Inverse Load Theory: A merging of the cognitive and functional perspectives of SLA

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Introduction

Why is learning a second language (L2) so hard, especially when adult learners already have established mental representations of the world through their first language (L1)? This question arises due to our intuitive knowledge that learning an L2 is different than learning an L1 and that the process is considerably more arduous. Recognizing that learning an L2 requires more cognitive resources naturally leads to our second question; how does one acquire an L2? Any theory of second language acquisition (SLA) must address these two questions. On the surface these questions may appear to be straight forward and easy to answer, but looks can be deceiving. Broadly speaking, there are two camps in the SLA field; those who see language learning as a cognitive phenomenon and those who see it as a social one. Each side has their respective rationales for their particular methods of data collection and interpretations.

Unfortunately, instead of each side complementing the contributions of the other, both camps sling insults in hopes of furthering their entrenched perspectives.

On the one hand, the post-modernists such as Lantolf (1996) accuse those who approach SLA scientifically as being content with their theories and unwilling, or unable, to consider alternative world views. Lantolf (1996) sees these researchers as being stuck in the routine of normal science with “nothing left to do but attend to the details and harvest the applications of the theory” (p. 738). On the other hand, rationalists such as Greg (in Jordan, 2004) accuse Lantolf as being a solipsist “who [does] nothing but chat-or rather discourse-without actually doing anything” (p. 3).

Entering into this debate, I unapologetically take a cognitive/rational view of SLA because in the absence of a mind, nothing exists or is perceived to exist. In other words, a second language is acquired
because there is a mind that acquires it. In this regard I am a rationalist who believes that there is an objective truth about how the mind has evolved and is used to perceive the external world. As such, scientific methods are needed to investigate the neural circuitry of the brain and uncover its potential and limitations in processing information.

Concurrently, I unapologetically take a sociocultural/post-modernist view of SLA because language in the absence of a social function is nothing more than gibberish that only has meaning for the one who utters it. In addition, while the workings of the mind can be investigated objectively, how it is used to interpret what it perceives is a subjective task that requires different methods and methodologies. Taking this dual standpoint, I propose developing a theory of SLA, tentatively called the Inverse Load Theory, which merges both a cognitive and functional perspective of SLA. The theory aims to explain the cognitive phenomenon of SLA that makes learning an L2 so hard and its interaction with the social phenomenon of SLA that makes learning an L2 so useful and relevant. This paper will attempt to answer the two questions asked previously (Why is learning an L2 so hard? and How does one acquire an L2?) in the development of the Inverse Load Theory.

**Why is learning an L2 so hard?**

In answering why learning an L2 is so hard for adult learners, I cannot envision an answer that does not primarily take a cognitive perspective. The mental effort that a learner experiences in acquiring a language is an intrinsic event that is completely independent of a social context. While there is merit in proposing that language is a social construction, a mind is a prerequisite for the interpretation and use of it. Therefore in order to answer the question one must investigate the inner workings of the mind, particularly the cognitive structures of the brain that makes up Chomsky’s “Language Acquisition Device” (Jordan, 2004, p. 124).
This black box in the brain of children contains neural circuitry that promotes the efficient acquisition of languages. With all languages adhering to universal principles as a result of this cognitive structure, one can view language as our genetic inheritance, or “human endowment” (referring to Chomsky’s nativist approach in Jordan, 2004, p. 132). The presence of such universal principles does not imply that all grammars are exactly the same. Rather, there is flexibility in the system that gives rise to differences between languages; which can be attributed to the setting of parameters, such as whether the language is with \(wh\)-in-situ (East Asian languages) or with \(wh\)-movement (Germanic languages) (White in VanPatten & Williams, 2007, p. 42). Therefore, “we know the principles of grammar innately, and parameter settings are triggered by input” (Jordan, 2004, p. 132).

Similar to the role of genes in natural selection, parameters allow small changes to exist between languages without risking the corruption of the whole system. In this way, language is similar to a living organism that is capable of evolving according to the needs of the community who uses it. However, in the case of adults learning an L2, acquisition is anything but efficient, leading one to question what happened to the language acquisition device (LAD).

