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## Think of a number: conceptual transfer in the second language acquisition of English plural-marking

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### Résumés

Dao (2007) found that Vietnamese learners of English produced numeric plurals (e.g. *five books*) before lexical plurals (e.g. *books*). Processability Theory (PT) (Pienemann 1998; 2005; 2007) predicts the reverse order, assuming that agreement requires a process of **unification** which involves the storage of information, while production of a single word does not. Using a model of lexical access, Weaver++ (Levelt, Roelofs & Meyer 1999) we show how (i) agreement can result from **co-activation** where two words simply respond to the same concept, so no information storage is involved and (ii) the production of numeric plurals is facilitated for Vietnamese learners by conceptual transfer (Jarvis 2011): in Vietnamese there is a chain of conceptual links between plurality, numerals, classifiers, and nouns, but no direct link between plurality and nouns, so numerals facilitate the use of nouns for Vietnamese learners, but they must acquire a direct link between nouns and plurality.

Dao (2007) a constaté que les apprenants vietnamiens de l'anglais produisent des pluriels numériques (p.e., *five books* 'cinq livres') avant les pluriels lexicaux (p.e., *books* 'des livres'). La Processability Theory (Pienemann 1998; 2005; 2007) prédit l'ordre inverse, eu égard à l'hypothèse que l'accord nécessite un processus d'unification qui implique la mise en mémoire d'informations, ce que n'exige pas la production d'un seul mot. Au moyen d'un modèle d'accès lexical, Weaver++ (Levelt, Roelofs & Meyer 1999), nous montrons (i) comment l'accord peut provenir d'une co-activation par laquelle deux mots répondent à un seul concept, et la mise en mémoire d'informations n'est donc pas nécessaire, et (ii) comment la production de pluriels numériques est facilitée par un transfert conceptuel (Jarvis 2011) pour les apprenants vietnamiens : en vietnamien, il existe une chaîne de liens conceptuels entre pluralité, numéraux et noms, mais pas de lien direct entre pluralité et noms, si bien que les numéraux facilitent l'usage des noms par les apprenants vietnamiens, qui doivent toutefois acquérir le lien direct entre noms et pluralité.

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## *Entrées d'index*

**Mots-clés** : nombre, acquisition de langue seconde, vietnamien, anglais, pluriel, accord, Processability Theory

**Keywords** : number, second language acquisition, Vietnamese, English, plural, agreement, Processability Theory

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## *Texte intégral*

# 1. Introduction

- 1 The question of how a known language (L1) can affect production of utterances in a language learned subsequently (L2) - commonly referred to as **transfer** - remains a vexed one. The seemingly reasonable assumption that it is easier to learn an L2 that is similar to your L1, than to learn one that is significantly different begs many questions: How do we measure similarity and difference between languages? Does transfer affect all aspects of language (phonology, syntactic organization, morphology, semantics) equally? Are the processes of transfer the same in all domains? Can it affect the route of acquisition or just the rate? And is difference, once assessed, necessarily a hindrance in all circumstances, or can it actually be a help? Can any theory of language processing and language acquisition afford an account not only of whether or when transfer will occur, but how?
- 2 This paper has a bearing on all of these issues. First, it suggests we can assess cross-linguistic similarity in terms of whether two languages encode the same lexical concepts, and if so, whether they package those concepts together in comparable lexical items, or divvy them up in different ways. Second, it suggests that where languages do encode comparable concepts but in different lexical packages, this can have an effect on the *route* of acquisition by favouring productivity of a particular morpheme in some contexts, but not in others. For example, production of the English plural -s may be facilitated in contexts where the concept of plurality is made salient by the selection of a numeric quantifier. This then influences the context in which a morpheme first appears, i.e. in numeric expressions like *five books* rather than in unquantified NPs like *books*. Third, we question the limitations on syntactic transfer referred to in Processability Theory (PT) as **developmentally moderated transfer** (DMTH; Pienemann 1998; 2005; 2007) suggesting that conceptual transfer may affect not only the conceptual level of L2 processing but also the construction, in the early stages of acquisition, of the network that links grammatical representations of words **-lemmas-** to each other. Finally, we suggest that conceptual transfer can be effectively modeled with explanatory gains using an adaptation and extension of the Weaver ++ model of Speech production (Levelt, Roelofs & Meyer 1999).
- 3 We address these issues with reference to a study of the production of English plural morphology by Vietnamese learners (Dao 2007). In this study, Dao found that, in the spontaneous English of school-aged Vietnamese learners, plural-marking emerged productively on nouns accompanied by numerals (numeric plurals, see (1) a, (1) b), before it emerged on nouns used alone (lexical plural, see (2) a, (2) b).

