

13 LANGUAGE STRUCTURE, LEXICAL MEANING, AND COGNITION

Whorf and Vygotsky Revisited

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Words move, music moves
Only in time; but that which is only living
Can only die. Words, after speech, reach
Into the silence. Only by the form, the pattern,
Can words or music reach
The stillness, as a Chinese jar still
Moves perpetually in its stillness.

—T. S. Eliot¹

Psychologists often speak about language and meaning in terms of individual “words” that label “things” in the world. Such expressions emerge not only in casual speech, but also pervade the scholarly literature. Influential works such as Roger Brown’s (1958) *Words and Things* lend support to this tendency in their titles, if not always in their detailed arguments. Speaking in this way perpetuates the illusion that language and speaking are primarily about individual words, words conceived of as sturdy self-sufficient forms with straightforward referential meanings, forms that we take out into the world to attach to various objects we encounter in our experience, much the way a hunter might take a snare out into the forest to capture rabbits (or other “natural kinds”). This view, in turn, strongly entails another, namely, that word meanings are merely derivative of experience, simply labeling and thus ultimately responding to objects, rather than having their own internal value and logic that can play a dynamic role in the constitution and

conceptualization of experience. This derivative view of word meaning, now serving as a proxy for all of language, leads quite naturally to a view of human cognition in which language plays a secondary, handmaiden role at best. In this way, our own “fashion of speaking” about language in terms of “words” shapes our scientific understanding of the significance of language for thought.

Yet over a century of systematic linguistic research shows that this view of words and hence word meaning is unsustainable on several counts. First, what qualifies as a word form can be difficult to determine and is often the product of analysis rather than its starting point, not only for scientists but also for children learning language. Although this point can be difficult to appreciate for speakers of languages (such as English) that happen to have large numbers of minimal, freestanding forms, it is transparently obvious in other languages in which most forms are internally complex or bound to other forms. Second, many word forms do not actually refer to “things” (or “objects”) but rather to events or properties, or even to nothing external at all, having essentially a grammatical function (e.g., English *of*). And those words that do refer to objects may do so in remarkably different ways, selecting this or that feature as the basis for reference (compare Quine, 1960). Finally, perhaps most importantly, even referential word meanings depend heavily on the

place a given form occupies not only in a specific utterance but also in an overall grammatical structure of meaningful forms or categories, structures that differ dramatically across languages. Failure to recognize the structure-dependent quality of word meanings makes it difficult to understand their dynamic nature, both psychologically, as they come to play a constitutive role in cognitive development, and culturally, as they come to shape diverse conceptualizations of experienced reality.

We need, therefore, to replace this understanding of words and things with a structure-oriented understanding of lexemes and their meanings in order to grasp the full potential for language to influence thinking. The first section of this chapter articulates a view of lexemes and lexical meaning that provides a salient place for grammatical and semantic structure. Though hardly novel, this view needs firm emphasis if we are not to be misled by the casual, uninformed understandings described above. The second section links this view of lexical meaning to traditional theories about the relation of language and thought in the work of Whorf and Vygotsky. The discussion makes clear that both theorists saw language structures as the principal locus of linguistic influences on thought and argues that this provides a key connection that allows comparative and developmental theories to be joined into a unified position. The third section presents an empirical case study that compares two language groups, American English and Yucatec Maya, showing empirically how structural factors shape the referential value of individual lexical forms and how those referential values then influence cognition both developmentally and comparatively. The concluding discussion rethinks the course of language development and human development more generally in light of these language effects.

THE ROLE OF LANGUAGE STRUCTURE IN LEXICAL MEANING

Since the term *word* is typically used to refer to a unit of language whose form and meaning are given independently of grammatical analysis,

the term *lexeme* will be used here instead precisely to highlight the dependence of such units on a structural analysis. Other terms are often used to similar purpose (e.g., *lexical item*, *lexical unit*) and there is no intent here to advance or defend a particular view of lexemes within the array of competing theories in linguistics. All that is essential in the present context is that lexemes be understood as abstract units of language emerging from structural analysis. They are composed of one or more morphemes (minimal units of semantic meaning) that express a meaning and a morphosyntactic category relevant to predication.² Language structure shapes each lexeme in two distinct, but interrelated ways. First, most *lexemes* can be identified as *forms* only with reference to an analysis of the overall language structure, rather than solely by reference to their own independent phonological and referential properties. Second, the substantive *meaning* of each lexeme then depends intimately on its structural-functional role in the language. Both of these issues have been widely ignored or deliberately evaded in traditional approaches to understanding words, approaches that focus on the phonological and referential values of words at the expense of the structural values of lexemes (Lyons, 1968, Ch. 5).

Lexical Form

A lexeme is, first of all, a constituent of the language, a lexical form that serves as an identifiable functional unit within the larger structural whole. Despite this, many psychologists treat lexemes as if they were *structurally autonomous words*, that is, as forms whose phonological and referential properties can be defined and aligned independently of structural considerations to produce minimal, free-standing referential units. Although some lexemes may have such properties, this is not generally the case. Often the relevant properties do not apply, or they do not align as expected, or they apply and align only when supplemented by other structural information. In such instances, we are forced to recognize that the identification of most lexemes is the product of grammatical analysis, not independent of it.

And this raises serious questions about accounts of language acquisition built on regarding words as freestanding primitive building blocks.

Phonological features alone cannot be used to identify the lexical forms in a language. A phonological word is a segment of speech that constitutes a single unit of pronunciation. The phonological criteria for a word vary from language to language depending on the sound patterns characteristic of it. In English, a word typically contains one dominant stress; in other languages, such as Turkish, processes such as vowel harmony play a role in defining a word (Lyons, 1968, p. 205; Trask, 2004, p. 2). But whatever the criteria, such a phonological unit need not align exactly with the meaningful lexical forms in a language as defined on other grounds. For example, the English utterance "You're here" contains two phonological words: *you're* composed of two lexemes (*you* and *be* [-are]) and *here* composed of one lexeme. In Yucatec Maya, the comparable utterance "*wayaneche'*" places the entire sentence into a single phonological word, composed of four morphemes (*way-yàan-ech-e'* 'here-exist-you-deictic'). Conversely, in the English utterance "Did you guys really break up?" the verb *break up* serves as a single lexeme, even though it is composed of two phonological words. To complicate things, the two phonological words (*break* and *up*) can serve in other contexts as separate lexemes in their own right and, as a noun, the combination *break up* forms a single phonological word! Likewise, in our Yucatec example, the morphemes *way* . . . -e' function as a single lexical form, which sometimes occurs as such (e.g., *waye'* 'here'), but where the *way* sometimes stands alone as a phonological word and sometimes binds to other intervening material, but always requires the -e' or a similar form to complete it further along in the utterance. More generally in Yucatec, as well as other languages such as Nootka (Whorf, 1941/1956) and Yup'ik (Trask, 2004), whole sentences appear as single phonological words. In short, there is no reliable relationship here between a phonological word and a lexeme in the language. Or, as Trask (2004, p. 2) puts it, "Phonological words are important in the study of pronunciation, but they are irrelevant to the

study of grammar." Phonological criteria alone provide a poor guide to the meaningful lexical forms in a language, and theories of acquisition based on such an assumption are not generally viable. Indeed, the ability to segment words as a metalinguistic act comes fairly late in development, usually as part of literacy skills (Bialystok, 1986).