The LAD may only be accessible for children and dismantled after a relatively short time, thus forcing adult L2 learners to use less efficient alternative processes to learn the target language. These may be the same processes that are used to learn any other skill and therefore those who are cognitively challenged may be at a disadvantage of acquiring an L2. Pinker (2007) argues that the end of the “critical period” (p. 298) to learn an L1 through the LAD is due to the maturation of the brain. It is possible that the language acquisition device is composed of neural tissues that require a significant amount of resources due to its high metabolism. This conjecture is valid considering that the brain consumes “a fifth of the body’s oxygen and
similarly large portions of its calories and phospholipids” (Pinker, 2007, p. 300). Working within this assumption, the brain may dismantle the Language Acquisition Device in an attempt to save costs once enough time has passed for the acquisition of an L1 (Pinker, 2007, p. 300).

The argument for the dismantling of the LAD, thus creating a critical period for efficient acquisition, should not seem so farfetched. The human body is an amazing system that undergoes changes at critical times. Consider puberty; where at a time that is appropriate for reproduction, the body releases hormones that change the body and prepares it for the task of creating and delivering new life. Is learning a language any less important for the brain to prepare for than changing the body for reproduction? Once the task of acquiring a first language is complete, does it serve us well to keep the neural circuitry intact, even with its high metabolic costs? Pinker (2007) likens the LAD to that of a floppy disk or turntable:

It is like borrowing a floppy disk drive to load a new computer with software you will need, or borrowing a turntable to copy your old collection of LP’s onto tape; once you are done, the machines can be returned (Pinker, 2007, p. 300).

The implication of the short shelf life of the LAD is that SLA is an extremely effortful process, the study of which requires an explicit understanding of cognitive science. In addition, since L2 learners are not starting at a zero state, and must use cognitive structures not originally designed for language acquisition, differential experience plays a role in the acquisition of a second language. This experience in part determines each learner’s steady state in the target language; however, this aspect of SLA lies outside the domain of Chomsky’s Universal Grammar (Jordan, 2004). Whether one fully believes in the LAD or critical period hypothesis, it should be clear that the potential and limitations of the mind play a crucial role in the acquisition of a second language and must be taken into account for any comprehensive theory of SLA.
While cognitive processes are likely to involve social contexts, it is important to note that it is the way that the brain processes the input from the social contexts that answers why learning an L2 is so hard. The Inverse Load Theory claims that older L2 learner’s brains have matured; dismantling the LAD to redirect resources needed for new cognitive structures in the processing of other age appropriate tasks. However, any theory of SLA that only focuses on the cognitive aspect of language learning fails to capture the full domain of the phenomenon, particularly how a learner acquires and uses an L2.

**How does a person acquire an L2?**

While language is impossible without a cognitive base capable of encoding and decoding messages, equally important in the study of SLA is an understanding of how learners use the target language in communicative events and how this use evolves as competence increases. This perspective goes well beyond Chomsky’s linguistic competence, which ignores “the creative aspect of language” (Jordan, 2004, p. 6). It is not enough to be cognitively aware of which sentences are grammatically correct as predicted by “universal grammar” (Jordan, 2004, pp. 128-132). Scoring high on grammaticality tasks means nothing during a communicative task.

Consider the following grammatically correct sentence: “Colorless green ideas sleep furiously” (Chomsky cited in Pinker, 2007, p. 79). While this sentence would be considered grammatically correct if someone uttered it on the street, the person would no doubt be considered incomprehensible. Contrast Chomsky’s grammatical, but incomprehensible sentence, with the following one: “Sally poured the glass with water” (Pinker, 2007, p. 79). While this sentence is ungrammatical, it is fully comprehensible. So while the language acquisition device may give young learners the advantage of being more grammatically correct in the target language, it does
not prevent older learners from becoming comprehensible. The implication for language teachers concerns the assessment of language performance. Should students be assessed against monolingual standards of grammaticality in the target language? Is a student who sounds like a native speaker, but not communicatively competent, more fluent than one who sounds like a foreigner, but is functional in many different contexts? If the goal of learning a second, third or fourth language is to communicate with others in a broad number of environments, then grammaticality no longer seems very significant, provided that the discourse is comprehensible.

