Chapter Two

Lexical and Functional Categories

2.0 Introduction

This chapter begins with an introduction to lexical and functional categories (Section 2.1), and then goes on to look at research on lexical and functional categories (Section 2.2); the functional categories and the theory of universal grammar (Section 2.3); the theories on acquisition of functional categories and reasons for the delay in the acquisition of functional categories (Section 2.4). Evidence of the lexical-functional divide in prepositions is discussed in child language acquisition and brain damage studies (Section 2.5). Finally we will present Littlefield’s categorization of prepositions (Section 2.6) and evidence for fine-grained categorization in Section 2.7.

2.1 Lexical and functional categories

In the grammatical tradition, grammatical categories and parts of speech have been persistently divided into two classes: grammatical (or functor) expressions and contentives (Bolinger 1971). The former consists of those expressions, words and bound morphemes that have a purely grammatical function, while the latter provides the principal semantic information of the sentence. Figure 1 presents the types of syntactic categories and its members.
We begin with a review of the general linguistic properties that have been said to be illustrative of the distinction and the psycholinguistic evidence for the nature of the functional/lexical divide. To throw light on this debate, we also review the characteristics of functional categories.

Three tests or clues can be used for this categorization:

(a) Semantic: what type of meaning is conveyed?

(b) Morphological: how the word is structured?

(c) Syntactic: how the word functions, and where it occurs in the sentence?

**Semantic test:** If the word has semantic content and a meaning of its own, it is a ‘lexical’ category, or else a ‘functional’ category. For example,

<table>
<thead>
<tr>
<th>Word</th>
<th>Part of Speech</th>
<th>Category</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>happy</td>
<td>adj</td>
<td>lexical</td>
<td></td>
</tr>
<tr>
<td>run</td>
<td>verb</td>
<td>lexical</td>
<td></td>
</tr>
<tr>
<td>cat</td>
<td>noun</td>
<td>lexical</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>determiner</td>
<td>functional</td>
<td></td>
</tr>
<tr>
<td>is</td>
<td>auxiliary</td>
<td>functional</td>
<td></td>
</tr>
<tr>
<td>any</td>
<td>quantifier</td>
<td>functional</td>
<td></td>
</tr>
</tbody>
</table>
Lexical categories are the principle content of the sentence, and are used in telegraphic speech, particularly in news headlines. For example, HEAVY RAIN LASHES CITY: VEHICLES STRANDED. Functional or grammatical categories act as glue that hold the sentence together and make the sentence grammatical.

**Morphological test:** If the word undergoes derivational processes to create new words, it is typically lexical, and if it does not do so, it is functional.

<table>
<thead>
<tr>
<th>Word</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>happy</td>
<td>lexical</td>
</tr>
<tr>
<td>-happiness</td>
<td></td>
</tr>
<tr>
<td>happy</td>
<td>lexical</td>
</tr>
<tr>
<td>-happily</td>
<td></td>
</tr>
<tr>
<td>run</td>
<td>lexical</td>
</tr>
<tr>
<td>-runner</td>
<td></td>
</tr>
<tr>
<td>cat</td>
<td>lexical</td>
</tr>
<tr>
<td>-catlike</td>
<td></td>
</tr>
</tbody>
</table>

Lexical categories are ‘open’ class and can add members easily, while functional categories are a ‘closed’ class and their membership is finite and limited.

**Syntactic test:** Lexical categories tend to serve as heads of phrases and functional categories introduce or modify heads.

Within transformational syntax, the distinction has re-surfaced as a contrast between ‘functional’ and ‘lexical’ categories (Stowell 1981; Ouhalla 1991; Kayne 1994; Chomsky 1995). The distinction now is seen as theta-assigning properties of lexical categories and expressions and the non-theta-assigning properties of functional categories (Grimshaw 1990).

Within transformational grammar, the syntactically significant functional classes include complementizer, determiner and Infl(ection), the latter of which is now often
decomposed into Tense and Agr(eement). Other functional categories are regularly added to the list, most frequently verbal categories such as Neg(ation), Asp(ect), and Foc(us) but also nominal categories such as Det(ominator), Num(ber), and K (Case).

The distinction between functional and lexical parallels the distinction between ‘closed’ and ‘open’ classes (Quirk et al. 1972). Functional classes like pronouns, articles, conjunctions, etc., form classes whose membership is fixed, while nouns, verbs and adjectives are open classes whose membership can be extended through borrowing or by transparent derivational means. Thus, lexical items belong to an open class whereas functional elements on the other hand form a closed class.

Typically, functional classes are small and listable for any language, and the total number of all such elements within a language is considerably smaller than the numbers of open class expressions. Characteristics of lexical and functional categories are summarized in Table 2.1

<table>
<thead>
<tr>
<th><strong>Lexical Categories</strong></th>
<th><strong>Functional Categories</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contain semantic content</td>
<td>Lacks ‘heavy’ semantic content</td>
</tr>
<tr>
<td>Open class</td>
<td>Closed class</td>
</tr>
<tr>
<td>Unlimited membership</td>
<td>Limited membership</td>
</tr>
<tr>
<td>Free coining of new items</td>
<td>No coining possible</td>
</tr>
<tr>
<td>Variety of complement-types</td>
<td>Constrained complement-types</td>
</tr>
<tr>
<td>Can assign theta-roles</td>
<td>Can’t assign theta-roles</td>
</tr>
<tr>
<td>Can be separated from complement</td>
<td>Can’t be separated from complement</td>
</tr>
<tr>
<td>Morpho-phonologically independent</td>
<td>Morpho-phonologically dependent</td>
</tr>
</tbody>
</table>

*Taken from Littlefield (2009:19)*

*Table 2.1: Characteristics of lexical and functional categories*
2.2 Research on lexical and functional categories

Evidence from language acquisition, language use, and language pathology suggest that the distinction between lexical and functional categories is cognitively and biologically real, and not merely a descriptive distinction. This distinction has been borne out by psycholinguistic research in aphasic breakdown, language acquisition, priming experiments over recent years with evidence that a small subset of words are acquired, produced and processed differently from the majority of the basic expressions of a language.