Nor can denotational referential values alone be used to identify the lexical forms in a language. The traditional view is that a word denotes an object (or type of object) in the world. But there is great variation in which objects show up as lexemes in languages. Where one language may have a single lexeme, another will require a construction, and vice versa. For example, Yucatec has a lexeme *chúuh* to designate a type of gourd with a figure-eight shape used to carry liquids. English, by contrast, uses a construction describing the functional shape and material, *bottle gourd*. Spanish more often simply uses the term for gourd, *calabaza*, perhaps joining it if necessary with an indication of the typical function (of carrying wine), *calabaza vinatera*. Conversely, English has a single word *boy* designating a male child. In Yucatec, the equivalent expression would be *xi'pal*, a compound form explicitly indicating male child (*xiib'-paal* 'male-child'). There is an equivalent form in Spanish, *muchacho*, but notice that it is composed of a stem modified with a gender affix, neither of which can stand alone (*muchacho* 'boy, child' vs. *muchacha* 'girl'). So an object designated by a single form in one language may require two or more forms to be joined in another language; these forms in turn may be independent or dependent. The same argument holds when we extend the analysis beyond objects, to semantic features. For example, whereas the feature of 'masculine' in the previous example is designated by a separate morpheme in Yucatec, it appears as a dependent suffix in the Spanish, and is fused into the lexeme in English. And to complicate matters still further, each of these languages is capable, in other contexts, of using each of these three techniques to indicate gender.³ Finally, some lexemes simply do not designate any single object or referential feature. For

example, English lexical forms such as *of*, *if*, and *respectively* do not refer to experience so much as they tell us how to interpret relationships among elements in a construction; likewise, the Yucatec “prepositional” form *ti* ‘to, at, in, on, by, for, from, [etc.]’ covers such a range of meanings that it approaches purely relational status, deriving its specific meaning from context. Or, as Lyons (1968, p. 200) puts it, “We must conclude that semantic considerations [alone] are irrelevant in the definition of the word [unit]. . . .” In sum, denotational reference alone is a poor guide to the meaningful lexical forms in a language, and we should be wary of theories of acquisition that presume some natural one-to-one correspondence across languages.

Even when phonological form and referential meaning combine, there are other ways in which the traditional notion of a word creates difficulties for analysis. Should we regard the nouns *boy* and *boys* as one word or as two? Should we regard the verb forms *stink*, *stinks*, *stank*, *stunk*, *stinking* as one word or five? And should we recognize the relationship among *be*, *is*, and *are*, or among *go*, *went*, and *gone*? To see these as single lexical forms in the language, we have to identify an underlying commonality of meaning across variable sound forms and of sound forms across shifts in referential meaning. Such an analysis requires an appeal to structural patterns at every step. Note, too, that in those languages without neutral, uninflected base forms, one or another form will have to be regarded as the citation form for the lexeme. For example, in Spanish, the infinitive (e.g., *hablar* ‘to speak’) has traditionally been selected as the citation form from an array of some 46 inflected forms for the verb. For the native speaker, most especially new learners such as children, this very structural dependence and absence of an obvious base form may make it difficult to consciously recognize and discuss lexical forms, even though they are used fluently in speech.

In short, the traditional notion of a word, a phonologically freestanding base form with clear reference to objects in the world, even when enriched to include characteristic conjunctions of form and meaning, fails to

recognize the tacit structural analysis that the speakers must conduct in order to recognize and deploy the lexemes in their language. To capture these phenomena, we need to distinguish between phonological words and referential values on the one hand, and *lexemes* as functional units in the language warranted by structural analysis on the other hand. It is true that phonological and referential values are essential to the language learner in inducing the lexemes in a language, but they are not sufficient. Structural analysis and, ultimately, structural meanings must also be invoked at each stage of the induction process.

Lexical Meaning

A lexeme, like any other form in language, conveys a variety of structural meanings each time it is used. If it has denotational referential value, that is, a regular correspondence with some element of experience, then of course it signals that meaning. The focus and scope of such denotational meanings may vary across languages.⁴ But there will always be language internal structural contributions to the meaning as well. Structural meaning of this sort arises both *paradigmatically*, from its selection from an array of available forms with contrasting values, and *syntagmatically*, from its placement with other forms in utterances. This selection-and-placement, this structural aspect, complete and transform the referential meaning of every individual form in an utterance. We can say then that lexical meaning has two faces: one to the outer environment of the experienced world and the other to the inner environment of the code structure itself. We are concerned in what follows with the contribution of the latter to overall meaning.

Each lexeme occupies a place in a *paradigm* of similar and contrasting forms such that part of its meaning comes from its position in the paradigm. For example, English has three lexemes for siblings, a general term *sibling* and two more specific terms contrasting in gender: *brother* ‘male sibling’ and *sister* ‘female sibling’. Yucatec has four lexemes covering the same referential range: *láak* ‘other,

sibling', 'íits'in 'younger sibling', *sukú'un* 'older male sibling', and *kiik* 'older female sibling'. Note that when we refer to someone with the English term *brother*, this conveys that the person is a sibling and, because it was chosen instead of *sister*, it also signals male gender information; but it does not convey information about age. In contrast, when we refer to the same person with the Yucatec term *sukú'un*, this too conveys that it is a sibling and, because it was chosen instead of 'íits'in, it signals age information—that this is an older sibling. Simultaneously, because it was chosen instead of *kiik*, it also signals gender information within the set of older siblings. Figure 13.1 displays the paradigmatic contrasts of age and gender within the set of sibling terms. As should be clear, I cannot directly translate the English term *brother* into Yucatec without first considering the relative age of the sibling, ignoring gender if he or she is younger and obligatorily marking it if he or she is older. But at least in this case, going in either direction, we can clarify the sense with an adjective signifying gender or age.

The situation can quickly become more complicated, however, when there is no easy combinatorial equivalent. For example, the Yucatec word *pàach* can refer to a person's back, the back of a hand, etc. and so is often

glossed as 'back'. But it can also refer to the skin of a fruit, the shell of a nut, the bark of a tree, or the hide of an animal—where there is clearly no contrasting notion of 'front' in play as there is in our English notion of 'back'. Furthermore, *pàach* can even be used to refer to the outside portions of a house (and adjacent portions of the yard) away from the two entrances of the oval structure, as shown in Figure 13.2. From an English vantage, the term *pàach* joins our meaning of 'back' (as opposed to 'front'), with other meanings such as 'outside' (as opposed to 'inside') and 'unimportant part' (as opposed to 'important part'). Although there are clear cases of denotational referential overlap in which *back* and *pàach* can both refer to "the same thing," they are in fact quite different in their overall structural potential and hence not equivalent in meaning. And this then is the more general lesson: Referential overlap does not ensure structural (or semantic) equivalence in meaning if the overlapping forms come from distinct paradigms of forms.

Each lexeme can also enter into an array of *syntagmatic* or morphosyntactic relations with other elements such that part of its meaning comes from this placement. For example, the English lexeme *pig* can be an agent ("The pig bit the dog") or a patient

English		Yucatec	
<i>brother</i>	<i>sister</i>	<i>sukú'un</i>	<i>kiik</i>
		'íits'in	

FIGURE 13.1. Comparison of English and Yucatec Maya kin terms for siblings.

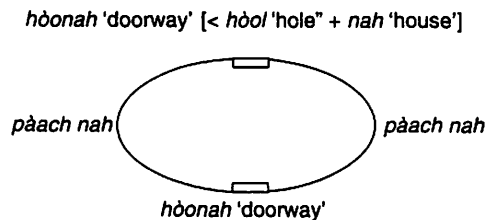


FIGURE 13.2. Range of application of the Yucatec Maya term *pàach* in relation to the regions of the traditional oval Mayan house or *nah*.