Olaofe (1992) recognizes the need to change the assessment practices of second language learning from one of linguistic competence to one of communicative competence, stating that “if the assessment of the learner’s performance is going to be more effective, emphasis must shift from acquisition of linguistic competence per se to communicative competence without necessarily underplaying the importance of linguistic competence” (p. 207). The assessment model proposed by Olaofe (1992) is categorized hierarchically; with the highest levels consisting of communicative abilities and the lower levels consisting of lexico-grammatical abilities. By emphasizing a functional perspective in assessment of second language learning, Olaofe (1992) believes that instruction will be more effective because educators will be able to concentrate on those aspects of the target language that are most crucial for the learner to master in order to gain communicative competence; which is the ultimate goal of the painstaking endeavour of learning an additional language. Olaofe (1992) states that this model should “contribute more to our knowledge of error gravity since categories at the higher layer of the assessment model are to be considered more serious than those at the lower layer that may not affect intelligibility very significantly” (Olaofe, 1992, p. 215). By using this alternative assessment model, Olaofe (1992)
can explain why some learners do well on tests, but cannot function in communicative events, while those who do poorly on tests may be communicatively competent.

Consistent with the model proposed by Olaofe (1992) is the concept-oriented approach discussed by Bardovi-Harlig (in Vanpatten & Williams, 2007, pp. 57-75). This approach to SLA is not preoccupied by the surface structure of the target language, namely grammaticality tasks. Instead it focuses on “the range of linguistic devices that speakers use to express a particular concept (von Stutterheim & Klein, 1987), the interplay of ways to express a meaning, and the balance of what is explicitly expressed and what is left to contextual information (Klein, 1995)” (Bardovi-Harlig in Vanpatten & Williams, 2007, p. 58). Therefore “learners who use goed (yesterday) are using morphological inflection to express the past, but we would be unlikely to discount them as ill-formed” (Bardovi-Harlig in Vanpatten & Williams, 2007, p. 63). To those who would argue that this approach does not encourage the “proper” use of the target language, a re-evaluation of the measuring stick is in order.

Munoz (2008) argues that “in the case of foreign language learning, it can be argued that learners’ success can be more appropriately and realistically measured in terms of their bilingual attainment as expert or fluent bilinguals than in terms of the monolingual attainment of native speakers of the L2” (p. 198). The implication of this perspective is that our expectations for what constitutes fluency may be erroneous. Since it is unlikely for L2 learners to ever acquire the same linguistic competency in the target language as a native speaker, instruction should focus primarily on those skills that are critical for comprehensibility. As such, it is not the ability to form grammatical sentences that are the most crucial aspect in SLA but the ability to communicate with others effectively. If two speakers are able to functionally use language to achieve a communicative goal, then who is to say that there are any errors in the system? Pinker
(2007) argues in his book that language is dynamic; it changes as the community who uses it change. Just as it would sound silly to claim that a humpback whale’s song contains errors (Pinker, 2007, p. 382), so too is it silly to suggest that two people who fully comprehend each other’s discourse are misusing the language.

Answering how a person acquires an L2 is significantly more complicated than answering why it is difficult to learn. The reason for this complexity is the need to account for the interactions between the functional use of language in a social context and the cognitive limitations of each interlocutor. Whereas previously the social context could be ignored when discussing the processing of language by the mind, functionality and context takes a prominent position in explaining how acquisition takes place. The Inverse Load Theory proposes that the cognitive demand for resources is inversely proportional to the functional load of the discourse. In other words, sentences with few words that bear the full burden of particular functions, such as past tense, has high functional loads (Chapter 4 in VanPatten & Williams, 2007). The demand for cognitive resources (cognitive load) in processing such sentences would therefore be low (Schnotz & Kurschner, 2007). But if simple sentences with high functional loads are easily processed, then why has language evolved to become more complex with lower functional loads? The answer lies in the structural integrity of the sentence / text.

If more than one aspect of the discourse maps a particular function, then the discourse is protected against error. Consider the following sentence: “I play soccer.” Such a sentence has a high functional load and therefore the cognitive load is low. But what if the interlocutor made a mistake and meant to say “I played soccer”. The meaning of the sentence changes from one of continuous present to past tense. Since there is no redundancy in the sentence, the listener has no way to know that an error has been made. If the sentence is restated as “Yesterday, I played
soccer”, “yesterday” and “-ed” signify that the action took place in the past. Agreement with each other protects the sentence from communicative errors, but with a higher cognitive load. Sentences / texts with low functional loads give the interlocutor a chance to recover semantic information in the event of an error in the system. Consider the sentence “Yesterday I will play soccer” which has a tense error. An interlocutor may notice the error and take action to recover the meaning of the sentence. Since “yesterday” holds more semantic information, it will also have a higher functional load. The interlocutor may therefore choose to ignore the error of using “will” and interpret the action to have already taken place. Alternatively, the interlocutor may seek clarification from the speaker. Either way, the low functional load of the sentence is a safety mechanism against miscommunication; where one believes to have comprehended a message but in fact has not.