We present a brief summary of evidence from language acquisition (spontaneous and experimental) studies, language processing studies, and brain damage and language disorder studies.

Radford (1990) proposed a theory of language acquisition that makes crucial use of the distinction between lexical and functional categories. The central claim is that there are three distinct stages of development. Table 2.2 summarizes the three stages and their characterization (taken from O'Grady 1993:1).

<table>
<thead>
<tr>
<th>Stage</th>
<th>Characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pre categorical</td>
<td>one-word utterances, no categorical structure</td>
</tr>
<tr>
<td>2 lexical (20 mos. ±20%)</td>
<td>System of lexical categories and phrases</td>
</tr>
<tr>
<td>3 functional (24 mos. ±20%)</td>
<td>System of functional categories</td>
</tr>
</tbody>
</table>

Table 2.2: Three stages of syntactic development
Providing data from English acquisition as first language, Radford indicates that the lexical system emerges before the functional system, which he argues is determined by different biologically determined stages of 'maturation' of Universal Grammar (UG).

In the area of language acquisition, first language learners (Brown & Fraser 1963; Brown 1973; Gleitman & Wanner 1982; Egido 1983; Guilfoyle & Noonan 1988; Lebeaux 1988; Gerken, Landau, & Remez 1990; Radford 1990) and second language learners (Johnson & Newport 1989; Morgan, Meier & Newport 1989) appear to have more difficulty producing, processing, and imitating functional morphemes than lexical morphemes.

There is evidence that functional expressions are not affected by speech errors. For example, spoonerisms only involve pairs of lexical expressions, and never involve functional ones (Garrett 1976, 1980). Thus, one gets errors like *The student cased every pack* but not *Every student packed the case* for *The student packed every case* or *A student likes the lecturer* for *The student likes a lecturer*.

Robust evidence comes from experiments that show that normal subjects take longer to reject nonwords based on lexical expressions than those based on functional expressions, e.g. *thinage* vs. *thanage* (Bradley 1978, and replicated by others, see Matthei & Kean 1989). This implies that the linguistic processing mechanism 'knows' that a word is a functional expression and thus 'knows' that it will not undergo any derivational processes. For lexical expressions, the processor appears to make a wider search for matching candidates within the lexicon. Thus, it appears that the linguistic
processor knows the distinction between a lexical and a functional word and their respective linguistic properties. Word priming experiments (Shillcock & Bard 1993) show that lexical expressions prime lexical homophones (i.e. the verb *arose* primes the noun *rose*) and they also prime semantically related expressions (e.g., *wood* also primes *timber*). Functional expressions, however, do not prime homophones (e.g. *would* does not prime *wood*) nor do they appear to prime semantically related expressions (e.g. *may* does not prime *must* or *might*).

Interesting data on lexical-functional divide comes from brain damage studies and the evidence can be taken as strongly indicative of the nature of the mature language faculty. Agrammatic aphasia (Broca’s aphasia), is characterised by slow or very slow speech, no control of sentence intonation, impaired access to functional expressions, no control of syntactic operations; but comprehension, provided syntactically complex sentences are avoided, is unimpaired and lexical expressions are generally used appropriately, indicating full access to semantic information (Goodglass & Baker 1976). In agrammatic aphasia, semantic processing appears to be intact, while syntactic processes are disrupted. Language deficits in aphasia have been attributed to different factors: consistent problems with the CP-layer (Grodzinsky 2000; Friedmann 2001); difficulties in verb movement (Bastiaanse & van Zonneveld 1998), underspecification of the [±Past] feature of the T/INFL category (Wenzlaff & Clahsen 2004), or problems with the process of accessing and using grammatical knowledge (Crain et al. 2001).

Children’s natural productions, processing delays, and disorder studies provide good evidence for a bifurcation of linguistic categories into lexical and functional.
However, a review of experimental studies shows that functional categories are available to children even in newborns when studied through sophisticated experimental techniques. Though the review given below is not comprehensive but illustrative, it brings home the point that functional categories are innate and not necessarily learnt.

Gerken et al. (1990) tested infants of 23-30 months in an experimentally controlled elicited imitation task using sentences containing English or nonsense functional words (e.g., *Pete pushes the ball; Pete pusho na ball*). Infants omitted the English functional words significantly more than the nonsense functional words, hence suggesting that they recognized the distinction between the English and nonsense functional words.