- (1) *In responding to the game Spot the Difference*
- a. "A cat, cat ... .. three cats ..." (XT, grade 7)
  - b. "... three blackboards, three, three boards in the second ... and one board in the first ... (DP, grade 11)
- (2) *In answering the Researcher's question, "Close your eyes, and tell me what you remember in this room (or picture)"*
- a. "Um ... fan ... computer ... wall ... door ... window ... desk ..." (XT, grade 7)
  - b. "... I remember ... onion ... tent ... book ... flower ..." (DP, grade 11)

4 The target-like numeric expressions in (1) were produced in a session earlier than or at the same time as the non-target like nouns in (2) (where there were in fact many computers, doors, desks, books flowers etc). The (a) examples were produced by one learner and the (b) examples by another; while their use of numeric plurals was clearly productive, neither of them produced plural endings on a noun used alone with enough frequency or variation to qualify as productive use of plural -s in this context.

5 Practitioners of PT generally assume that the agreement evident in numeric plurals involves unification (see for example Pienemann's discussion of *two dogs* (Pienemann 1998: 169-172; 2007:140). Unification is a process where two values of the same feature expressed by two separate words, are brought together in a single functional representation of the phrase to which they belong. In this representation or **functional structure**, each feature can appear only once with only one value: the two values originating in different words must share a single representation, or **unify**. This is only possible when the values are identical or compatible. Since it involves feature transfer, comparison and storage (see pp. 14-15 for more detail), unification is more cognitively demanding than selection of a plural noun alone.

6 Pienemann's assumption is that the expression *two dogs* involves unification, since *two* and *dogs* each express a Number feature with the value plural. If so, we would expect the bare plurals to be cognitively simpler and so to emerge before properly formed numeric expressions.

7 We suggest that two factors can account for Dao's unexpected results: first, agreement may arise simply because two features are valued simultaneously by the same concept, and so inevitably agree; and second, conceptual transfer may facilitate the use of plural-marking in English, when numerals are involved, even though Vietnamese has no plural-marking on nouns at all. More specifically, as a classifier language, Vietnamese makes use of conceptual links between numeric concepts, countability, which is expressed by classifiers, and the entities they classify expressed by nouns. In English countability is expressed not by classifiers but by the plural-marker -s. Thus, the cognitive structure underlying Vietnamese quantification provides a scaffold that may facilitate the activation of plural-marking in English, when numerals are involved, but not when nouns are used alone. In doing so, it affects the *route* of acquisition of English plural-marking.

8 The structure of the paper is as follows. Section 2 introduces the notion of conceptual transfer and explains the DMTH of PT. Section 3 presents results of previous studies of the acquisition of English plural-marking in a PT framework. Section 4 explains why the results of Dao's study (Dao 2007) are problematic for PT, and discusses some irregularities in PT's theoretical approach to the processing of agreement. In this section we explain the process

of unification as implemented in Lexical Functional Grammar (LFG, Bresnan 1982; 2001) and Levelt et al.'s (1999) model of lexical access, WEAVER++, and argue that an extension of the latter provides an alternative and more appropriate model of agreement for early stages of acquisition. We also discuss the typological differences between English and Vietnamese and show how these can be captured in lexico-semantic terms, and represented in the Weaver++ model. In Section 5, we use the Weaver++ model to represent steps in the acquisition of English plural-marking by Vietnamese learners, clarifying the role played by conceptual transfer. We conclude with some comments in Section 6.

