصميمها كلاسيك

3.____

4. المدرسه هنأت طالب انت درسته

4.____

5. ناصر يعرف الشخص اللي أتى مبكراً

5.____

6.هذا مديري اللي انا اشتغل لأجله

6.____

7.الفقراء اللي ملابسهم تبدوا سيئه يجب ان يحترموا

7.____

8.أبي اتهم سارق الشرطه مسكته

8.____

9.عائلتي رحبوا بالضيف اللي فاز بالسباق

9.____

10.هذا فقير اعطيته الفلوس

10.____

11.الشرطة حذرت شيخوطته كانيت الجسر

11.____

12. أحب الكتب اللي انت تقرأها

12.____

13. أنا رأيت كلب عض أحمد.

13.____