Two seminal studies demonstrated that ‘telegraphic-speaking’ children were better able to respond to utterances that contained functional expressions than to utterances from which they were omitted (Shipley, Smith, & Gleitman 1969; Petretic & Tweney 1977). In another study, Katz, Baker and McNamara (1974) found that children as young as 17 months considered novel words (e.g., *dax*) as proper or common nouns based on the type of article that preceded them, that is, classified an object addressed as ‘a dax’ as a common noun and ‘dax’ as a proper noun (see also Gelman & Taylor 1984).

Similarly, Shady, Jusczyk, and Gerken (1998) found that 10.5-month-old infants listened significantly longer to passages with real functional words than to ones with nonsense words as substitutes for them. The same pattern of response occurred even
in a condition in which the nonsense words had similar phonetic properties to real English words (whereas in another experiment in which nonsense words were substituted for functional words, no significant headturn preference to these two types of passages occurred). Thus, infants were not merely responding to the occurrence of nonsense words in some of the passages, but had also developed some specific expectations for functional words that should occur in English utterances.

The findings reviewed above lead to three conclusions: (1) Young children can detect functional words and use the distinct characteristics of these grammatical elements to segment the speech stream into words and phrases; (2) children are able to discriminate between function and content words (as well as nonsense words) already at an early age. And (3) the omission of functional words in early speech is not a result of a deficit in infants' competence to detect and process functional categories.

Children’s early linguistic productions are typically characterized by the variable or null use of function items. These morphologically impoverished productions have frequently been interpreted as evidence for the rudimentary nature of early child grammars and a general absence of functional categories in early child speech. However, studies with newborns and pre-grammatical children have shown sensitivity to functional categories, thereby suggesting that early child grammars are much richer and more fully developed than early child productions might suggest. The absence of functional words in child speech cannot therefore be taken as an absence of functional categories in child speech. The absence of functional words in early speech could be more accurately explained by appealing to phonological rather than syntactic aspects of children's developing grammars.
2.3 Functional categories and the theory of universal grammar

Children throughout the world learn different languages in a very similar manner regardless of language or culture, at about the same age. First words emerge, then word combinations occur, and finally, syntax is mastered. What enables children to acquire all languages in a very similar way? Linguists and biologists believe that the innate Universal Grammar humans are born with, is composed of principles that are not dependent upon language input and only a small set of parameters that vary in a binary fashion across languages (Baker 2001; Hornstein, Nunes, & Grohmann 2005).

Universal principles constraint all languages, and do not have to be learned because they are part of the genetically endowed language faculty and consequently are known without language experience. One important universal principle is the Structure Dependence Principle that all grammatical operations are structure-dependent. Regardless of language, all syntactic operations are sensitive to the grammatical structure of the sentences to which they apply. For example, in English we form a Yes/No Question by interrogative inversion:

\[(5) \quad \begin{align*}
a. & \quad \text{She is working at home.} \\
b. & \quad \text{Is she working at home?}
\end{align*}\]
(6) a. Children will love this game.
   b. Will children love this game?

In forming a question from a statement, we do not simply move the second word to the front of the sentence as it may appear. Rather the operation is structure dependent. In the case of a standard Yes/No Question we move the auxiliary (is, are) or modal (will, might, should) to front of the Subject.

Unlike universal principles that require no language experience, parameters do require language input or primary linguistic data for their setting. Since all parameters have two possible settings, children will need language input to select the proper setting. A fixed set of parameters account for most of the syntactic variations among human languages (Atkinson 1992; Baker 2001; Chomsky 1981; Radford 2004; Roeper & Williams 1987; Wexler 1998). Parameters determine such things as word order in a language and whether question words (e.g. who, what, how) move to the front of a sentence or not. The acquisition of language competence can be viewed as a matter of ‘setting’ grammatical parameters through exposure to appropriate receptive language input combined with the learning of a lexicon.

In the Minimalist model, the lexicon has taken on a greater role in the grammar than it had in earlier generative grammar theory. Each representation of a word in the lexicon consists not only of phonological and semantic properties (sound and meaning), but also syntactic features such as categorial membership (i.e., whether it is a Noun, Verb, Determiner, etc.), inflectional behavior (e.g., how it is marked for number, person,
and gender). Moreover, in the case of verbs, it is syntactic argument structure. For example, run requires only one argument: a subject ‘The girl runs’; kiss requires two arguments, a subject and an object ‘The father kisses the baby’; and give typically requires three arguments ‘The girl gives the baby a toy’.

Developing an early core lexicon is an important step in the acquisition of language. The acquisition of word meaning, however, describes only part of what a child is learning even in the single-word stage of language development. Contemporary linguistic theory emphasizes that the child must also be learning the syntactic features of words in relation to the parameter settings of the language being acquired. Such grammatical options- tense, agreement, determiners, Case, distinguish one language from another. Typically, at about 12 months a child will begin to produce isolated words with no evidence of grammatical marking. Within another six months or so, however, the child will begin to produce forms such as Determiner ‘No’ (e.g., ‘No shoe’), the progressive Verb marker -ing (e.g. “running”), and the Genitive or Possessive ‘s (e.g., ‘the boy’s ball’).

2.4 Theories of acquisition of the functional categories

Under the acquisition of functional categories, we discuss the theorization of acquisition of functional categories in first and second languages. Here we discuss a few theories/predictions on the acquisition of functional categories.
2.4.1 Strong continuity theory

The Strong Continuity View was proposed by Boser et al. (1992), Poeppel and Wexler (1993), Lust (1994), and others. According to this, functional categories and their projections are innate and as a result, they are present at birth. Since the functional structure is innately specified and they should exhibit in full complexity within a clause as soon as the functional categories are acquired singly, and then the necessary phrasal complexity is attained.