## 2. Conceptual Transfer

9 One common view of transfer is that it may affect the rate of L2 development, but not the route (Wode 1978, Zobl 1982, Krashen 1985, Odlin 1989). PT articulates a particularly strong version of this view in its Developmentally Moderated Transfer Hypothesis (DMTH) (Pienemann 1998; 2005; 2007) which states that transfer during acquisition is severely limited by the development of the L2 processing system. It may seem odd that the use of L1 processing resources should be limited by L2 processing ability, but the logic of the DMTH is this: according to PT, a syntactic processing system (the **processor**) consists of a set of highly specialized and language-specific cognitive **procedures** – a distinct one for each word class (Noun, Verb, Adjective, Preposition, etc.), each phrasal category (NP, VP AdjP, PP, etc.), for a simple sentence, and for alternative types of embedded clauses (relative clause, complement clause, etc.). These represent the procedural knowledge or linguistic 'know-how' of the speaker. In the fluent speaker, both the initiation of these procedures and the language- and structure-specific tasks they perform are highly automated. These tasks include retrieval of diacritic feature values, like the plural value we are concerned with, assignment of word order, unification of features to ensure agreement, assignment of grammatical functions (Subject, Object, etc.), selection of appropriate morphosyntactic forms and delivery of output from one procedure to the next. Automation develops as a consequence of frequent productive use during acquisition, and entails a lack of flexibility – or conscious control – in the performance and sequencing of each procedure. In short, an L1 processor is like a highly specialized cognitive machine, tuned to perform L1-specific processes on L1-specific input to produce L1-specific morpho-syntactic structures. Given this, it is exceedingly unlikely that the same 'machine' will recognize L2 items as valid input, or be able to process them in L2 appropriate ways.

10 Only if the L1 and L2 are extremely similar in their morphosyntactic structures, both in terms of the meanings expressed and the distribution of meanings across morphemes and lexical items, is the L1 processor likely to be of any use in processing the L2 in such a way as to accelerate production of L2 structures. And even then, in any processor, procedures for higher level more complex structures can only be initiated by delivery of output from the appropriate lower level procedure; a dependency which means the products of lower level procedures naturally emerge in a learner's spontaneous speech before the products of higher level procedures. So, use of an L1 processor cannot alter the route of acquisition – emergence order – only, at best, the rate.

11 Though we take PT as our point of departure, and adopt most of its assumptions with respect to the way syntax is processed, there is one important way in which our assumptions differ significantly from PT's. Since the limitations imposed by the DMTH apply only to *syntactic* processing, it follows that the *conceptual* (pre-syntactic) structures of an L1 may, in principle, influence the development and use of a learner's emerging L2 conceptual system, and potentially, and this is the crucial point, the construction of the *lemma* system also, from the earliest stages of development. In other words, in our view, PT's DMTH does not exclude the possibility of conceptual transfer, or its effects on the most basic level of syntactic processing, lexical selection.

12 Jarvis (2011: 3) identifies **conceptual transfer** as an approach to transfer that "focuses more on the effects of cognition on language use – particularly the effects of patterns of cognition acquired through one language on the receptive or productive use of another language" (e.g. Jarvis 1998, Pavlenko 2003, Cardiero 2008, Inagaki 2001). According to Jarvis (2011) most such studies in a cognitive linguistics framework have been grounded in theories of concepts or conceptualist semantics, especially Slobin's (1993; 1996) notion of thinking-for-speaking.

13 However, PT makes use of Levelt's (1989) psycholinguistic model of the conceptual-syntactic interface as its starting point, and we employ more recent work on lexical selection by Levelt et al. (1999) – a model known as Weaver ++. In both these models, lexical concepts, that is concepts which find expression in lexical items, exist as part of a neural network linked to each other in line with their semantic relations, and linked to word-forms via lemmas which represent grammatical constraints on, or requirements for the use of those word-forms. These lemmas form the most basic part of PT's syntactic processor; this is where values for language-specific features – the information atoms expressed by each inflection and function word - are stored. Activation of a lemma is seen as pre-syntactic processing, part of general cognitive abilities like classification and association, but selection of a diacritic feature value, such as singular or plural number, which can be added to a lemma, is viewed as syntactic processing of the simplest kind, and the comparison of such values expressed in different lemmas, as occurs in agreement, is syntactic processing of a more demanding kind. These distinctions underlie PT's first three stages of acquisition: (1) the most basic lemma stage, where learners can access single invariant words and formulae, (2) the lexical stage, where inflected word-forms can be selected but there is no exchange of information, and (3) the phrasal stage, where learners can compare information expressed by words within a phrase to produce agreement.