("The dog bit the pig") depending on its placement in a sentence. The capacity to enter into both roles is part of the meaning of *pig* (as opposed to *apple* or *stone*) and the placement activates the relevant role—so the meaning lies in a lexical–grammatical interaction within an overall construction (see Goldberg, 2003; Lucy, 1994, 2000). In much the same way, the English lexeme *up* has a variety of spatial meanings ("John went up to his room") and a variety of temporal (aspectual) meanings ("John and Sarah broke up") each evoked by placement with other elements; in some cases, both readings are possible ("When Sarah came in, John stood up"). Sometimes the syntactic possibilities are predictable from referential features (so pigs can bite because they are alive and have mouths with teeth), but this is not always the case. Note that an English speaker has no trouble saying "We had chicken for dinner," but it is odd to say "We had pig for dinner." It is difficult to make sense of this on referential grounds. What matters is that there is another lexeme *pork*, which substitutes, paradigmatically in the latter case. But sometimes, even when there is no lexical competitor, a syntactic possibility can be blocked. For example, within English the terms *red* and *green* both denote colors and we can say that objects can "turn red" or "turn green"; but though we can say those objects *redden* we cannot say that they *greenen*. So the capacity to take the inchoative suffix *-en* is part of the structural potential of *red* but not of *green*, which means we must resort to a phrase such as *turned green* to convey a similar meaning. Furthermore, what is referentially predictable also differs across languages. In Yucatec, the word *k'éek'en* 'pig' can be used equally well as a singular or a plural. In fact, *k'éek'en* can be used equally well to describe a live pig, a dead pig, or a piece of pork, hence the ambiguity in the expression *túnkonik k'éek'en*, which can mean 'he is selling pig/pigs/pork'. So the need to distinguish between 'pig' and 'pigs' or between 'pig' and 'pork' is part of the structural meaning of English *pig* in a way that it is not part of the structural meaning of Yucatec *k'éek'en* (Lucy, 1992a). The structural contrasts among verbal predicates are even more

marked and diverse (see Levin, 1993, for examples). In short, we have to consider the syntactic potential of a lexeme as part of its meaning and to consider its specific meaning in use as a product of that potential interacting with a local syntactic arrangement.⁵

In general then, a lexeme is a functional unit within the overall language structure. A structural analysis is required to demarcate lexical forms, using the available phonological and referential patterns, and each such unit naturally incorporates aspects of meaning based on its place in the overall structure. These structural meanings include not only the conventional referential scope of the item, but also the array of forms with which a lexeme shares and contrasts in meaning, the array of morphosyntactic potentials that it has, and the specific meaning values evoked by specific structural placements. The lexicon is therefore deeply structure dependent. Whether and how these lexemes appear as "words" will vary by language. Traditional efforts to treat "words" as if they were structure-independent forms that correspond in a straightforward way with language-independent "things" in the world simply cannot be sustained in the face of these analyses. We must instead adopt an approach that considers structure central to language form and meaning from the outset and not as something added later. And when we look for possible effects of language on thought, it is to these same structural factors that we should turn our attention. Although each language is structured when the child encounters it, it may take years for that child to become sensitive to the full significance of that structure. And sensitivity to these structural regularities will provide the fulcrum by which language-internal forces can come, ultimately, to (re)shape the child's view of reality.

THE INFLUENCE OF LANGUAGE STRUCTURE ON THOUGHT: THEORETICAL PERSPECTIVES

Despite the important contribution of language structure to meaning, including word meaning, investigations of the influence of

language on thought rarely consider structural factors. Even comparative studies exploring the impact of different languages on thought exhibit the same neglect of structure. To some extent this neglect stems from disciplinary factors—many of the psychologists and anthropologists interested in this area understand little about language structure or understand it in very partial ways, so they are not likely to consider it in their approaches (Lucy, 1992a, 1997a). But the neglect also has roots in general limits to *metalinguistic awareness* that lead people to foreground readily segmentable forms at the expense of broader structural patterns (Silverstein, 1981; Sapir, 1927/1949) and in more language-specific projections (or transfers) of our own structural patterns and understanding onto other languages; this is often called *transfer* (Jarvis & Pavlenko, 2008) and I have elsewhere called it *semantic accent* (Lucy, 2004, 2006). Because structural factors rarely enter into the linguistic analysis, they also rarely form the target of the language and thought interface in research.

Instead, current research on language and thought manages to circumvent or minimize attention to structure in several ways. The first and most basic approach of course is to focus on words in isolation, that is, without any reference to their grammatical or other systematic properties. This is especially common in studies of key words referring to culturally salient mental states, emotional complexes, or social values. The researchers act as if such terms can be described and understood without any reference to their grammatical status. A second approach involves isolating a small set of words on some notional or domain-based criterion without any effort to articulate their grammatical unity or heterogeneity. So there are studies of body parts that do not report whether all the terms are obligatorily possessed, or studies of motion verbs that fail to tell us whether they all denote activities or state changes or are divided in this respect, or studies of color terms that fail to take account of the reality that the terms in some languages fall into diverse parts of speech, some nouns, some verbs, and some adjectives, and have varying syntactic options within each of

these. Other approaches do not neglect structure completely, but subordinate it to other factors and draw on it only insofar as it is convenient. So a third pattern is to attend to grammatical structure, but highly selectively. Here we see studies that extract a formal class such as “spatial” prepositions, but then ignore all the nonspatial uses of the forms as, for example, when the same prepositions also mark temporal aspect. A fourth pattern works to compare functionally similar morphological categories across languages, but fails to take account of the differing formal structural properties characterizing these categories in different languages. Here we see studies of spatial frames of reference that lump together obligatory verb inflections in one language with optional lexical modifiers in another as comparable. (In a sense this approach merges the domain centrism of the second approach with the structural selectivity of the third.) And a fifth pattern effectively ignores structure by being methodologically blind to it, that is, by tacitly importing it into the analysis. Here are the various elaborate efforts to define the lexemes of a language with sentences composed of other, purportedly more basic lexemes, but without specifying the syntax being used to construct those definitional sentences. And here too are all the efforts to interpret the forms of other languages in terms of our own, as, for example, when we project the individuating properties of our “count nouns” onto lexemes in a language in which there is no warrant for doing so (Lucy, 2000).⁶ The pattern should be clear: Contemporary approaches offer manifold ways to avoid attending to the impact of structural meanings on the relation of language and thought.

Yet there are many reasons to believe that structural meanings might offer the greatest impact on thought. Structural patterns are ubiquitous, leading speakers to monitor constantly (or habitually) certain relevant features of meaning across a wide array of forms. They are often obligatory, in which case speakers are actually compelled to attend to and signal them. And they are typically systematic, such that the various components of structural

meaning are interrelated, leading to cross-cutting entailments among semantic categories that reinforce and interact with one another. Their ubiquity, obligatoriness, and systematicity thus make them good candidates to provide direction to interpretations of the world beyond language, especially under conditions of uncertainty.

In exploring the potential impact of structural meaning on thought, at least two distinct levels of the problem emerge (Lucy, 1996).⁷ The first, more general level concerns the significance for human thought having any language. Here we ask when in development, in what contexts, and in what ways does thought become sensitive to or dependent on language? The second, more specific level concerns the significance for speakers having a particular language. Here we ask whether the language and the specific lexicogrammatical structures a person uses matter. Of course these two levels are intertwined: General mechanisms always operate through specific structures, and those specific structures in turn realize their effects through general mechanisms. Hence an adequate approach must address both levels in a unified way. Often research does not link these two levels, and even when it does the linkage is through “words” conceived of as culturally supplied cognitive tools without any relation to the rest of the language (e.g., Brown & Lenneberg, 1954). In light of the discussion here, we need a robust approach that takes account of structural meaning at *both* levels of analysis.