2.4.2 Radford's maturational theory

If functional categories are not innate, then they might be acquired through biological growth or maturation. Radford (1990, 1996) proposes that the functional categories are initially absent, and then emerge gradually, in parallel. According to Radford, the functional system matures, with parallel and independent development of the various functional categories. Initially, the child produces only lexical projections (VP stage) where it is assumed to utter bare VPs or APs with or without overt lexical subjects, following that the functional system matures in parallel and essentially independently.

2.4.3 Bottom-up structure building account

Another explanation is where the functional categories are gradually built up from bottom up (i.e. the VP): a view held mainly by Guilfoyle and Noonan (1992) and Vainika (1993/94). Radford's lexical stage is followed by a stage when the 'I-system' is developed but not the C-system, followed finally by the attainment of the full adult complement of functional categories. This view is called as the bottom-up structure
building hypothesis, and it explains that functional systems mature one by one from the bottom of the tree structure to the top, following the innate restrictions on phrase structure and also the principles of Universal Grammar at every stage.

2.4.4 The Semantic Bootstrapping Hypothesis

Lastly, the semantic bootstrapping hypothesis focuses on the lexical categories as the dominant factor in early child language. Typically this hypothesis cannot be considered as a UG-based theory, it however, accepts the general concepts and assumptions of UG such as phrase structure and distinct word classes.

According to the hypothesis, children presumably begin labeling semantic categories of words and phrases based on the objects, actions, and properties in the world to which the word or phrase refers (e.g., Grimshaw 1981; Pinker 1982, 1984). Only once children have learned various lexical items, they become sensitive to functional words and change the basis of categorization from referential to grammatical. In line with this hypothesis, Freidrici (1983) argued that children are not sensitive to functional words almost until they are 10 years of age. However, the semantic hypothesis is concerned with the way functional words are discovered, and assumes like any other UG based theory that functional categories are innate, and available to children from the beginning.
2.5 Prepositions and the lexical-functional divide

For clear-cut cases like nouns and determiners the distinction between lexical and functional categories is straightforward. However, there are some categories that are extremely difficult to classify like adverbs, auxiliaries, numerals, and, most of all, prepositions. It is the latter we are interested in this thesis. There is no consensus in the literature about whether the prepositions side with the lexical categories nouns, verbs, adjectives or whether they are a functional category like determiners, inflections and complementizers. Some feel that prepositions "straddle between functional and thematic elements" (Abney 1987:63); some propose that they are 'functional elements of a nominal system' (Grimshaw 1991) while some others consider them heterogeneous, i.e. some prepositions are lexical and some functional (van Riemsdijk; 1990; Rauh 1995; Zwarts 1995). The lack of clarity in treating prepositions as lexical or functional is due to the criteria used for distinguishing lexical from functional categories.

Since Jakendoff (1973), it had been generally accepted that prepositions belong to one of the four major lexical categories along with nouns, verbs, and adjectives. This characterization of preposition as a lexical category was problematic, as nouns, verbs, and adjectives are an open class with an unlimited membership, whereas prepositions have a limited number of membership. Moreover, majority of prepositions assign Case structurally (as do verbs) and express semantic relations, but a few (for example: of, dative to) are purely syntactic and assign Case inherently (cf. Ura (2001)). According to Rauh (1993), prepositions are heterogeneous. He divides prepositions into two
categories using syntactic and semantic properties: lexical and non-lexical prepositions respectively. Rauh argues that ‘Lexicals’ are to have their own entries in the lexicon, but non-lexical have undergone a particular grammaticalization, and therefore no independent lexical entry, but can be listed under the entry of the governor. The non-lexical categories are divided into two: Case prepositions and fixed–phrase prepositions (prepositions that form a single syntactic unit with their noun). Similarly, Tremblay (1996), divides French prepositions into lexical prepositions, that have semantic content, and non-lexical ones which are semantically lacking. Tremblay differentiates these two categories on the basis of their ability to assign theta roles in lexical prepositions and in their inability of that in semantically lacking prepositions.

Basically, Jakendorf, Rauh, and Tremblay suggest that the prepositions can be divided into two categories: lexical and non-lexical. In the present study we attempt to prove empirically that the second language learners of English respect Littlefield’s (2006) fine-grained categorization of prepositions of English that divides the prepositions into four categories having ± Lexical and ± Functional features. This divide in prepositions was empirically supported by studies in child language processing, and brain damage.

2.5.1 Child language

In the 2003 study, Littlefield focused on the CHILDES database of two children: Naomi (MacWhinney & Snow 1985, 1990; Sachs 1983) spanning a period of 3 1/2 years (1;2.29 to 4;9.3) and Sarah (Brown 1973) spanning nearly 3 years (2;3.5 to 5;1.6). Littlefield distinguished lexical prepositions from functional ones on the basis of three criteria: (i) functional items lacked denotational semantics; whereas lexical
had a clear referential meaning (Hoekstra 1995); (ii) functional items were generally stressless, whereas lexical items were stressed (Hoekstra 1995); (iii) functional prepositions fulfilled a sub-categorization requirement, so could not be substituted with any other preposition, whereas lexical prepositions could be easily substituted for one another (Friederici, 1982). Both children in the study were found to show a relatively steady and rapid increase in their use of lexical prepositions over time, whereas the functional prepositions did not even emerge in their spontaneous speech patterns until they reached an MLU of 3 (2.0-2.49). The important finding here is that English functional prepositions appeared later than the lexical prepositions in child’s first language. Second, the overall error of English functional prepositions was higher (Naomi 40%, Sarah 37%) than the lexical prepositions (12% each). Moreover, both the subjects went through an initial period where the error rate of functional prepositions was 100%. On the basis of these two observations, Littlefield confirmed a division between the acquisition of lexical and functional prepositions.