14 To create the possibility of conceptual transfer having an impact on L2 development, it is necessary to assume that aspects of L1 processing closest to the conceptual interface, the levels of lexical concepts and lemmas, can be employed during L2 acquisition and processing. We see this as a largely common-sense account, based in part on the ready availability; indeed the automaticity of the concept-lemma links of the L1, and in part on readily observable evidence such as L1 influence on word retrieval. Just how the L1 systems may affect L2 processing will be made clear in the discussion below of the specific case of Vietnamese learners producing plural morphology.

### 3. Past studies of plural-marking in English second language acquisition

15 We know of only two studies that have looked specifically at the second language acquisition (SLA) of number agreement in nominals in a PT framework. That framework requires the data to be unplanned speech, elicited in ways that favour the use of the target structures, and requires specific criteria to be applied in assessing emergence: to demonstrate a point prior to acquisition there must be cases where a structure should be used, but is not; then, to demonstrate productivity each new structure must be used at least twice with different lexical components; to prevent mimicry the data gatherer must avoid use of the target-structures, and any repetitions are removed from the data set.

16 Using this methodology, Di Biase and Kawaguchi (2002) investigated the SLA of Italian, where number combines with gender in portmanteau affixes that attach to nouns, articles, quantifiers and adjectives, as in (3) (adapted from Di Biase and Kawaguchi 2002: 281).

(3) *Ho tant-i amic-i Australian-i*  
*Have.1-SING many-MASC/PL friend-MASC/PL australian-MASC/PL*  
*'I have many Australian friends.'*

17 They looked at plurals in cross-sectional data from six instructed learners. Ignoring errors in gender agreement, they found that one learner produced no plural noun forms in any context (representing the stage before emergence) and that four learners produced lexical plurals and plural nouns with articles, adjectives numeric and non-numeric quantifiers (representing full emergence). One learner only produced lexical and numeric plurals. On this basis, they concluded that lexical and numeric plurals are acquired before non-numeric phrasal plurals, such as a combination of a determiner or adjective and a noun. Clearly, basing an emergence order on a contrast between just two learners is less than ideal, and their data could not establish whether lexical plurals are acquired before or after numeric plurals.

18 The second study, by Dao (2007) sought to rectify this, and looked specifically at the use of lexical and numeric plurals elicited from Vietnamese learners of English. This study was also cross-sectional but involved a larger group of 36 teenaged school-based learners. The profile of these learners is outlined in Table 1 below. To determine acquisition in the PT framework, Dao (2007) adapted PT's **emergence criterion** which requires, (i) a minimum of two **lexical variations** (one token each of two different lexemes, e.g. *tables* and *chairs* for lexical plurals or *three tables* and *two chairs* for numeric plurals), (ii) a minimum of one **formal variation**(contrasting form for at least one lexeme, e.g. *tables* or *three tables* and *one table*), and (iii) use in a minimum of five **obligatory contexts** (this number is high, making Dao's data very robust).

Number of Learners	Gender		Grade	Years studying English	Number of hours/weeks/year
	F	M			
6	3	3	7	1	5/40/year
6	3	3	8	2	5/40/year

6	3	3	9	3	5/40/year
6	3	3	10	4	5/40/year
6	3	3	11	5	5/40/year
6	3	3	12	6	5/40/year

Table 1. Learners' profile

19 In this larger sample, there were only four learners who produced no plural-marking and twenty four who produced both lexical and numeric plurals. Of the remaining eight learners, two produced lexical plurals only, but six produced numeric plurals only. Table 2 summarises these distribution patterns.

	Lexical Plural	Numeric Plural	Numeric Singular	Number of Learners
Group 1	<i>book</i>	<i>five book</i>	<i>one book</i>	4
Group 2	<i>book</i>	<i>five books</i>	<i>one book</i>	6
Group 3	<i>books</i>	<i>five books</i>	<i>one book</i>	2
Group 4	<i>books</i>	<i>five books</i>	<i>one book</i>	24

Table 2. Distribution patterns in plural-marking produced by learners.