The contrast between these two levels can be seen clearly in the work of Whorf (1941/1956) and Vygotsky (1934/1987), two of the most influential theorists studying the relation between language and thought. Whorf argued that diverse languages can provide very different analogical guides to habitual thinking, but he said very little about how or why such analogical effects develop psychologically, that is, how or why cognition comes to draw on language categories at all. Vygotsky argued that language was essential to the psychological development of conceptual thought and higher levels of intellectual development, but he had little to say about the impact of cross-linguistic variation, that is, how different

language categories might affect thought dependent on them.⁸ A more or less similar division of labor characterizes most contemporary approaches to the relation between language and thought. Yet the two approaches complement each other in important ways and each would gain power if joined to the other. But how can this be done? The same two theorists provide an important clue in *their shared appeal to language structure as the key element of the language and thought relationship*. The effort here to join their two approaches in a unified account aims to initiate a much broader engagement between these two levels of the language and thought problem precisely by emphasizing the pivotal role of language structure.

Whorf’s (1941/1956) views on the importance of structural patterns for thought are well known. He repeatedly emphasized that the overall patterns of relations were more powerful factors determining meaning and influencing thought than were individual forms. He makes this clear in his seminal “Habitual Thought” paper when, after some preliminary examples, he introduces the main argument by focusing on patterns across grammatical categories, parts of speech, and “surface” formal status:

The linguistic material in the above examples is limited to single words, phrases, and patterns of limited range. One cannot study the behavioral compulsiveness of such material without suspecting a much more far-reaching compulsion from large-scale patterning of grammatical categories, such as plurality, gender, and similar classifications (animate, inanimate, etc.), tenses, voices, and other verb forms, classifications of the type “parts of speech,” and the matter of whether a given experience is denoted by a unit morpheme, an inflected word, or a syntactical combination.⁹ (1941/1956, p. 137)

In the body of the paper, he shows in detail how complex meanings emerge out of structural relations (or categories) in the grammar and how by a system of *analogical projections* and secondary reanalyses based on such relations, speakers are led to quite different

habitual understandings of experience (for a full discussion, see Lucy, 1985, 1992b). In this way, human languages as particular systems of meaning can guide speakers into one direction of thought rather than another. And finally, in his concluding remarks he invokes an even more expansive notion of structure, arguing that our concepts are shaped by very large-scale structures of meaning that draw on and cross-cut multiple systems in the language:

Concepts . . . depend upon the nature of the language or languages through the use of which they have been developed. They do not depend so much upon ANY ONE SYSTEM (e.g., tense, or nouns) within the grammar as upon the ways of analyzing and reporting experience which have become fixed in the language as an integrated "fashion of speaking" and which cut across the typical grammatical classifications, so that such a "fashion" may include lexical, morphological, syntactic, and otherwise systemically diverse means coordinated in a certain frame of consistency. (Whorf, 1941/1956, p. 158; emphasis in the original)

As should be clear, subsequent work seeking to evaluate Whorf's ideas empirically by research on individual words or small sets of words, without reference to their place in the language as a whole, simply miss the central insight of his work. In the present context, by contrast, his insight about the importance of language structure becomes our focus.

Vygotsky's (1934/1987) views on the importance of language structure in intellectual development are perhaps less widely recognized. This may be because his key unit of analysis has been translated into English as *word meaning*—which is then interpreted to have to do with free-standing "words" as discussed earlier. But word meaning for Vygotsky has an important structural element.¹⁰ According to Vygotsky's theory, in the second year of life human intellect (as the capacity to generalize) joins with human sociality (as the capacity to communicate) in the form of word meaning conceived of as "*a unity of thinking and speech*" or, more broadly, "*a unity of generalization and social interaction*" (1934/1987, p. 49; italics in original). Crucially, in the course of subsequent

development, word meaning develops, and what develops are the structural or systematic relations to other word meanings, which in turn enable true concepts and mature language.

His argument takes the following form. He begins by emphasizing that the key problem in conceptual development is the formation of a system of relations among concepts:

We turn now to the central problem of our research, the problem of the system.

There is no question that any concept is a generalization. Up to this point, however, we have been dealing with separate, isolated concepts. We must now ask *what kinds of relations there are between concepts*. How is the individual concept—this stitch that we tear away from a living integral fabric—intertwined and interwoven with the system of concepts present in the child? Only within such a system can the concept arise, live, and develop. . . . Moreover, without well-defined relationships to other concepts, the concept's existence would be impossible. In contrast to what is taught by formal logic, the essence of the concept or generalization lies not in the impoverishment but in the enrichment of the reality that it represents,¹¹ in the enrichment of what is given in immediate sensual perception and contemplation. However, this enrichment of the immediate perception of reality by generalization can only occur if complex connections, dependencies, and relationships are established between the objects that are represented in concepts and the rest of reality. By its very nature, each concept presupposes the presence of a certain system of concepts. Outside such a system, it cannot exist. (Vygotsky, 1934/1987, p. 224; italics in original)

He then clarifies that these systematic relationships among concepts mediate our view of the empirical world:

Outside a system, the only possible connections between concepts are those that exist between the objects themselves, that is, empirical connections. This is the source of the dominance of the logic of action and of syncretic connections of impressions in early childhood. Within a system, relationships between concepts begin to emerge. These relationships mediate the concept's relationship to

the object through its relationship to other concepts. A different relationship between the concept and the object develops. *Supra-empirical connections between concepts become possible.* (Vygotsky, 1934/1987, p. 234; italics in original)

And finally, he concludes the discussion by linking the emergence of concepts, and the structures within which they exist, to the maturation of word meaning:

the central point—the main thought—of our entire work...[is] the notion that the development of the corresponding concept is not completed but only beginning at the moment a new word [form] is learned. The new word is not the culmination but the beginning of the development of a concept. The gradual, internal development of the word's meaning leads to the maturation of the word itself. Here, as everywhere, the development of the meaningful aspect of speech turns out to be the basic and decisive process in the development of the child's thinking and speech.¹² (Vygotsky, 1934/1987, p. 241)

In short, for Vygotsky the development of the structural aspect of the word (i.e., its full lexical meaning in the sense explained earlier) represents the central driving force in the relationship between language and thought. This general developmental process may, in turn, be supplemented (or pushed) by explicit training to exploit such structural relationships via institutional practices such as formal schooling. Despite his emphasis on the importance of the development of word meaning, that is, on the development of the structural aspect of meaning, most research inspired by Vygotsky continues to neglect it. In the present context, his emphasis on structure provides a crucial point of connection to more comparatively oriented theories such as Whorf's.

The two theories connect through their appeals to the role of language structure in influencing thought, thereby providing one way to synthesize research on the different levels of the language and thought problem. Together the theories suggest that language use in thought makes possible the development of higher order thinking, that is, thinking

in (true) concepts; but this can happen only if the speaker commits to the specific categories of a given language, that is, to the structural relations instantiated in its morphosyntactic categories. More specifically, as children develop, they can achieve power and generality in their thought only by exploiting the structural properties of language, as described by Vygotsky, but this necessarily entails commitment to the locally available structural properties, that is, to the language-specific structural means available, with all that that entails in terms of the sorts of limits described by Whorf (Lucy, 1985, 1996; Lucy & Wertsch, 1987).

This synthesis opens up a new approach to empirical research. The approach breaks with the traditional focus on "words" in favor of a focus on lexical meaning and grammatical categories. It effectively joins the cognitive-developmental and language-comparative aspects of the problem, recognizing their mutual interdependence. And the integration of the two levels creates new methodological opportunities as well. Developmental sequences can be used to clarify causal relations that might be unclear in the correlational studies characteristic of comparative work; the existence of different developmental endpoints across languages allows new precision in the diagnosis of ongoing language and thought interactions in development (Lucy & Gaskins, 2001). The case study that follows serves to exemplify the features of this approach.