An analogy for this situation is the framing of a house. Builders construct homes with more studs than are needed to carry the load (weight of the roof and/or floors above), so that if one stud fails, the whole structure does not collapse. However, this practise requires more resources and the act of building a house becomes more complicated. If a builder wants to save costs and simplify the work he has to do, he can simply use the bare minimum number of studs, but each one would be carrying a high load. Failure of any of the studs may result in the collapse of the structure. Therefore the Inverse Load Theory states that SLA is a balancing of the cognitive and functional loads of a discourse; the process of systematically reducing the functional load of a language while keeping the cognitive load within acceptable limits. This balancing act can be done on the part of an instructor or naturally by a learner in an authentic environment.
While the Inverse Load Theory is primarily a merging of theories from two perspectives, its true contribution is the call for a detailed understanding of both cognitive and social influences in a single theory of SLA. To simply suggest that there are limitations of the mind in processing language is not sufficient in my opinion. How do the limitations contribute to the observed stages in SLA? Do the limitations of the mind contribute to L1 transfer? The Inverse Load Theory draws heavily on the Cognitive Load Theory in explaining how the mind is limited in processing a second language and it is the contributions from studies operating under the Cognitive Load Theory that provides the foundation for explaining various phenomena of SLA. Therefore the following sections are dedicated to discussing Cognitive Load and its interaction with the functional phenomena of SLA, thus arguing for the need of the Inverse Load Theory.

**Intrinsic Cognitive Load and SLA**

Cognitive Load Theory (CLT) is one that is concerned with instructional effectiveness. It focuses on the limitations of cognitive structures and attempts to explain how instruction can be organized in order to maximize the transfer of knowledge from the working memory into schemata of the long term memory (Diao & Sweller, 2007). It is a theory that is not restricted to the context of SLA but has been applied to a broad range of learning tasks, such as using multimedia in learning about the formation of lightning (Mayer, Heiser & Lonn, 2001), solving algebra problems (Kalyuga & Sweller, 2005; Kalyuga & Sweller, 2004), and learning concepts in physics (Ward & Sweller, 1990). While cognitive load theory is primarily concerned with how to maximize the effectiveness of instruction according what we know about cognitive science, I aim to use it as a framework for how learners in both naturalistic and instructed environments
automatically negotiate the balancing of cognitive resources and functional use of an L2 language. This balancing act may either be consciously or unconsciously directed by the learner. It is therefore my intention to show how the Inverse Load Theory can expand beyond the reach of the Cognitive Load Theory to become a specialized theory of SLA that merges both cognitive and functional perspectives and accounts for observed stages in the development of interlanguage.

One of the main constructs of the Inverse Load Theory is borrowed from CLT, which is cognitive load; the demand for resources in the working memory for the processing of information (Schnotz & Kurschner, 2007). Cognitive load itself is composed primarily of two separate loads; intrinsic and extraneous load. Both of these elements will be defined and discussed in terms of their relevance to SLA and related to the Inverse Load Theory in how the learner uses the language functionally within the limits of their working memory.

Every task that requires any amount of mental processing has an intrinsic load. This is the amount of mental effort required on the part of a learner at a particular level of expertise to process the information. “It is determined entirely by element-interactivity, that is, by the number of cognitive elements that have to be held simultaneously in working memory (Sweller and Chandler 1994)” (Schnotz & Kurschner, 2007, p. 476). When element-interactivity is high, the task is considered to be difficult for the learner and his/her working memory may be at risk of overloading. In the case of SLA, an intrinsic load that is too high for the expertise of a learner results in the target language being incomprehensible. The cognitive load theory “assumes a limited working memory that stores about seven elements but operates on just two to four elements” (van Merrienboer & Sweller, 2005, p. 148). If an L2 learner has to process a sentence or text in the target language, each word must be analysed as to its relationship with the words
around it. In this case, each element (a word) must simultaneously be processed with all the other elements (the other words in the sentence or text). This situation is an example of high element-interactivity (Schnitz & Kurschner, 2007, p. 476). Conversely, memorizing a list of words may have many elements (words) but the element-interactivity is low due to there being no need to simultaneously process them (Schnitz & Kurschner, 2007, p. 476). It is therefore advisable when instructing L2 learners to appropriately reduce the intrinsic load of the language by reducing the element-interactivity of the discourse in order to increase comprehensibility.