20 These mixed results could be taken to suggest that the emergence order of lexical and numeric plurals relative to each other is free, and that both belong to a single acquisitional stage. However, statistical analysis suggests otherwise. According to Hatch and Lazaraton (1991), an implicational hierarchy indicating emergence order is statistically significant if its coefficient of reproducibility is greater than 0.9, and its coefficient of scalability is greater than 0.6; coefficients for the hierarchy where numeric plurals emerged before lexical plurals were .945 and .753 respectively. In other words, statistically, it is more probable that Vietnamese learners acquire numeric plurals before lexical plurals, than the other way around (Dao 2007).

21 This poses a problem for PT, if we accept the standard assumption that numeric plurals involve the same process of syntactic unification as other phrasal plurals, such as determine-noun and adjective-noun agreement, which clearly emerge later.

## 4. Processing Agreement

22 PT maintains that less demanding structures emerge earlier in SLA than more demanding ones, and that the measure of processing demands is the extent to which information must be stored and 'exchanged' in the syntactic processor. As indicated above, one of the most significant factors necessitating information exchange is unification, a process of value comparison which underlies agreement in the framework of Lexical Functional Grammar (LFG) adopted by PT.

23 To illustrate, when an English speaker thinks of some objects of a certain type - say the type 'book' - wanting to mention them, she automatically considers their quantity (one or more) and encodes this information along with the word-form that best denotes the objects to which she wants to refer (*book* + *s*). According to PT, which employs a version of Levelt's (1989) model of lexical access, this involves a process where a lexical concept BOOK activates a

corresponding lemma *book*, which being identified as a noun, has a diacritic Number feature to which, in this instance, a plural value must be added (cf. Figure 2 below). Crucially, this plural value comes directly from the concept of plurality activated along with the BOOK concept, i.e. the concept most strongly associated with the speaker's intended referent. This, activation and addition of the plural value, argues PT, requires no exchange or comparison of information, merely the deposition of conceptual information into the syntactic processor, and so belongs to PT's lexical stage.

- 24 But, suppose a speaker wants to indicate a specific subset of books, by locating them in (discourse or contextual) space: *these books*. Here, the standard PT / LFG analysis assumes that a plural value will **not** be deposited in the lemma of the demonstrative; instead its number value will be determined only when both lemmas are delivered to one and the same phrasal procedure in the syntactic processor. But what exactly does this procedure do? PT assumes that it implements a unification process as conceptualized in LFG (Bresnan 1982; 2001).

## 4.1 Unification in LFG

- 25 As noted above, in LFG, agreement depends on attempts to **merge** feature values expressed by two words in a constituent into a single value in f-structure (see Figure 1). Moreover, LFG assumes a mental lexicon in which the word-form *books* is **permanently** associated with its basic semantic content (called a **PREDICATE** feature, abbreviated: [PRED 'BOOK']) and with any valued diacritic features including, in this case: [LEXCAT<sup>1</sup> N; COUNT +; NUM PL]. Similarly, demonstrative forms *this* and *these* would each be **permanently** associated with their semantic and formal features: [LEXCAT DET; DEF +; DEIXIS +; LOC PROXIMATE] for both and with [NUM SG] and [NUM PL] respectively.
- 26 To generate phrases, lexical items are placed into a phrase structure according to their lexical category, and language-specific rules or instructions encoded in these phrase structures or in words themselves indicate how features within a phrase should be related in f-structure. To implement determiner-noun agreement for number, a number value expressed by each word is mapped to a single feature in the f-structure of the phrase, so the values must be able to merge (see Figure 1). If the [NUM PL] feature of the noun *books* is mapped to an f-structure, the [NUM PL] value of *these* can be merged with it, yielding *these books*, but the [NUM SG] value of *this* could not, making *\*this books* unacceptable.



