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THE EFFECTS OF LITERACY ON LEXICALITY

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LEXICAL STATUS in a language is considered to be synchronically fixed (Heine et al. 1991:95), but there is evidence from psycholinguistic experiments and observations that indicates there is more than one level of lexicality. In Chinese, the word for 'word' 字 *zi* simultaneously refers to a character, a syllable, a morpheme, a lexeme, and also to a syntactic word.

(1) 我 們 走 路 去 學 校.
wo men zou lu chu sui xiao
1st PLUR walk road to study school
'We walk to school'.

Zi 字 'word' can refer to the ideograph 路 (character), to the sound *lù,* to the morpheme meaning 'road' or to the same morpheme serving as a less literal component in a compound such as 走路 *zou lu,* 'walk', and also to the compound itself. It does not matter whether a morpheme is free, such as 路 *lu* 'road' or bound, such as 們 *men* 'plural'. Each of these linguistic elements can be referred to as 字 *zi.*

In psychological terms, however, there are distinctions between the sorts of phenomena which are associated with the different levels. Literacy plays an interesting role in discovering these different layers of lexicality. When asked to repeat sentence (1) backwards, more literate subjects are more able to reverse the order of the morphemes as in (2)a, while less literate subjects can only reverse the order of the syntactic words, whether simplex or compound, as in (2)b.

(2) a. 校 學 去 路 走 們 我
xiao sui chu lu zou men wo
b. 學 校 去 走 路 我 們
sui-xiao chu zou-lu wo-men

Less literate subjects are less likely to be able to give a meaning for the components of a compound than are more literate subjects. However, evidence from brain damaged patients suggests that there is a psychological reality to the lexical status of the component morphemes of a word. Those with Broca's aphasia often produce only the nominal element of a compound (e.g. the *fan* of *chi fan)* while those with Wernicke's aphasia are more likely to produce the verbal element of the compound (e.g. the *chi* of *chi fan*) (Bates & Chen 1991, Zhang ms). This implies that the grammatical

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category of the component is still present synchronically and available to a speaker, despite the overriding category of the compound as a whole.

Slips of the tongue in normal, but less literate subjects indicate the primacy of the compound as a psychological lexeme. When asked to read sentence (3), a majority of undereducated subjects pronounced the sequence 小兔子 *xiao tu zhi* 'small rabbit' as 小白兔 *xiao bai tu* 'small white rabbit'. It seems that 小白兔 *xiao bai tu* has been lexicalized colloquially to stand for 'rabbit', and in reading 小兔子 *xiao tu zhi* rapidly the subjects accessed their semantic translation of the ideograph and then realized it in speech as their normal lexeme for the concept 'rabbit'. In that case, the compound 小白兔 *xiao bai tu* has become an opaque lexeme, whose component morphemes are irrelevant to the meaning of the whole.

(3) 小 兔 子, 跳 跳 跳
Xiao tu zhi *tiao tiao tiao*
small rabbit diminutive jump jump jump
'The small rabbit jumps'.

If lexicalization is a language-wide phenomenon whose earmarks include componential opacity and morphological bonding, then one would not expect the degree of lexicalization of a word to be significantly affected by the literacy of the speaker. Yet following the standard view of lexicalization, that is precisely the conclusion that one would draw, given the above data.

2. LITERATURE REVIEW. Lexicalization, as a linguistic label, emerges from the functional linguistic school of thought, and it is often paired with the term grammaticalization (Heine et al. 1991, Hopper & Traugott 1993, Traugott & Heine 1991). As historical processes, both lexicalization and grammaticalization often result from reanalysis. However, while grammaticalization gives rise to new productive patterns that add to the grammar of a language, lexicalization produces seemingly isolated additions to the lexicon. Regularity, productivity, and transparency as components are therefore attributed to grammaticalized items, whereas idiosyncracy, randomness and opacity are expected of lexicalized words.

2.1. LEXICALIZATION VERSUS GRAMMATICALIZATION. According to Heine et al. (1991: 95), the difference between the two terms can be summed up as follows: 'Assuming that both involve some kind of "idiomization", the latter may be said to be morphologically productive in the case of grammaticalization but not in that of lexicalization'.

The above is representative of statements about lexicalization in grammaticalization literature as a whole. Yet there are serious drawbacks to this approach when applied crosslinguistically to languages belonging to contrasting typologies (Katz 2001).