Educators naturally reduce the intrinsic load of language when instructing learners with various expertises in the target language. Notice how a teacher’s instructions to a task changes depending on the fluency of the learner in the target language. First to a native speaker of English, followed by an intermediate, low intermediate and beginning speaker of English (Gass & Mackey in Vanpatten & Williams, 2007, p. 177):

1. “Now, Johnny, you have to make a great big pointed hat.”
2. “No her hat is big. Pointed.”
3. “See hat? Hat is big. Big and tall.”
4. “Big, big, big hat”

Notice how the sentence with the lowest element-interactivity (Big, big, big hat) contains only two elements (“big” and “hat”), while the one with the highest element-interactivity has 11 elements. Recall that working memory can only operate on two to four elements (van Merrienboer & Sweller, 2005, p. 148); therefore it makes sense that the teacher would reduce her instructions to only 2 elements for the beginning speaker. Any more elements would overload the learner’s working memory and lead to incomprehensibility.

If working memory can only operate on two to four elements simultaneously, then how can the native speaker process 11 elements? The answer to this question can be found in the
environment organizing and linking principle of CLT. This principle states that “there are no limits to the amount of information that can be dealt with by working memory if that information has been previously organized and stored in long-term memory” (Diao & Sweller, 2007, p. 79).

The implication of this principle is that “element interactivity cannot be determined merely by analyzing the tasks or the learning material, because a large number of interacting elements for one learner may be only a single element for another learner with more expertise” (Schnotz & Kurschner, 2007, p. 476).

This principle helps to explain how universal grammar allows a child learning an L1, or to a lesser degree an adult learning an L2, to acquire the ability to understand and produce an infinite number of sentences within the limitations of the working memory. The novice learner may process each word in a sentence simultaneously as separate elements in the working memory, while the more advanced learner has acquired phrase structures such as noun, verb, and prepositional phrases. The advanced learner therefore uses these phrase structures as interacting elements instead of each individual word in the sentence (Pinker, 2007), thus lowering the element-interactivity and freeing more working memory resources. Since intrinsic load depends upon the expertise of the learner, the task of assessing each learner’s current abilities is crucial in determining the course of instruction that is most beneficial for the student.

**Comprehensibility and the Inverse Load Theory**

The Inverse Load Theory expands on the effects of intrinsic load on learners of an L2. For example, consider the construct of comprehensibility. It is intuitively known to mean language that is understandable, but taking a post modernist view leads one to ask what is being understood. An easily understandable utterance can be considered fully comprehensible if one is
only considering the surface structure of the grammar. Recall the earlier comprehensible utterance by a teacher to a novice L2 speaker; “Big, big, big hat” (Gass & Mackey in Vanpatten & Williams, 2007, p. 177). From a surface structure perspective, this utterance would be considered comprehensible for a novice L2 learner because the grammar is very simple. There is only one adjective repeated several times for emphasis and a noun. As mentioned previously, the intrinsic load has been lowered to allow for processing by the working memory of a novice L2 learner. This reduction has been accomplished by increasing the functional load for certain aspects in the utterance. The descriptive function is held solely by the term “big” and the object function is held by “hat”. Both terms carry the full weight of their respective functions, which accounts for their high functional loads. In addition, the subject and verb functions are completely absent from the utterance and therefore do not need to be processed by the working memory, thus lowering element interactivity. However, the problem arises when one considers the utterance as part of a communicative task. What is the communicative goal of uttering “big, big, big, hat”? Is the listener supposed to draw a big hat? Look for the (a specific) big hat? Wear a big hat? Without any context the utterance is rendered completely incomprehensible. The learner must search for a context by imagining a multitude of situations where the utterance would be appropriate. This search adds more elements to the processing of the language even though it is not embedded in the utterance. Therefore intrinsic load is not a static quality of any utterance; it depends both on the expertise of the learner and the purpose for processing the information; whether as a grammatical exercise or communicative task.

The Inverse Load Theory is concerned with using the knowledge gained about intrinsic load and researching how it interacts in the contextualization of linguistic input. Kumaravadivelu (2003) describes four types of contexts that an L2 learner will have to negotiate in the
development of her interlanguage. The first one is linguistic context, which contains formal grammatical structures, such as pronouns and articles. Stress and intonation make up the extralinguistic context. The specific situation in which the language is used makes up the situational context, while cultural norms make up the extrasituational context. A functionally fluent L2 speaker must be able to coordinate and simultaneously process all of these contexts in a relatively short time. It is easy to see how these contexts increase the element interactivity of a communicative task for a novice learner and thus an increase in the intrinsic load.