THE INFLUENCE OF LANGUAGE STRUCTURE ON THOUGHT: A CASE STUDY

The following study illustrates a structure-centered approach to the relation of language and thought by examining whether the structural differences between American English and Yucatec Maya, a language indigenous to southeastern Mexico, lead to distinctive effects on habitual cognition. The discussion first describes some salient contrasts between the two languages, then proposes possible cognitive effects, and finally assesses whether speakers exhibit the expected effects and when such effects arise in development. The

study thus integrates Whorf's concerns about the effects of language differences on thought with Vygotsky's concerns about the effects of language development on thought. The focus in this article will be less on the substantive details, which have been reported elsewhere (Lucy, 1992a; Lucy & Gaskins, 2001, 2003a), and more on the intimate relation between lexical meaning and grammatical structure and on the fruitfulness of synthesizing Whorf's and Vygotsky's approaches.

Language Contrast: Number Marking Semantics

American English and Yucatec Maya differ in their number-marking patterns for nouns (Lucy, 1992b, pp. 56–83). First, the two languages differ in the way they signal plural for nouns. English speakers obligatorily signal plural for nouns semantically marked as referring to discrete objects (e.g., *car*, *chair*) but not for those marked as referring to amorphous materials (e.g., *sugar*, *dirt*). Yucatec speakers are never obliged to signal plural for any referent, although they often do mark plural for animate referents. Second, the two languages differ in the way they enumerate nouns. For English nouns marked as having semantically discrete reference, numerals directly modify their associated nouns (e.g., *one candle*, *two candles*); for nouns not so marked, an appropriate unit, or unitizer, must be specified by a form that then takes the number marking (e.g., *one clump of dirt*, *two cubes of sugar*). Yucatec requires that constructions with numerals be supplemented by a special form, also a unitizer but usually referred to in the literature as a numeral classifier, which typically provides crucial information about the shape or material properties of the referent of the noun (e.g., '*un ts'iit kib*' 'one long-thin candle', *ka'a ts'iit kib*' 'two long-thin candle').

These grammatical differences correspond to a difference in lexical semantics having to do with quantification. In essence, all nouns in Yucatec are semantically unspecified as to quantificational unit, almost as if they referred to unformed substances. So, for example, the

semantic sense of the Yucatec word *kib*, which is typically translated as 'candle' (as in the previous example), is better translated into English as 'wax' (i.e., 'one long-thin wax')—even though, when occurring alone without a numeral modifier, the word *kib* can routinely refer to objects with the form and function that we would call candles (as well as to other wax things). Again, this pattern is general and is not confined to this specific lexeme. So, for example, as discussed, *k'ëek'ën* can refer equally well to 'pig', 'pigs', or 'pork' and *há'as* indifferently to 'banana plant, banana leaf, banana fruit, etc.' in both singular and plural. If the context does not make the intended reference clear, it can be specified further with the optional plural marker or by using contrasting unitizers.¹³ Because *all* Yucatec lexical nouns are neutral in regard to quantification, *all* of its nouns require such obligatorily marking, in contrast to English, which requires such marking only for some of its nouns (e.g., *dirt*, *sugar*).¹⁴ Given the quantificational neutrality of the Yucatec noun it becomes clear why it is important to specify a unit when counting: Expressions such as 'one wax' or 'one beef' do not make quantificational sense without some unitizer (e.g., 'one stick [of] wax' or 'one head [of] beef'). In contrast, those nouns in English that do include the notion of quantificational 'unit' (or 'form') as part of their basic lexical meaning can simply take the numeral directly without any unitizer (e.g., *one candle*, *one pig*, *one banana*). Furthermore, even outside of such numeral constructions, those same English nouns including quantificational unit in their basic lexical meaning typically require obligatorily plural marking for reference to multiple tokens, whereas in Yucatec such marking is always optional. These complementary patterns of plural marking and numeral modification form part of a unified number-marking pattern that is evidenced typologically across many languages (Lucy, 1992b, pp. 61–71).

The crucial point in the present context is that apparently similar forms in the two languages can have very different underlying lexical meanings. More specifically, denotational

overlap, that is, having two forms that select the same object in the world in a given context, does not amount to semantic equivalence, that is, having the same lexical meaning. In context, both *kib'* and *candle* can refer to candles, but *kib'* accomplishes this by reference to the material and *candle* by reference to other characteristics such as shape, composition, and use.¹⁵ Crucially, this meaning difference is not an isolated, idiosyncratic one, characteristic only of this translation pair, but rather forms part of a systematic pattern of lexical meaning for all nouns, which in turn forms part of an overall number-marking schema of plural and enumeration in the language.¹⁶ The meaning of lexical nouns in Yucatec depends on their participation in the broader system of quantification and item-by-item translation in terms of referential overlap with English will likely miss it completely. Not only will the individual forms be mistranslated, but the language itself may seem unduly arbitrary and haphazard from an English point of view, lacking vital distinctions and insisting on dispensable ones.

Cognitive Hypotheses and Predictions

To assess whether traces of these contrasting verbal patterns influence speakers' cognitive activities more generally, we need first to elucidate the potential implications of these grammatical patterns for the general interpretation of experience. If we consider the denotational meaning of nouns referring to discrete concrete referents, that is, *stable objects* that maintain their physical appearance over time, then certain regularities appear from which cognitive implications can be drawn. The quantificational unit presupposed by English nouns referring to objects of this type is frequently the shape of the object, where shape here refers to a set of dimensional, boundary, integrity, and arrangement properties. Hence use of these English lexemes routinely draws attention to the shape of a referent as the basis for incorporating it under some lexical label and assigning it a number value. Yucatec nouns referring to objects of this type, lacking such a specification of quantificational unit, do not

draw attention to these aspects of shape and, in fact, fairly routinely draw attention to the material composition of the referent as the basis for incorporating it under some lexical label. If these linguistic patterns translate into a general cognitive sensitivity to these properties of referents of the discrete type, then we can draw the following prediction: Yucatec speakers will attend relatively more to the material composition of stable objects (and less to their shape) than will English speakers, whereas English speakers will attend relatively less to the material composition of stable objects (and more to their shape) than will Yucatec speakers.

We can develop a second prediction about material referents. Any concrete material referent must appear at any given moment in time with some spatial configuration, that is, in some shape or arrangement. We will confine our attention here to those materials that retain their contiguity without the assistance of a container (e.g., a squeeze of toothpaste), what we can term *malleable objects*. For these referents, a temporary (or accidental) shape is available at the moment of reference, but it could be otherwise for it is highly contingent on the current state of affairs. Because both Yucatec and English nouns referring to such material referents lack a presupposed quantificational unit, their lexical semantics should ignore the temporary shape and, in fact, should routinely draw attention to the material composition of a referent as the basis for incorporating it under a lexical label. If the linguistic patterns translate into a general cognitive sensitivity to these properties of referents of the material type, then Yucatec and English speakers should not differ from each other in their cognitive responses to malleable objects.

The two sets of predictions can be brought together into a unified prediction for these two types of objects. English and Yucatec speakers should differ in their cognitive response to stable objects in line with the differences in their grammatical treatment of them, but they should agree in their response to malleable objects in line with the similarity in their grammatical treatment of them. Alternatively,

looking within each language, we can predict that English will show a cognitive split vis-à-vis the two types of objects, whereas Yucatec will show cognitive continuity across them. Note that these predictions are relative rather than absolute, that is, they contrast two patterns, not absolute values. Note also that neither pattern of classification can be described as inherently superior to the other. And note finally that these predictions are based on general structural patterns in the language, not on the analysis or selection of particular individual lexemes.