A blow to the universal delay in the use of functional prepositions came from a study by Morgenstern and Sekali in 2009, where they compared the utterances of Peter from CHILDES database for English; and Madeline for French in a longitudinal study, sample aged 1;08 to 2;04 years. They found that though Peter used spatial prepositions more often than functional prepositions in early stages, Madeline tended to use more functional prepositions than spatial prepositions as shown in Figure 3 (taken from Morgenstern & Sekali 2009: 3-4).
2.5.2 Processing

Freiderici (1983) studied processing time for lexical and functional prepositions by 5- and 8-year old German children on a word-monitoring task. She found that younger children took significantly more time to respond to functional prepositions than lexical prepositions were found, and this lag in the response of the older children, as well.

2.5.3 Brain damage

Friederici (1982) tested knowledge of prepositions in German in 12 Broca’s and 12 Wernicke’s aphasics on a cloze test and grammaticality judgment task. After omitting verb particles from her test sentences, she looked at two categories in prepositions: those with a high semantic content and those that were required for purely syntactic
reasons. No difference was found in the comprehension (judgment) abilities of the Broca’s patients between the two types of prepositions. However, their productive abilities on the cloze test showed a significant difference: lexical prepositions were correctly produced 69.6% of the times and functional ones 36.3%. In Wernicke’s patients, the opposite production pattern was found: subjects correctly produced more functional than lexical prepositions.

Grodzinsky (1988:119) argued that Friederici’s proposal “...does not seem to be well supported from a grammatical point of view” because “members of the category preposition are always closed-class items, yet they are selectively impaired.” However, Teask and Hummer (1994) presented counter-evidence from the spontaneous speech of agrammatic patients, and found that there was no evidence to support Grodzinsky’s claim.

2.6 Littlefield’s (2006) categorization of prepositions

The debate on how to categorize linguistic items in terms of their features has mostly focused on whether items are lexical or functional. That is, the debate has mostly concerned the features of lexical and functional as binary opposites, if an item is [+Lexical], then it must be [-Functional] as well and vice-versa. Grimshaw (1991) and van Reimsdijk (1990, 1998) proposed the feature [± F] or [+Functional], which divided the major lexical categories into functional [+F] and lexical [-F] elements. However, Littlefield (2006) parsed out the functional features from the lexical features, suggesting that these features are not in binary opposition. Therefore, if an
item is [+Lexical] it can be either [-Functional] or [+Functional], and the same is true for [-Lexical] items.

According to Littlefield, a linguistic item is [+Functional] if it provides connectivity between items in a phrase or a sentence. For example, the role of inflection (INFL) in a sentence is to link the subject with the predicate. Without this [+Functional] item, a sentence like, *The girl walk slowly*, would be difficult to interpret since it lacks the [+Functional] item. A linguistic item is treated as [+Lexical] if it contributes descriptive, or notional content. Essentially, the functional feature concerns the syntactic contribution and the lexical feature concerns the semantic contribution.

Crucially for this study, we can determine whether a preposition is [+Lexical] and [+Functional]. A preposition is determined to be functional if the preposition links elements in a phrase together. These elements that can assign Case or Agreement are designated [+Functional], those that cannot are designated [-Functional]. Prepositions are determined to be [+Lexical] if they contribute a descriptive, substantive meaning and can act as arguments or adjuncts. Prepositions are [-Lexical] if they don’t contribute substantive meaning and cannot act as arguments or adjuncts. A diagrammatic representation of Littlefield’s categorization is presented below (as represented in Thomann 2013:2):
2.6.1 [± Functional]

As mentioned above, a preposition is [+Functional] if it is able to link elements in a phrase together, usually through Case assignment and a [-Functional] item cannot link elements together. Interestingly, [+Functional] items and [-Functional] items differ in what types of movement they allow. Littlefield (2009:50) provides examples of how [+Functional] items pattern differently than [-Functional] items. In the sentences, they trudged up the rocky slope (up being a semi-lexical) and They let out the brown dog (out being an adverb), [+Functional] items (i.e. up) are allowed to engage in pied-piping (7a) and fronting (8a), while [-Functional] items (i.e. out) are not allowed as in (7b) and (8b).

(7) a  [Up which slope] did they trudge? (semi-lexical)
    b  *[Out which dog] did they let?  (adverb)
(8) a  [Up the slope], they trudged. (semi-lexical)
    b  *[Out the beagle], they let.  (adverb)
However, [-Functional] items allow object shift (9a) while [+Functional] items do not allow object shift (9b).

(9)  
\begin{align*}
a & \quad \text{The looked (up) the number (up).} & \text{(particle)} \\
b & \quad \text{Mary is proud (of) her son (*of).} & \text{(functional)}
\end{align*}

[-Functional] prepositional items follow the pronominal object (10a) whereas [+Functional] prepositional items must precede their pronominal objects (10b).