The Inverse Load Theory predicts that a novice L2 learner will first process the language concurrently with the linguistic and situational contexts. The reason for this contextual preference is that they are crucial during a communicative function. While an utterance can have a simplified grammar that incorporates gestures to facilitate communication, such as using hand gestures to indicate manner of motion (Choi & Lantolf, 2008), some formality of grammar is needed. Similarly, a communicative task is a social function that is situation specific, therefore consideration of the situational context is needed. With the importance of the linguistic and situational contexts in completing a communicative goal established; these aspects of the discourse may be considered as having a high functional load in the absence of processing the extralinguistic and extrasituational contexts.

If the prediction of the Inverse Load Theory is correct, that the L2 learner reduces the cognitive load of an utterance by increasing the functional load of context onto the linguistic and situational context, then it can help to explain misunderstandings between interlocutors. In the early stages of acquisition, one is preoccupied in processing only the most basic information needed to complete a communicative task. This economic form of processing the target language comes with risk of misinterpreting stress and cultural elements in the input (extralinguistic and
extrasituational context). The novice learner is not attending to these elements in the input and therefore does not pick up the patterns. Compare the extralinguistic context of emphasizing “please” with falling intonation and “please” with rising intonation. The former may be considered an order while the latter may be considered a polite request, according to British English (Kumaravadivelu, 2003). An L2 speaker not attending to this context may inadvertently come across as rude when his full intention was to make a polite request. Concerning culture, it may be virtually impossible for an immigrant to ever be fully capable of navigating the extrasituational context. There are just too many interacting elements that need to be acquired and simultaneously processed. Kumaravadivelu (2003) describes the concept of culture as being a complicated one since:

[I]t includes a wide variety of constructs such as the mental habits, personal prejudices, moral values, social customs, artistic achievements, and aesthetic preferences of particular societies (p. 267).

Therefore the Inverse Load theory predicts that out of the four contexts discussed above, processing of the extrasituational context is the last one to occur due to its high intrinsic cognitive load and low functional loads that are embedded both in the linguistic forms used and the shared cultural knowledge of the members of the dominant community.

A Theoretical Explanation for the Acquisition of Adverbs and Past-Tense Morphologies according to the Inverse Load Theory

Learners of an additional language have been observed to progress through specific stages in the use of adverbs in their expression of temporality. In a longitudinal study of 8 English learners, Bardovi-Harlig (1992) investigated whether “the use of time adverbials show a quantitative decrease as the accuracy of use of past-tense morphology increases” (p. 301). While
it is difficult to generalize the results of this study to a larger population due to the small sample size, Bardovi-Harlig (1992) found that the use of time adverbials does indeed decrease as the accurate use of past-tense morphology increases. Interestingly though, she found that this inverse relationship does not occur simultaneously. It appears that the decrease in use of time adverbials occur first, followed by the increase use of past-tense morphology. This finding provides a significant contribution to the field of SLA because it brings to light some stages in the acquisition of a second language, however further studies is needed to determine if this pattern holds with languages other than English. While the Bardovi-Harlig (1992) study advances our knowledge of SLA, it does not answer the important question of why these stages even exist, or why the use of adverbs decrease just prior to the increase use of past-tense morphology. The limitations of the mind to acquire a second language are not explored.

This is a case where the Inverse Load Theory can be applied to suggest why certain patterns in SLA are observed. According to the Inverse Load Theory, novice English learners need to reduce the element-interactivity of their utterances. They do this by increasing the functional loads of their sentences, thus decreasing the cognitive load needed to process them. The L2 learner therefore must reduce the redundancies embedded in the sentences they use. In terms of reducing the redundancy for past-tense, the learner must unconsciously choose between using an adverb or past-tense morphology. Clearly the Bardovi-Harlig (1992) study suggests that it is the adverb that the learner chooses to retain at the expense of the past-tense morphology. The reason for this choice by the beginning speaker of English can be answered by looking at both the cognitive and functional loads of each form.