In a language such as Hebrew, there are almost no monomorphemic words, since vowels and consonants play complementary roles in word formation. The majority of vowels found in a Hebrew word code derivational and inflectional contrasts, while a

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majority of consonants code lexico-semantic information. Morphemes are discontinuous, and every syllable carries parts of more than one morpheme. But despite the extremely fusional nature of the language, componential transparency is the norm, rather than the exception. In fact, in Modern Hebrew, non-linear derivation patterns, involving the use of discontinuous roots and templates to form new words are still extremely productive. (Bolozky 1999).

Mandarin is known as an isolating language, but it has a large stock of complex lexemes (Li & Thompson 1998). The dependence level of these lexemes is low, in that they are not phonologically affixed and there is no reduction or resyllabification involved. In this sense, the morphologically complex lexemes of Mandarin are quite different from those of Hebrew. But both Mandarin and Hebrew enjoy a high level of morphological transparency. As cited previously, there is evidence from brain-damaged speakers of Mandarin that components are accessed according to their grammatical categorization, rather than the grammatical category of the word as a whole (Bates & Chen 1991).

Multimorphemic words in English are more tightly fused than those in Mandarin, but less so than in Hebrew. Multisyllabic lexemes in English are common, but there is by no means a one-to-one correspondence between morpheme and syllable. Speakers of English have great difficulty analyzing lexemes into their component morphemes. Even in such common words as *heal* and *healthy*, speakers of the language require instruction in its history in order to identify the common root, according to the introduction to a leading textbook on the history of English (Pyles & Algeo 1993:2). In other words, commonly used English lexemes are often componentially opaque for the average speaker.

The implications for the concept of lexicalization from the above observations of Hebrew, Mandarin and English are as follows: (1) lexical status is not necessarily dependent on degree of fusion, (2) lexical status is not necessarily dependent on opacity or semantic bleaching of components, (3) opacity and fusion are independent of each other (Katz 2001).

The significance of these initial observations is as follows: if lexical status can be established independently of both fusion and opacity, then lexeme formation (i.e. lexicalization) cannot be defined as necessarily 'morphologically unproductive'.

Heine et al.'s statement (1991:95) might suggest that componential opacity is something that indicates a high level of lexicalization, where the term lexicalization is defined as incremental. The higher the opacity, the higher the degree of lexicalization. But if such an interpretation were used, most words in a language such as English might be judged to be more lexicalized than those in Hebrew and Mandarin. What would be the implications of such a finding?

One possibility would be to suppose that individual words in English have undergone a greater process of semantic erosion and that opacity results from such bleaching. But an alternative explanation is available: it is not so much that individual words have had their morphemes bleached, but rather that the speakers of the language, due

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to a lack of overall systematicity in lexical patterning, have been conditioned to ignore componential analysis as a useful strategy.

2.2. LEXICALIZATION VERSUS DERIVATION. Since lexicalization as a linguistic concept emerges from the functional tradition of grammaticalization literature, the concept is often contrasted with grammaticalization. It is seldom directly compared to the traditional grammatical term 'derivation', and this omission can give rise to confusion. Are the terms conterminus? Does one include the other?

The traditional term 'derivation' has been relegated, at least in elementary linguistic texts, to extremely regular patterns of word formation, the most common examples being drawn from Latinate vocabulary items in English. Yet it is also used as a synonym for 'etymology'.

Hopper and Traugott (1993:49) state: 'The process whereby a non-lexical form such as *up* becomes a fully referential lexical item is called "lexicalization"'. The statement is indisputably correct on its face, but it carries some dangerous implications. It is implied, though not stated, that if a function word becomes a content word, then lexicalization has taken place, but not vice versa. In fact, some researchers confuse 'lexicalization' with 'degrammaticalization', implying a particular directionality to the process.

For our purposes here, we do not wish to second guess either the directionality of the process of word formation or its regularity or lack of the same. We are primarily concerned with how collections of morphemes are perceived by speakers to be single lexical units. For this reason, we introduce the more theoretically neutral 'lexicality'. Something is more lexicalized in this usage if it has a greater degree of lexicality, not necessarily because it has undergone a more extreme process of lexicalization.

Lexicality refers to the identification of a linguistic sequence as a single lexeme by speakers. Lexicality can be quantified. For example, we could argue that the English word *husband* has a higher level of lexicality than *housewife* which is more lexicalized than *house snake*. All are derived from a compound whose first element is 'house', but derivation is not equally obvious in each case. In this usage, lexicality is entirely synchronic and psychological.

3. EXPERIMENTAL METHODS AND RESULTS. This paper is based on data compiled under a project that set out to probe the issue of lexical transparency by comparing psychological componential opacity (the psychological ability of speakers to analyze components) with circumstantial componential opacity (whether the requisite cues to allow for such analysis are synchronically there) (Katz 2001)[1].