(10)  
\begin{align*}
a & \quad \text{He looked (*up) it (up).} & \text{(particle)} \\
b & \quad \text{Mary is proud (of) him (*of).} & \text{(functional)}
\end{align*}

Table 2.2 excerpted from Littlefield (2009:69), summarizes the differing patterns of [+Functional] and [-Functional] elements.

<table>
<thead>
<tr>
<th></th>
<th>[-Functional]</th>
<th></th>
<th>[+Functional]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adverbs,</td>
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<td>Semi-lexical</td>
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<td>Particles</td>
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<td>Preps,</td>
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<td></td>
<td></td>
<td>Functional Preps</td>
</tr>
<tr>
<td>Pied-piping</td>
<td>*</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Fronting</td>
<td>*</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Object Shift</td>
<td>✓</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Pronominal object</td>
<td>✓</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>precedes Prep Element</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>True adverb between</td>
<td>*</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>verb and Prep element</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gapping (DP follows P)</td>
<td>*</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 2.4: Structural features of [-Functional] and [+Functional] items

2.6.2 |± Lexical|

As with |± Functional] items, |± Lexical] items pattern differently than |± Lexical] items in terms of what types of movement are allowed. For example, |± Lexical] items allow for easy substitution of elements (11a) and |± Lexical] items do not (11b). Note: the particle in (11b) is marked as ungrammatical because there is no shared element
that contributes a consistent meaning as with the adverb which has the shared spatial meaning of *up*.

(11)  
<table>
<thead>
<tr>
<th></th>
<th>The girls will sit/stand/drive/jump up.</th>
<th>(adverb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>*The girls will crack/throw/blow up.</td>
<td>(particle)</td>
</tr>
</tbody>
</table>

Additionally, [+Lexical] items allow for imperative structure (12a, 12b) and [Lexical] items do not (12c, 12d).

(12)  
<table>
<thead>
<tr>
<th></th>
<th>Out!</th>
<th>(adverb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>To the park!</td>
<td>(semi-lexical)</td>
</tr>
<tr>
<td>c</td>
<td>*Up! (meaning: Throw up!)</td>
<td>(particle)</td>
</tr>
<tr>
<td>d</td>
<td>*Of Daisy! (meaning: Be proud of Daisy!)</td>
<td>(functional)</td>
</tr>
</tbody>
</table>

Table 2.3 below, excerpted from Littlefield (2009:69), outlines the different patterns that are allowed for [+Lexical] versus [-Lexical] items. Littlefield (2009:69).

<table>
<thead>
<tr>
<th>Prep element occurs with unique, unpredictable head</th>
<th>[-Lexical]</th>
<th>[+Lexical]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy substitution</td>
<td>*</td>
<td>\</td>
</tr>
<tr>
<td>Imperative stress</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Contrastive stress</td>
<td>*</td>
<td>\</td>
</tr>
<tr>
<td>Gapping (DP precedes P)</td>
<td>*</td>
<td>\</td>
</tr>
<tr>
<td>May be an argument</td>
<td>*</td>
<td>\</td>
</tr>
<tr>
<td>May be an adjunct</td>
<td>*</td>
<td>\</td>
</tr>
<tr>
<td>Modified by degree adverbs</td>
<td>*</td>
<td>\</td>
</tr>
<tr>
<td>Modified by <em>straight</em></td>
<td>*</td>
<td>\</td>
</tr>
</tbody>
</table>

Table 2.5: Structural features of [-Lexical] and [+Lexical] elements
2.6.3 Fine-grained categorization of prepositions

The four categories of prepositions are different from each other in that they act differently syntactically as seen above, but their semantic and phonological overlap indicate that they nevertheless belong to the same domain. We quickly look at the four categories now.

2.6.3.1 Adverbs

Adverbs are the pure lexical category and are categorized as [+Lexical, -Functional] features. They contribute semantic content but cannot link elements in a sentence nor do they have case assignment properties.

2.6.3.2 Semi-lexical prepositions

Littlefield assigns features for semi-lexical prepositions as [+Lexical] because they have descriptive content and are [+Functional] because they assign theta roles and establish spatial relationships, and they can link elements in a phrase through Case assignment (Littlefield 2009:42). It seems that the semi-lexicals are the largest category of the prepositional domain.

The theta roles assigned by semi-lexicals are the locative, goal, source, path, and instrument.

(13) a. The eggs are in the basket. (Locative)
    b. We went to Colombo. (Goal)
    c. I flew from Sri Lanka. (Source)
    d. We walked along the river bank (Path)
    e. I cut the cake with a knife. (Instrument)
2.6.3.3 Particles

Particles are an idiosyncratic category which are assigned [-Lexical, -Functional] categories. They do not contribute substantive, descriptive meaning, nor have the ability to assign Case. Generally, particles are thought to either trigger an aspectual or idiomatic meaning in conjunction with certain verbs (Fraser 1965, 1976; Bolinger, 1971). Bolinger also claims that where particle *up* occurs with the verb be, as in *His term is up* and *Time is up*; *up* can be paraphrased with the verb *finished* (completive aspect). In addition, Bolinger says that these aspectual features do not match with the particular particle all the time, for example.