Cognitive Contrast with Adults: Shape versus Material Preference

The cognitive predictions were tested with adult speakers from both languages (Lucy, 1992a, 2004; Lucy & Gaskins, 2001, 2003a). Twelve speakers in each group were shown various triads of objects. Each triad consisted of an original *pivot* object and two *alternate* objects, one of the same shape as the pivot and one of the same material as the pivot. So, for example, speakers were shown a plastic comb with a handle as a pivot and were asked whether it was more like a wooden comb with a handle or more like a plastic comb without a handle. The expectation was that English speakers would match the pivot to the other comb with a handle whereas the Yucatec speakers would match it with the other comb made of plastic.

Informants were shown one group of such triads involving stable objects that, across the stimulus set, controlled for size, color, function, wholeness, and familiarity (see Lucy & Gaskins, 2001, for examples). The predicted classification preference was strongly confirmed, with adult English speakers choosing the material alternate only 23% of the time and adult Yucatec speakers favoring it 61% of the time. That is, Yucatec speakers were over two-and-a-half times more likely to choose the materially similar alternative.

A second set of informants was shown a different group of such triads involving malleable objects, that is, foams, creams, gels, pastes, powders, particles, or granules, each formed

temporarily into distinctive shapes (see Lucy & Gaskins, 2003a, for examples). In this case, as expected, both groups made a substantial number of material choices, with adult Yucatec speakers favoring material choices 53% of the time and adult English speakers favoring them 34% of the time. Although the direction of contrast is similar to that found for stable objects, the group difference narrows considerably such that the Yucatec speakers are making only about 50% more material choices than are the English speakers. The difference is no longer statistically reliable, exactly in line with the language-based prediction.

Clearly the two adult groups in this comparison do construe and classify these objects differently and in line with the expectations based on the underlying lexicogrammatical structures of the two languages. Even when English and Yucatec speakers both have a lexeme capable of designating an object in the world, the cognitive construal of that object differs as a function of the underlying structure-based meaning value of the lexemes. Furthermore, the difference in orientation does not only reside locally as a fact about each individual lexeme, but also forms part of a global structural pattern in the language, part of a coherent "fashion of speaking" that splits the lexicon in one case and does not in the other.

Cognitive Contrast with Children: Shape versus Material Preference

A second line of research explored the development of these cognitive differences in childhood (Lucy & Gaskins, 2001, 2003a). This effectively joins the Whorfian question about the impact of language differences of the sort just described with a Vygotskian one about the impact of language on the development of thought. And it provides the synergistic methodological benefits outlined earlier. On the one hand, developmental research allows us to address the question of which comes first, the language pattern or the cognitive pattern. Although many factors suggest that the language categories must be the leading force here

(see Lucy, 1992a), direct developmental evidence can provide an important confirmation. On the other hand, once we have an adult contrast, we can use it to help us diagnose when and how language and thought interact in development. One of the perennial problems in studies of the development of language and thought is that the two are so entangled that it can be difficult to determine which is influencing which. But when there are distinct developmental endpoints, we can use the sequential appearance of these differences as a diagnostic tool to determine the order and nature of the developmental process. Thus, in terms of the different types of language and thought effects we described earlier, this second line of research links the structural and semiotic levels of the language and thought problem. That is, the research uses the effects of diverse languages to explore the general processes by which language and thought interact and uses the properties of the general process to help clarify the effects of language diversity.

Pilot work indicated that the distinctive cognitive patterns were appearing at around age 8 years. By age 7 years children in both groups have mastered the language patterns at issue in speech. English-speaking children have substantial command of plurals and Yucatec-speaking children have substantial command of numeral classifiers. Accordingly, we then administered the full set of triads described earlier to samples of American English and Yucatec Maya children at ages 7 and 9 years. Looking first at stable objects, we obtained the results shown in Figure 13.3. As can be seen, English-speaking and Yucatec-speaking 7-year-old children showed an identical early bias toward shape—choosing material alternates only 12% of the time. But by age 9 years the adult pattern was visible: English-speaking children continued to favor shape, choosing material alternates only 18% of the time, whereas Yucatec-speaking children were now choosing material alternates 42% of the time. Finally, on the far right, for comparative purposes, are the adult results reported earlier. Thus, the same kind of language-group difference found among adult speakers is also found

in children by age 9 years—and this result is statistically reliable.

Turning next to the results for malleable objects, where we expect the two groups to look alike, we find that English-speaking and Yucatec-speaking 7-year-old children both showed a substantial number of material choices as shown in Figure 13.4. English-speaking children choose the material alternate 42% of the time and Yucatec-speaking children choose the material alternate 46% of the time. At age nine there is essentially no change: English children choose material alternates 43% of the time and Yucatec children choose them 50% of the time. And again, the adult responses are given to the right of the chart. Overall, the similarity of response found among adult speakers for referents of this type also appears in children. However, now viewed in contrast to the developmental data, we can see that the adult results appear more strongly differentiated in a manner reminiscent of the stable-object results—which perhaps suggests some general transfer of effect from the stable object category to these malleable object stimuli.

We can bring both of these results together to display the interaction of referent type and language type across age, as shown in Figure 13.5. These composite findings show that language and thought engage in new ways in middle childhood and subsequently give both specific and global shape to adult

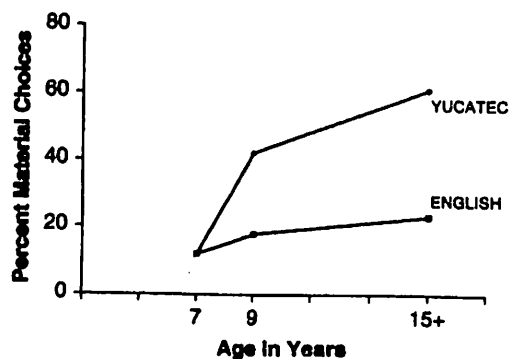


FIGURE 13.3. Developmental pattern for English and Yucatec classification preferences with stable objects: material versus shape.

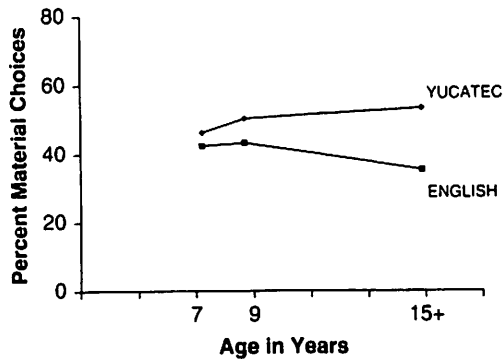


FIGURE 13.4. Developmental pattern for English and Yucatec classification preferences with malleable objects: material versus shape.

thought. Seven-year-old children show clear sensitivity to referent type independently of language group membership. They show a relative preference for material as a basis of classification with malleable objects and a relative preference for shape as a basis of classification with stable objects. Both bases of classification respond to stimulus properties and are fully available to and used by both groups. Apparently, referent type but not language type is the dominant factor in these nonverbal cognitive tasks at this age. Simply having a linguistic form in the language is not enough in itself to shape cognition. In contrast, 9-year-old children show differential sensitivity to referent type along adult lines: Their classification preferences differ where the languages differ and correspond where the languages correspond. This suggests that language categories increase in their importance for cognition between ages 7 and 9 years, and that category patterns in the linguistic structure become important in a new way. Adult responses continue to show these language-specific patterns but also trend toward consolidation into a dominant pattern for each group. The Yucatec responses converge toward material choices and the English responses toward shape choices. The split-marking pattern in English obviously militates against the complete erasure of the distinctions among referent types in that language, hence the overall trend necessarily remains