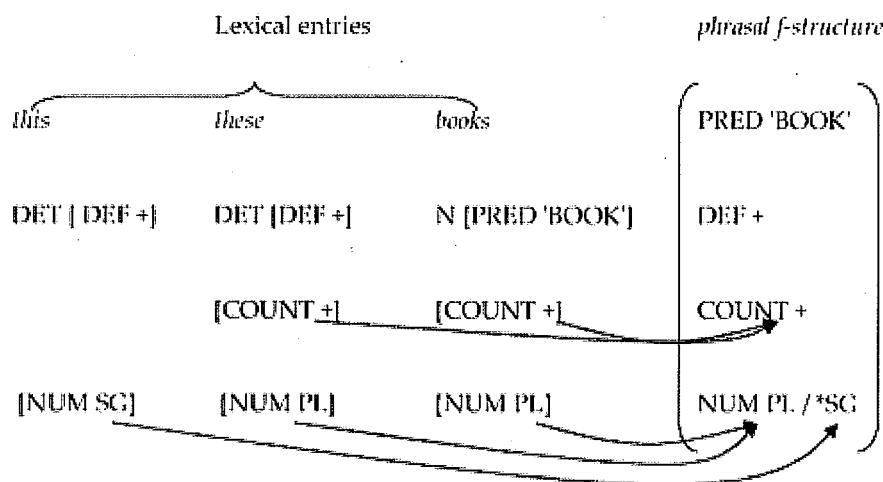


Figure 1. Unification of *these* and *books* in an LFG f-structure.

- 27 It is the storage and unification of information within a phrase that is represented in PT as a **phrasal procedure**; a key assumption here is that the need for unification means selection of the demonstrative form is delayed until the noun is selected and unification is processed, and it is this delay which is said to be so demanding for the novice speaker, putting phrasal agreement at PT's acquisitional Stage 3.
- 28 In dealing with agreement in this way though, PT actually departs from the model of lexical access (Levelt 1989) it adopts to explain the selection of **individual** words, where features are valued, by responding directly to conceptual structure. This begs the question: is it not reasonable to assume that a learner who lacks the language-specific procedures for processing phrasal agreement in their L2 will fall back on a series of lexical selections, and is it not possible that, under certain circumstances, such selections will give the appearance of agreement, without the need for Unification? And what happens if they do?

## 4.2 Weaver ++

- 29 In Weaver ++ (Levelt et al. 1999), as in Levelt's earlier model, the final selection of a word or feature value depends on levels of activation that accumulate, as links form in a neural network (see Figure 2, based on Levelt et al. 1999: 13, Figure 7, which represents activation of the word form *books*).

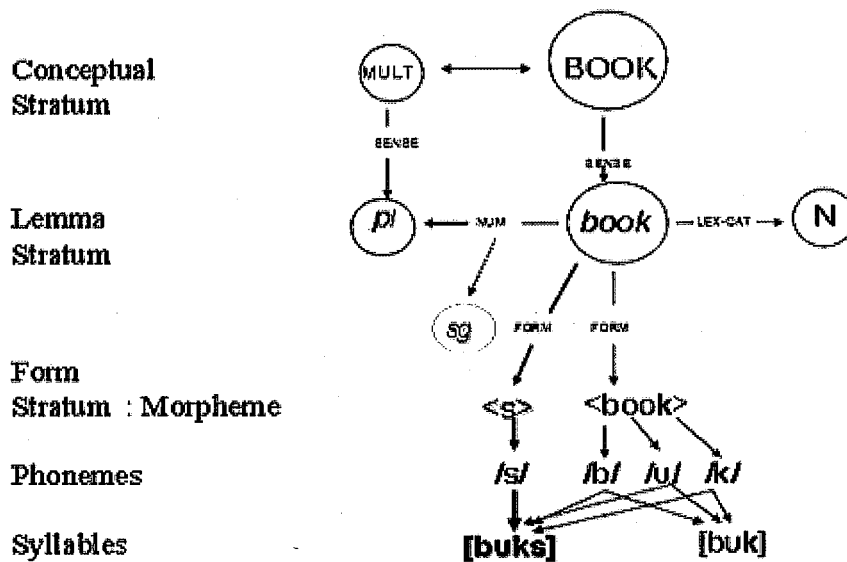


Figure 2. Production of the English expression books in Weaver++ (cf. Levell et al. 1999: 13, Figure 7).

30 Activation starts at the conceptual stratum, where lexical concepts become active in response to the speaker's communicative intent, flows from there to a lemma stratum, where grammatical information associated with specific lexical concepts and word forms is stored, to various levels (word, morpheme, syllable, and phoneme) within a form stratum. The diacritic features involved in agreement are subsidiary nodes associated with a lemma.