(14)  
\begin{enumerate}
  \item a. turn out, grind out, spin out (iterative or repeated sense)
  \item b. write out, work out (perfective sense or completive sense)
\end{enumerate}

In some verb-particle constructions (phrasal verbs), the aspectual meaning contributed to the phrase by the particle is not important, and the descriptive meaning remains the same.

(15)  
\begin{enumerate}
  \item a. She ate up the sandwich.
  \item b. She ate the sandwich.
\end{enumerate}

It can be noticed that either particle *up* is added or not, the descriptive meaning of (15a) and (15b) is the same.

On the other hand, there are some phrasal verbs (idiosyncratic) where neither the meaning of the verb nor the meaning of the particle contributes to the meaning of the verb-particle construction. Example, *shape up, put off* etc.
2.6.3.4 Functional Prepositions

Functional prepositions are assigned [-Lexical, +Functional] features since they lack substantive semantic content and have the ability to assign case. Example (16a) illustrates nominal and (16b) adjectival structures where the functional preposition of is needed only for Case assignment, but it does not assign any theta role. Functional prepositions can also be inserted into verb phrases where functional preposition assigns Case to the NP argument but not a theta role (16c).

(16) a. The destruction *(of) the city.
   b. Mary is proud *(of) her dog.
   c. The meal consisted *(of) vegetarian dishes.
   e. He built a toy house for the boy. (cf. He built the boy a toy house).

These examples would be ungrammatical if of/for was omitted because the preposition is required to assign Case to the following noun phrase. Additionally, it does not contribute to the meaning of the phrases. By altering the word order to the city's destruction, we can see that of is not required to retrieve the meaning of the phrase.

2.7 Evidence for the fine-grained categorization

2.7.1 Acquisitional data

Littlefield (2006) provided evidence for the four different categories of prepositions by administering a longitudinal study. Littlefield claimed established patterns in several syntactic domains show that the lexical elements are acquired before
functional elements. Therefore, Littlefield suggests that there are two possible predictions on the acquisition of the four categories of prepositions.

(17) a. Predicted order of acquisition:

First: -Functional (adverbs and particles)
Last: +Functional (semi-lexical and functional prepositions)

Here prepositions with [-Functional] features out rank the prepositions with [+Functional] features.

(17) b. Predicted order of acquisition:

First: + Lexical (adverbs and semi-lexical prepositions)
Last: -Lexical (particles and functional prepositions)

Here, prepositions with [+Lexical] features out rank the prepositions with [-Lexical] features.

It is of utmost important to note that the both the orders agree with two facts: (i) the pure lexical categories (adverbs) are acquired before the pure functional categories (functional prepositions) and (ii) the particles and semi-lexical prepositions will be acquired after adverbs and before functional prepositions.

Littlefield administered a longitudinal study in order to investigate which order (order 17a or 17b) is right.
The database: Five children (aged 1;2 to 2;3) in the CHILDES data base (MacWhinney & Snow 1985, 1990) were selected: Adam (2; 3.4 to 4;0.14) spanning 2 years; Naomi (1;2.29 to 4;9.3) for 3 1/2 years; Nina (1;11.16 to 3;3.21) for 1 1/2 years; Sarah (2;3.5 to 5;1.6) for 3 years; and Eve (1;6 to 2.3) for 9 months. Only Naomi’s data started from the first MLU Group, whereas all the other children were at MLU groups. Therefore, the particular stage shown in Naomi was not found in others. Therefore, another two children’s (Geraldine (1:5 to 2:00) spanning for over 6 months and Melisa (1;10.20 to 2;7.7) ) spanning for 9 months) data from the CHILDES database was later added. These two children showed patterns similar to Naomi. Moreover, some selected files of each child’s were coded for their caregivers’ utterances, in order to determine whether there was an influence of input on children’s acquisition patterns.

Method: The CLAN data progressing programme (MacWhinney 1993) was used to calculate the Mean Length of Utterance (MLU) of all these children. This programme calculated the mean of morphemes per utterance and each child’s data was divided into 7 MLU groups. All possible contexts where a preposition had been used or should have used were identified: Contexts with adverbs, particles, semi-lexical prepositions and functional prepositions were coded. Any item homophonous with prepositions was also coded.

Errors which children made with prepositions were analyzed and grouped into two main types of errors: omissions and substitutions. If a child had mispronounced or used a novel form for a preposition, they were coded as ‘other errors’. Following conventional guidelines for utterance inclusion and exclusion (Brown 1973: Miller
1981), several utterances were omitted, example, utterances with homophonous words that were not used propositionally, imitations, repetitions, etc. After identifying the relevant contexts, the prepositions were coded for four categories of prepositions: adverbs, semi-lexical, particles and functionals. These four categories of prepositions had been distinguished mainly by using the tests described in Table 2.4. Table 2.5 discussed above.

Results: The child data analysis showed that adverbs and particles were acquired early at Mean Length of Utterance (MLU) at 1.5-1.99 or 2.0-2.49 respectively, followed by semi-lexical prepositions (for most children with MLU of 2.5-2.99), with functional prepositions being acquired the last (for most children with MLU of 3.5-3.99). All five children followed same patterns of acquisition: adverbs/particles, then semi-lexical prepositions, and finally functional prepositions. However, no conclusion could be arrived at about the relative ordering of adverbs and particles as they showed similar growth patterns. This could be attributed to the fact that child data began in 2.0 MLU or later, except in the case of Naomi. A closer look at Naomi’s earlier data showed a difference in the distribution of adverbs and particles. As none of the other four children’s data began this early on, Littlefield has taken a close look at Geraldine’s and Melisa’s early data, from MLU Group 1 to MLU Group 2. All these three children showed a delay in production of particles though they had 100% accuracy whenever they appeared.