The Chinese portion of the experiment was divided into two parts. The first part involved a group of thirty children. The second involved thirty adults. Each subject was tested for level of literacy. Questionnaires were devised to test morphological recognition. Different questionnaires for the children and for the adults were chosen, each geared to suit the subjects' interests and attention spans. In order to minimize the direct effects of literacy, the subjects were not allowed to see the questionnaires or the written words. Instead, the tests were administered orally. (Katz et al. 2001)

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Child	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Age	4	5	5	5	5	5	6	6	6	6	6	6	7	7	7	8	6	6	6	6	7	7	7	7	7	7	8	6	7	6
Level	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	3	3	4
Def.	3	2	2	3	1	3	3	3	2	3	0	2	3	3	5	1	3	2	2	6	0	4	3	4	1	0	4	0	3	3
Ex.	2	6	3	4	10	3	4	5	5	2	7	3	2	6	6	5	5	11	2	5	9	7	10	10	9	8	9	10	4	7

Table 1. *Overall results for children.*

3.1. THE CHILDREN. For the children, nonsense words from the Chinese translation of the Dr. Seuss book *A Wocket in my Pocket* were selected. The Chinese translation used ordinary Chinese morphemes to construct new words. The nonsense words provided a good opportunity for testing the child's recognition of the morphemes without a great deal of contextual cuing.

Each of the children was first introduced to a nonsense word on a page in the picture book in order to interest him. The children were shown the pictures only. The text was covered up. The child was asked to give a definition for each of the target component morphemes in the nonsense words. After that, the child was invited to provide some examples of words that had the target morpheme as a component. Children were tested from a list of fifteen words.

Table 1 below lists the overall results of the experiment involving children. Children are listed by identifying number rather than names[2]. Literacy levels were determined according to the test described in Table 2 below. If a child failed to correctly define or give an example for a given test item, then that item was not counted in Table 1. The number of items correctly defined appear under the headings ' Def.' and of those for which a correct example was given under 'Ex.' The number of good definitions given by children ranged from zero to six. The number of good examples ranged from two to eleven.

The significance of the results will be discussed in more detail in the sections below. In general, however, it would appear that for many of the test subjects, a number of the nonsense words were semantically opaque as to the morphemes tested. Literate subjects did significantly better in providing examples than did their pre-literate peers. Exemplification is a more reliable measure than definition.

The pre-literate children gave an average of 4.6 correct examples. The literate children gave 7.6 correct examples on average. Because the lexemes in question were nonsense words, none of the children were likely to have had any experience with the test lexeme as a whole. The thing being tested for was familiarity with the parts of the word. All morphemes used were common and naturally occurring in ordinary vocabulary.

To illustrate how this process worked, in example (4) below, we offer the following exchange with child number 24 concerning test item number 9, TELLAR 紅心祖師: *red; heart; ancestor; teacher.* The English nonsense word TELLAR was translated into Chinese by 郝廣才 into a sequence of four morphemes, the last of which, 師 *teacher,* was being tested for in this exchange.

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(4)	Q: 紅心祖師的師是什麼意思?	*What's the meaning of* 師 *in* 紅心祖師*?*
	A: 撕開、獅子。	*To tear apart. A lion.*
	Q: 你有沒有聽過老師的師?	*Have you heard of* 師 *in* 老師*?*
	A: 有啊! 我正要說，只是…	*Yes. I was about to say, but…*
	Q: 喔! 被我說了。	*I said it.*
	老師的師是什麼意思?	*What's the meaning of* 師 *in* 老師*?*
	A: 是老師啊。	*A teacher.*
	Q: "師" 還可以造什麼詞?	*Can you think of any words with the word* 師 *in them?*
	A: 獅子、施榮偉， 施榮偉就是我的朋友。	*A lion. Shr, Rong-Wei; he is my friend.*

The child thought of homonyms when asked to think of other words with the same component as 師. A more sophisticated speaker would have known it had to be 師, because he would have recognized the compound 祖師 *preceptor.* This might lead one to suppose that recognition of bi-morphemic subcomponents is what disambiguates possible homonyms. However, nineteen out of thirty children were able to recognize the 毛 *mao* 'fur' of 毛怪 *mao guai* 'fur monster' even though the word 毛 *mao* 'fur' has homonyms.

More literate subjects did significantly better at providing appropriate examples of other uses of the same morpheme than did their less literate counterparts. It seems that for the pre-literate, lexemes function holistically as phonological to lexical mappings, without the intermediate level of the morpheme. The experience of literacy in Chinese considerably boosts a speaker's awareness of individual morphemes.