31 The lexical items of LFG correspond quite closely to a combination of the information in the lemma and form strata of WEAVER++, but note the diacritic features associated with the *book* lemma in Figure 2: one for lexical category, with one value; another for number, with two possible values. In LFG, there would be two distinct lexical forms in the lexicon, each permanently associated with one number value or the other. Note also that the plural value of the number lemma in WEAVER++ is **directly** activated by a MULTIPLE concept (MULT) as well as being **indirectly** activated via the lemma *book*. In other words, in addition to the forward flowing activation that links a single lexical concept to a single lexical form, activation also flows horizontally, from concept to semantically related concept and from lemma to diacritic features.

32 In this model, it is the combination of horizontal and vertical links through the neural network that leads ultimately to one specific word form being selected over others: the more active links in a network leading to a form, the more strongly activated that form becomes; and whichever form is most strongly activated overall is the one that gains access to the articulatory mechanisms producing actual speech.

33 If we take this model as our starting point, it is natural to ask: what happens when several concepts activate several lemmas at the same time?

### 4.3 Semantic agreement and co-activation

34 We suggest that when word forms frequently occur in quick succession during speech, horizontal links form between their lemmas, in the same manner as they form between a single lemma and a diacritic feature. This creates the possibility that independent lemmas can be activated

simultaneously by the same lexical concept, and each contribute to the activation of the other, yielding agreement without unification, and hence without procedural delays. We call this *co-activation* (see Charters et al. 2011 for more detailed discussion).

35 Some evidence in support of co-activation comes from instances of 'disagreement' or what Corbett (2006) calls **semantic agreement**. In some languages, a predicate can agree either with its syntactic subject, or its 'logical subject', yielding a different form in each case. Serbian (Croatian, Bosnian) is one such language: when quantified with the numerals '2', '3' or '4', the semantically masculine noun *ovek* 'man' in (4) appears in a genitive form, and the demonstrative has a neuter ending *-a*; the predicate 'good' can appear either in the neuter plural form, agreeing with the neuter **grammatical** gender of the demonstrative or with the **semantic** masculine gender of the quantified referent, *ovek* 'man'.

(4)	<i>ov-a</i>	<i>dva ovek-a</i>	<i>su dobr-a</i>	<i>/dobr-i</i>
	<i>these-</i>	<i>two man-</i>	<i>are good-</i>	<i>/good-</i>
	PL.NEUT	SG.GEN	PL.NEUT	PL.MASC

*'These two men are good'*

36 Without pursuing a formal analysis or productive account of how these alternative values are bestowed on the predicate, Corbett (2006) suggests that such agreement patterns arise because the grammar allows a choice as to whether the gender feature of a predicate adjective agrees with the syntactic representation, or an 'underlying' semantic or conceptual representation.

37 Further, controlled studies have been conducted in a number of languages, to investigate verbal agreement with subjects like *the label on the bottles*, which though grammatically singular, can have a distributive interpretation, where each bottle has its own label, so there are in fact many labels. This is referred to as **notional plural**. When plural marking appears on the verb this indicates that the verb's numeric value is selected on the basis of the **conceptual** distributive representation with multiple referents (notional plural, and co-activation of the verb and the Subject NP); singular-marking indicates access to a **grammatical** number value stored in the syntactic processor (unification). Strong distributivity effects – indicating access to conceptual structure – have been found in Dutch, French, Spanish, and Italian (see Vigliocco, Butterworth & Garrett 1996, Vigliocco, Butterworth & Semenza 1995, Vigliocco, Hartsuiker, Jarema & Kolk 1996). The findings for English are less clear-cut. Bock & Miller (1991), and Vigliocco, Butterworth & Garrett (1996) found no such effects for English, prompting Vigliocco, Hartsuiker, Jarema & Kolk (1996) to suggest that the relatively impoverished agreement marking of English makes it comparatively insensitive to notional number. However, in a carefully designed experiment, Humphreys & Bock (2005) investigated the effect on verbal number of subject phrases like *'the gang on the motorcycles'* and *'the gang with the motorcycles'*, which create a bias towards a distributive or collective interpretation respectively, and found that significantly more plural (i.e. 'ungrammatical') verb forms occurred with subjects favouring a distributed (notionally plural) construal than with those favouring a collective (notionally singular) construal. They concluded that "subtle variations in the notional number of sentence subjects can affect verb agreement in English. This finding implies that the implementation of verb number agreement is influenced not only by the grammatical number properties of subject nouns but also by the

number properties of the mental referents of subject noun-phrases." (Humphreys & Bock 2005: 694)

38 All these studies point to the fact that conceptual representations of referent quantity are available at times when number values are selected for inflectional affixes on predicates, and can affect the selection of those values, even when a conflicting value is present in the immediately preceding syntactic context. How much more likely is it then, that conceptual representations of quantity will affect lexical selection by a learner whose syntactic processor cannot effectively store the relevant syntactic information?