The majority of errors were omissions (83%), substitutions and other errors were considerably lower, and omissions occurred in all categories of prepositions. The strongest support for the fine-grained approach came from the rate of errors: the most
difficult category was functional prepositions, with an error rate of 19.6% followed by semi-lexical prepositions (8.3%) and finally least difficult categories were particles (1.5%) and adverbs (1.1%). Littlefield concluded that acquisition of the four categories of preposition had the following order:

Adverbs, Particles, Semi-lexical prepositions, Functional prepositions

and these [-Functional] categories had an advantage over the [+Functional] categories.

Adult data: Interestingly, all adults showed a nearly identical distribution for all the four categories of prepositions. They used more semi-lexical prepositions (62%) than any other category, followed by adverbs (22%), then by functional prepositions (11%), and last were particles (4%).

The results of Littlefield (2009) study showed that the acquisition order of children cannot be attributed to input frequency. Mothers used the highest number of semi-lexical prepositions and very few particles and adverbs, but children used more adverbs and particles than semi-lexical prepositions. To sum up, a specific order of the acquisition of four categories of prepositions, and the matching error patterns of the four categories of prepositions (the category easiest to acquire has the least errors) confirmed the existence of the four categories of prepositions, in other words, empirically supported the fine-grained approach.

2.7.2 The Littlefield categorization and processing

Thomann's (2013) study examined the four categories of prepositions were processed by adults differently with the intention to validate Littlefield's categorization. If the
adults processed these four categories of prepositions similarly, then it would disprove Littlefield’s (2006) approach.

35 Northeastern University undergraduate students (Female = 21; Male = 14), native speakers of English, participated in the study. The range of their age was between 19 to 23 years. Firstly, the participants were presented with a picture to trigger the meaning of a preposition. Then the preposition or a filler word was presented and they were asked to answer if that word was related to the picture provided. The reaction times and responses were analyzed to see whether there was a pattern for the four categories of prepositions.

A preliminary study was conducted to see whether the pictures adequately gave the meaning of the preposition, which was to be given after words, and the pictures that were rated with less than 25% accuracy were removed from the main study. The length of the prepositional items was also controlled. Some filler trials were used, either adjective–noun combinations or compound nouns. The length of the filler trials was also controlled in the same manner. The length of the prepositional items and filler trials was controlled as the length of words could significantly affect reaction times of the responses. A practice session was conducted before the trials. The participants were tested on computer with DMDX software, and were asked to press a button to indicate whether the given preposition was relevant to the picture.

The results showed that adults processed the four categories of prepositions significantly differently. The reaction time data showed that [-Functional] categories (adverbs, and particles) were processed more quickly than [+Functional] categories.
(semi-lexical prepositions and functional prepositions). The response results showed that [+Lexical] categories (adverbs, semi-lexical prepositions) were rated 'more related' to the given picture than the [-Lexical] categories (particles and functional prepositions). Therefore Thomann's (2013) study validated Littlefield (2006) fine-grained approach in prepositions in adult processing.

2.8 Some confusing terms

A few terms need to be disambiguated before we give details of the study: functional categories, functional words, functional prepositions and functional features.

**Functional categories** are terms used in theoretical linguistics to refer to non-lexical categories, which are extended projections of functional heads, such as DP (Determiner Phrase), IP (Inflectional Phrase), CP (Complementary Phrase).

**Functional words** are the head of functional projections, for example, Determiners *(the)*, Tense *(past)*, Complementizers *(that, wh words)*, Quantifiers *(every, any)*.

**Functional preposition** is a term introduced by Littlefield (2006) to refer to prepositions that have no semantic content (and therefore cannot assign theta role), but is necessary for linking arguments through case assignment (see Section 2.6.3).

**Functional features**, another term introduced by Littlefield (2006), assign Case to the arguments in a sentence, or are needed for the purpose of tense and agreement. In the Littlefield theorization for prepositions, only Case is of concern in the definition of
functional features. Therefore, if a preposition assigns case to the arguments, then it is deemed [+Functional], and if not, then [-Functional]. Therefore semi-lexical and functional prepositions have [+Functional], and adverbs and particles have [-Functional] features.

In this study, we do not worry about the acquisition of functional categories because the learners in the study are 8+ years old and therefore they use Tense and agreement correctly and therefore have an IP projection, since they use wh-words they have a CP projection, and use articles and determiners, so have a DP projection. However, the concern is with the production or comprehension of ‘functional words’ as opposed to ‘lexical words,’ with respect to prepositions.

2.9 Conclusion

In this chapter, we revisited the literature on the acquisition of lexical and functional categories, with special reference to prepositions and have presented both the theoretical and empirical evidence for the fine-grained categorization of prepositions into adverbs, semi-lexical, particles and functionals. The current study focuses on second language learners of English (aged 8 years to 15 years), in order to find out acquisition patterns of these four categories of prepositions, on a dictation and a production (picture story narration) task. If there will be an order of acquisition in the tasks, the findings will validate the fine-grained approach of Littlefield (2006) for second language learning of English as well. In next chapter, we will introduce the details of the study and focus on the coding and scoring of the study.