3.2. THE ADULTS. There were thirty adults who participated in the experiment. They were divided into two equal groups: literate and illiterate. The adult subjects were tested on thirty potential items and asked to define and identify specific subcomponents of the words tested. The maximum number of correct identifications for illiterate adults was ten. However, no reliable conclusion can be drawn from this experiment, since the illiterate adults that we found were simply not familiar with the words above the first ten, which were on the most basic level of vocabulary.

The results for the adults were inconclusive because illiterate adults in Taiwan are native speakers of Taiwanese (or other languages besides Mandarin), and many of the illiterate subjects were not fully fluent in Mandarin. Comparing their performance with that of fluent native speakers of Mandarin who are also literate does not create an accurate picture of effects of literacy on morpheme recognition.

3.3. EFFECTS OF LITERACY ON ANALYSIS. Subjects were classified in advance of morphological testing as to their level of literacy. The literacy test in the following table was used. The test consisted of ten sentences, numbered according to progressively more difficult reading material. A subject unable to read even the first sentence was labeled 'o' for literacy. Those able to read the first sentence were labeled '1', and so on.

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識字測驗:
1. 小朋友，拉拉手，一二三，來唱歌，我們都是好朋友。
2. 小花貓，跑跑跑；小兔子，跳跳跳。
3. 我們可以整天奔跑，卻不感到疲憊、厭倦。
4. 我最難忘的是那一塊紅磚砌成的牆，和庭前爬滿綠藤的絲瓜棚。
5. 傲骨不可無，傲心不可有；無傲骨則近於鄙夫，有傲心不得為君子。
6. 災難之後，群情鼎沸，身為行政長官的他，為了安撫人心，頻頻向悼悼的群眾致歉。
7.「搶孤」儀式，印證著先民拓墾台灣的篳路藍縷、艱苦卓絕，自有其歷史傳承與文化認同上的背景與價值。
8. 因為深恐孤魂遊鬼內心悲怨、作祟加害，所以歷代地方官都必須率同百姓予以祭拜，企求合境平安、瘴厲不作。
9. 蒯之罄矣， 維罍之恥。鮮民之生， 不如死之久矣。 無父何怙？ 無母何恃？ 出則銜恤，入則靡至。
10. 自余為僇人，居是州，恆惴慄；其隙也，則施施而行，漫漫而遊。

Table 2. *Literacy test.*

The children who took part in this study ranged in literacy from '0' to '4'. The adults ranged from levels '0' to '10'.

While the cognitive development of children in the age group tested is still rapidly progressing, there is good reason to believe that the differences in performance observed were not due to cognitive development independent from the acquisition of literacy[3]. The subjects were normal kindergarten and elementary school children with no cognitive impairments. The morphemes they were being asked to recognize were part of their active vocabulary. The social and conversational skills of the children were comparable. Among the children tested, age was not a determining factor for success in morpheme recognition.

The issue with regard to literacy is as follows: do the more literate subjects enjoy a higher level of morphological transparency than those who are pre-literate? The answer is not altogether clear. Of the sixteen pre-literate children, only one was unable to give any correct definition. Of the fourteen reading children, two were unable to give any correct definition, one with a reading level of '2' and another of '3'. The maximum number of correct definitions given by pre-literate children was five. Only one of the pre-literate children attained to that level. The child, identified as 15, was able to correctly define all five of the first targeted morphemes, labeled <basic>. There were eight pre-literate children who correctly defined three of the targeted morphemes. Four of the pre-literate children correctly defined two of the targeted morphemes. Only two of the pre-literate children correctly defined one targeted morpheme.

Results among the literate children for definitions were not significantly different. Of the fourteen reading children, two were unable to give any correct definition,

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one with a reading level of '2' and another of '3'. The maximum number of correct definitions given by a reading child was six; this was the achievement of the subject identified as 20, whose reading level was '2'. But the child 30, who had the highest reading level, level '4', was able to give only three correct definitions. Three of the literate children gave four correct definitions. They all had a reading level of '2'. Four of the readers gave three correct definitions. Two of these had a reading level of '2', one was at '3' and another at '4'. Two subjects with a reading level of '2' gave two good definitions. There was only one literate subject who gave exactly one good definition. His reading level was '2'.

The results for definitions are not entirely reliable as indicators of morphological transparency. As already noted in the previous section, the process of defining a lexical component is meta- linguistic. It requires a level of sophistication that is more than most native speakers of any language ever attain. For this reason, when used alone as a measure of componential transparency, definition is an inadequate measure.