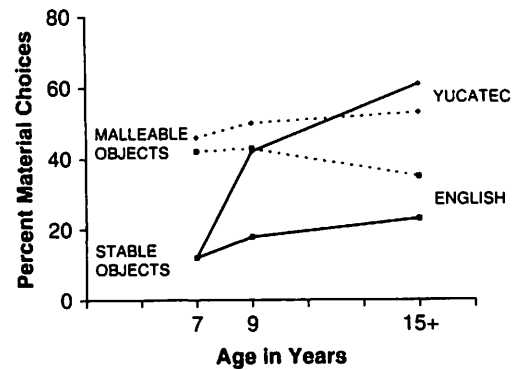


FIGURE 13.5. Developmental pattern for English and Yucatec classification preferences with both stable and malleable objects: material versus shape.

subordinate to the main effect of cognition aligning with the specific linguistic treatment of a referent type. We can summarize the overall pattern of these results by saying that *young children begin by grouping different referent types in the same way and shift during middle childhood to grouping the same referent types in quite different ways as a function of the structure of their language.*¹⁷

Finally, the late emergence of these language effects confirms that the acquisition of individual "words" referring to the various "things" is not sufficient to create these particular cognitive effects. Children in both groups have had the vocabulary necessary to refer to these stimuli for many years, and yet at age 7 years there are no cognitive differences. But these results also make clear that simple command of the grammar in the usual sense is also not sufficient. Most of the central elements of the grammar, including number marking, have been in place for many years. Just as English-speaking children have substantial command of plurals by age 7 years, so too do Yucatec-speaking children have substantial command of numeral classifiers by this age. Seven-year-old Yucatec-speaking children reliably use classifiers when counting, draw appropriate semantic distinctions among them in comprehension tasks, and will judge a number construction lacking them as faulty. However, they do still fall short of having the full adult range of classifiers in comprehension and

production. Insofar as the cognitive results derive from basic structural characteristics of the language rather than mastery of the full range of lexemes, there is no reason the effects should not appear at age 7 years rather than several years later. Something new must be happening during this middle childhood period.

THE DEVELOPMENTAL ASCENDANCE OF STRUCTURE

We have seen that the widespread tendency to think of the relation of language and thought in terms of “words” and “things” cannot be sustained. Instead, we must understand lexemes and their meaning values in terms of their place in the overall system in a language. In this sense, lexemes form an integral part of the overall meaning system of the grammar. And it is this systemic meaning that both Whorf and Vygotsky identified as the crucial aspect of language in terms of its importance for thought. The empirical case study of number marking in English and Yucatec supports their views. The contrasting systems of number marking are associated with contrasting performance on cognitive measures, in accordance with Whorf’s views. These effects of language on thought are mediated not only through lexical categories: The associated inflectional pattern of plural marking has other direct effects on cognition (see Lucy 1992b, Ch. 3). Likewise, effects are not limited to simple classification tasks: Similar patterns appear in complex classification tasks (Lucy & Gaskins, 2001), in memory tasks (Lucy & Gaskins, 2003b), and in everyday behavior (Lucy 2004). And these structural effects emerge during middle childhood, in accordance with Vygotsky’s views. Together, these findings suggest that the specific structure of the language that is spoken takes on new significance for cognition during this age period.

Understanding how language and thought come to relate in this new way will require taking a closer look at language development during this period. This is not a period of child language that has been heavily studied, but the available research shows that children develop

many new verbal skills during this period, and most of these changes suggest that the structural element of language attains new significance as the child engages in more demanding discursive tasks. In terms of language structure, children continue their lexical development, adding new forms and reorganizing old ones so as to converge on the meanings held by adults (Ameel, Malt, & Stroms, 2008). In terms of grammatical structure, they master constructions such as passives (Chomsky, 1969) and the anaphoric use of demonstratives (Karmiloff-Smith, 1979) that enhance discourse cohesion. They also rework existing structural resources to create more coherent narratives through the sophisticated handling of temporal ordering and reported speech (Berman & Slobin, 1994; Hickmann, 1993, 2003). All of these structural developments involve taking existing structural alignments of form and meaning and either overriding or manipulating them in the service of various discursive ends. In terms of language function, children during this period also begin to use language for new forms of verbal humor and insult, as well as specialized stances such as sarcasm and flirting (e.g., Hoyle & Adger, 1998; Romaine, 1984). These skills all involve deploying one line of referential meaning while a second, sometimes diametrically opposed meaning, is also evoked in order to express a stance the speaker is taking toward the material. In formal terms, the child has learned to exploit the reflexive poetic potential of language such that one level of the message effectively “comments” on another and a new message emerges from the conjuncture. At the same time, new metalinguistic skills emerge as children become able to explain the meanings of words more effectively, setting one construction into equation with another, and as their self-corrections grow beyond a concern with referential accuracy to a concern with communicative appropriateness and rhetorical effect. In particular, the ability to recognize and appeal to a listener’s presuppositions and then to manipulate their expectations and reactions suggests a growing enmeshment of language with the surrounding socially shared reality.

Collectively, these new skills reflect a growing sensitivity to and mastery of the full structural implications of language forms. Part of this mastery involves the realization that these implications are both recognized and used by others, and therefore that they can be deployed as strategic resources for achieving a variety of effects in communicative interaction. Eventually the child learns to draw on the full latent power of the shared structural means at his or her disposal. Crucially, the "problem-space" of language structure must itself be thoroughly mastered before these new functions can be erected on it (Karmiloff-Smith, 1979). The child's new capabilities are of three abstract types. First, there is deeper, more flexible mastery of the fundamentals of the meaning structure, mastery sufficient to permit the use of a single form for multiple meanings and to signal a given meaning through multiple forms. This flexibility permits greater referential precision and allows users to coordinate several messages in a single utterance, whether as speakers or hearers. Second, there is a deeper, subtler mastery of the fundamentals of the discursive space. These new discursive capacities necessarily involve shaping a message for the participants in a particular speech event. This implies an ability to understand the likely response a given utterance will elicit from a listener in a given situation and what, in turn, their interlocutors own response entails for them. In formal terms, what is emerging is the ability to coconstruct and sustain a shared reality, a common ground for the purposes of conversation. Third, both of these shifts depend on reanalyzing the deictic forms that anchor linguistic structures in on-going discourse (person, tense, modality, and evidentials). Hereafter, such deictic forms not only have reference to the default, taken-for-granted, immediate speech situation that dominates young children's speech, they also have reference to the broader shared social and interactive context, including language structures themselves, that adult speech both presupposes and helps create.

Interestingly, precisely during this period of enhanced structural mastery and associated

verbal competence, children also begin to lose some of their former flexibility in language learning. Children learning language later in life will typically exhibit this loss of flexibility in the form of an *accent*, that is, a structurally driven interference with the new language. And this accent will not just be phonological but also semantic and pragmatic, as the child systematically seeks to apply the structural concepts of one or another prior language to the new language (Lucy, 2006). It is as if the child, in order to implement more sophisticated forms of discourse, is forced in some way to rigidify the existing language system in a way that interferes with learning. In other words, new verbal powers seem to be purchased at the expense of structural openness. And henceforth, each new language is "heard" through the structural paradigms of the first-learned languages.

The results of the case study reported here indicate that something similar happens with cognition during this period. For it is precisely during this period of emerging verbal skill, resting on virtuoso structural mastery and commitment to local discursive realities, that linguistic relativity effects appear. We not only see other languages through the lens of our own language in the form of a semantic accent, it seems we also come to see and think about reality itself through categories shaped by that same semantic accent. Even as the use of language structures helps liberate us from living and thinking only in the immediate reality, "enriching" our vision (per Vygotsky), its structures and their shared entailments are also becoming "habitual" constraints on our vision of reality (per Whorf).