In order for either form to be processed in the working memory of the learner, it must first be noticed. While the frequency of past-tense morphology may be greater in the input, it
may not be as easily noticed for processing by novice learners. Field (2008) found that despite the lower number of function words in a discourse, and their high frequency, it is the content words that are attended to by English learners. He suggests that part of the reason for this result may be due to the learners’ difficulty in perceiving the function words; owing to “their low perceptual saliency, including their brevity, and (thanks to the ubiquitous schwa) their relatively indeterminate phonetic identity” (Field, 2008, p. 427). Similarly, past-tense morphology is more difficult to perceive than adverbs, leading to adverbs being preferentially processed by the working memory. However, the saliency of adverbs is only half of the answer as to why this form is chosen by novice English learners to carry a high functional load for temporality.

Since the sentences that novice L2 speakers choose to use and attend to are simplified, each aspect of the discourse must be as efficient as possible in holding semantic information. Adverbials and past-tense morphology both have the function of indicating past-tense, and their functional loads for this function decreases when both are present in the same discourse (Bardovi-Harlig in VanPatten & Williams, 2007), but they are not equal in nature. In addition to indicating past tense, adverbs are more precise in indicating exactly when in the past the action took place (yesterday, last week, this morning). Therefore adverbials naturally have a higher functional load than past-tense morphologies and are a logical choice for L2 learners to attend to in the development of their interlanguage because they have greater semantic potential.

Having discussed a possible explanation as to why L2 learners of English develop their use of adverbs before past-tense morphology, an investigation into why adverbial use decreases prior to an increase in the accurate use of past-tense morphology is in order. Recall that element interactivity is determined by the expertise of the learner (Schnotz & Kurschner, 2007). As the concept and use of adverbs become integrated with schemata in the long term memory, element
interactivity decreases; freeing more resources in the working memory to be used to acquire new skills. The Inverse Load Theory hypothesizes that as the expertise of the learner increases, and the use of adverbs become automated in the long term memory, the learner becomes aware that not every sentence requires the semantic information contained within adverbs. The increased cognitive resources allow the learner to selectively judge when using an adverb is appropriate. The learner is thus free to experiment with using past-tense morphology in the absence of adverbials. However, the accurate use of past-tense adverbials takes time to occur. First, an L2 learner has to notice the form in the input, which is not as salient as adverbs, as discussed above. Second, she has to practice using various past-tense morphologies and correct any errors that may arise. It is also important to note that the Bardovi-Harlig (1992) study only measured the accurate use of past-tense morphology, not the emergence of experimentation with them. It is therefore possible that a concurrent increase in experimentation with past-tense morphologies occurred alongside the decreased use of time adverbials. In addition, it must be stated that any significant extraneous cognitive loads that are experienced by the learner may postpone the emergent use of past-tense morphologies.

**Conclusion**

The SLA field cannot be accused of being deprived of theories, with there being a multitude of them permeating the discipline. In packaging the insights of others into the Inverse Load Theory, I do not intend to suggest that there is anything extremely new that it adds to the field. On the cognitive side of the Inverse Load Theory, all of the principles and insights are due to the research conducted by John Sweller and his colleagues. However, all of this research is aimed towards instructional effectiveness in all subject matter. It is not specific to SLA and does
not aim to explain the process of acquiring a second language. On the functional side of the Inverse Load theory, I have drawn from a number of researchers who have focused on the communicative function of SLA. The true intention of proposing the Inverse Load Theory for the purpose of this paper is to argue for collaboration between those who research the cognitive phenomenon of SLA and those who research the communicative phenomenon of SLA. In my brief time as a graduate student of SLA, I found that most of the studies I read are biased towards one aspect of acquisition, either cognitive factors or sociocultural/communicative factors. As long as the SLA field continues to be fragmented, the full explanation of the SLA phenomenon will continue to elude us. The future of the study of SLA must include research that investigates the relationship between the mind and the function of language. We must move beyond simply saying that there are mental limitations that account for the stages of acquisition and start investigating why these limitations exist and how they promote acquisition in the predictable order researchers have observed. By shifting our thinking from research in isolation to one of collaboration, the field will be better positioned to put the puzzle pieces together to explain the SLA phenomenon. Learning a second language is an extremely complex task that involves social, psychological, and biological factors. As such, a multitude of research methods and methodologies are needed to collect as much data as possible. In this regard, the SLA field has been exceptional, as evidenced by the vast number of theories present. Unfortunately, the field has been inadequate in collaborating between the cognitive – social divide. If the Inverse Load Theory can help extend communication and collaboration between researchers from different standpoints, with the goal of developing a greater understanding of SLA, then its purpose will have been served.
References