Significantly more of the literate children gave a higher number of good examples of the targeted morpheme in other compounds. The pre-literate children gave an average of 4.6 correct examples. The literate children gave 7.6 correct examples on average. It seems likely that the above result is due to the fact that the literate children may have encountered the morphemes in question in more combinations and may have been given better insight into morphological identity by knowing which written character was used for which morpheme in different compounds.

The tests with adults were inconclusive, unlike those with the children, because there was not as significant a difference between the definition and the identification test and only the first test items were accessible to the non-reading adults. It appeared that the illiterate adults simply did not know the test words above the first ten most basic items. Part of the difficulty in getting reliable data was caused by the fact that illiterate subjects in Taiwan are not native speakers of Mandarin, the test language. As such, they are not on a par in word recognition with their literate counterparts. This problem was not encountered with the pre-literate children.

4. DISCUSSION. The nature of this project changed considerably in the implementation. For instance, it was not originally intended that the Chinese portion of the experiment be focused primarily on literacy. While the subjects were divided into literate and non-literate groups, the vocabulary was also divided into basic, intermediate and advanced. It was hoped that differing contexts for vocabulary items would provide examples of circumstantial versus psychological opacity. However, in the case of Chinese, all that we managed to show was that those who had greater experience with the morphemes in different combinations were better able to identify them than those who had less experience. Less literate subjects had less experience with the systematic deployment of morphemes as subunits of syntactic words. They were thus capable of knowing a word without knowing its parts, or being able to say where else those parts were employed in their own vocabulary. For non-literate Chinese speakers, syntactic

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words are often monolithic wholes, despite the fact that this is an isolating language where morphemes and syllables are in one-to-one correspondence.

The theoretical implications of the above observations are not entirely trivial. If we assume with Heine that the more opaque a derivation is to native speakers, the more lexicalized is the vocabulary item, we might then conclude that the more literate a Chinese speaker is, the less lexicalized is his vocabulary. While the grammaticalization literature does not address these issues in terms of individual speakers, there is no reason why it should not. Is lexicalization a historical, monolithic process that goes in the direction of opacity? If so, how is it that during a lifetime of language use, individual speakers can gain insights into the structure of their language, rendering derivation more transparent? How is it that the same speaker can experience different degrees of lexicality for the same sequence of morphemes depending on literacy? These are questions that should be addressed in further research.

In Chinese, where the writing system displays a one-to-one correspondence of character to morpheme, literate native speakers have a considerable advantage over native speakers who are not literate in recognizing the components of a word, even when homonyms are involved.

5. CONCLUSIONS FROM THE EXPERIMENT. Instead of the expected results concerning variation in opacity between basic versus advanced vocabulary, it was found that morphological opacity correlates with lesser degrees of literacy, regardless of the difficulty of a vocabulary item. This finding challenges theories that link the degree of lexicalization of a word with its degree of componential opacity.

'The grammatical identity of the word is what marks it for availability and selection for use in a syntactic slot'. (Packard 2000:80). Lexical status remains unchanged for speakers despite the fact that during a lifetime of learning a higher degree of morphological transparency may be attained. More literate subjects may have a better idea what the parts of a word contribute to the whole, but they do not experience any reduction in their ability to employ lexemes as syntactic units. Lexicalization and lexicality should be reexamined in view of these facts.

6. IMPLICATIONS FOR LEXICALIZATION THEORY. Componential opacity is something that often happens after lexicality on the syntactic level has been achieved. Opacity is not a prerequisite to lexicalization, though it frequently is one of its after-effects. The degree of opacity that accompanies lexicality varies from language to language and from speaker to speaker.

Opacity does not consititute lexicality, nor does it bring lexicalization about. Lexicality invites opacity, as the individual meaning of morphemes is overshadowed by the meaning of the word as a whole. But lexicality does not require speakers to be ignorant of componential semantics; and learning more about the meaning of components does not lead to delexicalization.

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[1] Under Taiwan National Science Council Grant # 89-2411-H-126-020, the project had three components: Chinese, English and Hebrew. This paper deals only with the Chinese data.

[2] The sex of the child is not noted. No statistical significance was found by sex.

[3] Literacy in and of itself has some effect on cognitive development, so that literacy and cognitive ability are not always separable. Educated subjects may appear more intellectual despite equal cognitive endowment with their less educated contemporaries. This is true for adults as well as children. There was no indication that the less literate children in this study were less literate because of any cognitive delay or impairment, nor were the more able readers demonstrably further advanced in other areas. (One of the best readers among the children, for instance, learned to read at home, before starting school. Home environment plays a big role in literacy.)

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