This suggests that engagement with the inner structural logic of a language and the particular discursive world it enables provides the leverage needed to transcend the immediate moment so as to reenvision reality, to rethink it, and ultimately to remake it, precisely the practices that distinguish humans from other species. From this vantage point, linguistic relativity effects are not some unfortunate side effect of language development, but are rather its intended achievement as we recruit the inner face of our particular language structure to

the shared task of reimagining the reality around us. It is crucial to see that the structural patterns in language that support this development are the telos of language development, the end toward which it develops. And this telos is latently there from the beginning both as a presupposition of the developmental process and as its central achievement. It is not “words” but the pattern among “words”—their structural aspect—that allows us to reach beyond the immediate speaking moment to construe an historically specific, yet enduring reality, a reality that represents the stable and enduring legacy of each language to its speakers.

Or say that the end precedes the beginning,
And the end and the beginning were always
there

Before the beginning and after the end.

—T. S. Eliot

ACKNOWLEDGMENTS

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Notes

1. *Four Quartets* (1943, “Burnt Norton,” §V:137–143).
2. In the literature, lexemes are often designated by small caps (e.g., STINK) to differentiate them from the phonological forms in which they can appear and which are italicized (e.g., *stink*, *stank*, etc.) or from the specific referential

meanings these forms take, which appear in single quotations marks (e.g., ‘present tense of STINK,’ ‘past tense of STINK,’ etc.). In this informal discussion, since it creates no confusion, the italicized form will serve to designate the lexeme. Furthermore, it is worth noting that in cases in which a morphological rather than a lexical analysis is preferred, a similar distinction needs to be drawn between morphemes, as functional units warranted by structural considerations, and morphs as their substantive local manifestations. See Lyons (1968, Ch. 5) for a discussion. Finally, it is worth emphasizing that the appearance of a lexical meaning in phonological word form, especially if recognized by native speakers as such, may become psychologically or socially significant, but it is not an essential condition.

3. So, to pursue the gender example, English also contains compound forms marking gender (e.g., *man-child*, *male child*) and suffixes marking gender on a base (e.g., *lioness*, *priestess*). Likewise, Spanish has some alternates (e.g., *actor* ‘actor,’ *actriz* ‘actress’) that fall outside of the *-o/-a* alternation and, for that matter, the same alternation can signal values other than simple gender (e.g., *manzana* ‘apple,’ *manzano* ‘apple tree’). And Yucatec does distinguish the gender of some animals with minimal forms (e.g., *tso* ‘turkey cock,’ *xtúux* ‘turkey hen’) and with gender markers *nohochmáak* ‘old man’ *xnohochmáak* ‘old woman.’
4. The systematic cross-linguistic assessment of differences in the outer face, that is, denotational referential meaning, remains in its infancy. For an exemplary sustained effort at such “referential typology,” see Levinson (2003) and for insight into the scope of the problem for supposedly simple concepts, see Wilkins and Hill (1995) and Lucy (1997b).
5. Although most linguists recognize that lexemes have a structural aspect, the current discussion differs from some recent accounts in two ways. First, the range of structures considered relevant to lexical meaning in this chapter is broader. Included are both the external structures of referential practice such as typical focus and range of denotation and the internal structures of semantic value such as paradigmatic alternatives and morphosyntactic potential. In contrast, some linguists restrict the use of the term *structure* or *semantic structure* to a lexeme’s internal morphosyntactic potential and exclude the rest of lexical meaning as *semantic*

- content. Second, these various levels of meaning are seen as routinely and necessarily in dialogue, constantly influencing each other. In contrast, it is common to assert that only the morphosyntactic potential (its semantic structure) of a lexeme interacts with or is "visible to" the rest of grammar and that the rest of lexical meaning (its semantic content) is linguistically "inert." But if the various elements of lexical meaning interact, then this separation cannot be sustained. Typological, developmental, and historical data all suggest such interactions: Changes in referential use can alter semantic value and vice versa, and within the semantic domain changes in paradigmatic alternatives can affect syntagmatic selection and vice versa. For a discussion of the narrower view of semantic structure, see Grimshaw (2005, Ch. 2); for its use in characterizing language acquisition, see Pinker (1989, especially Ch. 3).
6. The five approaches described here form an orderly set in terms of their point of departure in articulating the "metalanguage" used: (1) units in the analyst's language used without recognition of their structural properties, (2) units in the analyst's reality (domain) used without structural analysis, (3) structural analysis used, but subordinated to domain constraints (within one language), (4) structural analyses used, but subordinated to domain constraints (across languages), and (5) structures of the analyst's language used without recognition of their structural origins or implications. See Lucy (1997a) for more on the contrasting logic of structure-based and domain-based approaches.
 7. Lucy (1996) articulates three levels of language and thought interaction, but the third, which has to do with institutionalized patterns of usage, will not be developed here.
 8. Vygotsky did write about variation in patterns of use in his discussions of schooling. See Lucy (1996).
 9. Note here that Whorf does recognize that the form-of-appearance of a meaning as a morpheme, word, or construction may also differ across languages and influence thought by virtue of its particular status. But it is just one aspect of patterning among many others.
 10. For discussions of Vygotsky's use of the term *word meaning* see Wertsch (1985, Ch. 4, especially pp. 99–108) and Van der Veer and Valsiner (1991, Ch. 11). The latter clarifies that the Russian term *znachenie* would be equivalent to our notion of intensional rather than extensional meaning (1991, p. 265, n. 2).
 11. This might be better worded as follows: There is a local impoverishment (the concept extracts only certain features of the object for representation) in the service of a global enrichment (the concept is inserted into a network of relations that adds features of meaning).
 12. In the following line, Vygotsky reiterates the primacy of meaning (i.e., internal structural relations) over mere external form by quoting a phrase from Tolstoy. Unfortunately, the wording in this context appears to suggest that concepts precede words. For Vygotsky's critique of this view and of Tolstoy's arguments to this effect, see pp. 170–172.
 13. So, we can say *k'éek'en-ó'ob'* 'pigs,' *ká'a-p'éel k'éek'en* 'two-unit pig,' *ká'a-túul k'éek'en* 'two-living pig,' *un-xéet k'éek'en* 'one-piece (of) pig,' etc., and *ká'a-ts'ít há'as* 'two-stick banana [= fruit],' *ká'a wáal há'as* 'two-flat banana [= leaf],' *ká'a kúul há'as* 'two seated banana [=plant]," etc. Note in the case of *ká'a-túul k'éek'en* 'two-living pig' that *túul* does not directly signal 'living' in a biological sense, but something broader on the lines of 'self completing or self moving'; in conjunction with *k'éek'en* 'pig/pork' or another species name it routinely yields a constructional entailment of 'animate' (Lucy 1992a, pp. 79–82, 2000). Many Yucatec unitizers generate constructional meanings of this type—a point that cannot be further developed here but that highlights in another way the structure dependence of lexical meaning.
 14. English has some lexemes that can appear quantitatively neutral as to number (e.g., *sheep*), whole animal status (e.g., *lamb*), or both (e.g., *duck*). Unlike the Yucatec lexemes, however, none of these examples requires a unitizer for indefinite reference under the whole animal interpretation. See a full discussion in Lucy (1992a, Ch. 2).
 15. Here, for example, is a contemporary definition of *candle* from *Webster's Seventh New Collegiate Dictionary* (1965, p. 121): "1: a long slender cylindrical mass of tallow or wax containing a loosely twisted linen or cotton wick that is burned to give light. 2: something resembling a candle in shape or use..." Although the shape and structure now predominate, historically the light-giving function apparently predominated (compare the related (*in*)*candescent* and Latin *candere* 'shine, glow, gleam (white), etc.')

16. As should be clear from the general argument, this structure dependence is not confined to nouns, but will also be true for adjectives, verbs, and other forms (Lucy, 1994, 1997b).
17. Research on other classifier languages such as Japanese produces results similar to those found in Yucatec (see discussion in Lucy & Gaskins, 2003a).

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