39 Interestingly, in all these examples, the semantic basis for agreement is only evident because it contrasts with a different and expected syntactically specified value, creating *syntactic disagreement*. Moreover they all involve subject-predicate agreement, not head-modifier agreement such as between a quantifier and a noun within a single phrase. Pienemann (1998; 2005) actually argues that subject-predicate agreement is harder to process because, to allow unification, the values of the subject must be stored in the processor until the verb form is selected, while in phrasal agreement, he says, information is all delivered to the phrasal procedure from conceptual structure at one time and need not be stored for as long. Since semantic subject-verb agreement also makes storage unnecessary, it should emerge in acquisition before syntactic agreement. Moreover, if the information required for phrasal agreement is all available at one time, why should a single concept not activate two lemmas simultaneously? By adopting the LFG approach to unification, Pienemann (1998; 2005) tacitly assumes that information can be delivered to only one lemma, otherwise unification would not be required.

40 If co-activation can produce semantic agreement between a numeral and a plural noun, this would place numeric plurals at the same stage as lexical plurals: the lexical stage, because both involve an inflection. The results of Di Biase and Kawaguchi's (2002) Italian study support that view. However, this still does not explain why numeric plurals should emerge *before* lexical plurals, as in Dao's data. To explain this, we turn to the second element in our account: typological differences between English and Vietnamese at both the conceptual level and the morphological level.

#### 4.4 Typological differences

41 Conceptually, these languages differ in their grammaticalisation of quantity concepts. English has a grammatical singular/plural number system, i.e. when any noun denoting a countable entity is used, the quantity of that entity must be signaled, if not by the noun, then by the choice or absence of determiner (article, demonstrative, quantifier, etc.) accompanying it.

42 Vietnamese, on the other hand, has what Corbett (2000) calls 'general number'. Nouns do not vary in form according to the quantity of entities to which they refer, and verbs do not inflect to reveal any characteristics, quantity or person, of their subjects. This means that there is no basis for positing a number feature in the lexical structure of Vietnamese nouns. In fact, there is no grammatical imperative to express quantity at all. If a Vietnamese speaker does express quantity - either numeric or vague - it is because they choose to do so, not because the grammar requires it of them.

43 Morphologically, English expresses grammatical number in various ways; by inflectional means: plural marking on nouns and subject agreement for

number (and person) on present tense verbs; by synthetic means: complex pronominal forms, irregular plural forms, and paradigms of singular/plural determiners (this/these, a/some); and by markers of countability (much/many).

44 In contrast, Vietnamese is expressed key grammatical concepts through free function words, and requires classifiers (CL) with any quantified nouns<sup>2</sup> (Doetjes 1996). Nouns fall into classes depending on which classifier they select (Aikhenvald 2003).

(5) hai cuốn sách  
two CL book  
'Two books'

(6) ba bông hoa  
three CL flower  
'Three flowers'

45 Despite these differences, in both English and Vietnamese, countability is entailed by expressions of number. In English, plural marking on a mass noun, e.g. *the cheeses*, forces a type interpretation because types are countable, where masses are not; in Vietnamese, use of a classifier with no numeral forces a singular interpretation because to be countable, a mass must first be individuated or delimited.

46 One straightforward way to convey these differences in lexical-semantic terms is to say that in English, most nouns are countable *and* express number; in Vietnamese, classifiers are countable but most nouns are *not*, and neither expresses grammatical number.

47 Since Vietnamese uses classifiers to express countability, and since they are independent words, each classifier has its own lemma, and the concept of countability is linked directly to lemmas, not to a diacritic feature. Thus, the Vietnamese conceptual system provides for activation of nodes relating to plurality at the lemma stratum in response to thinking of numbers, not things.

48 In learning a plural-marking language like English then, speakers of Vietnamese must learn to associate nouns with the expression of countability and number, even when no numerals are involved. This means they must learn first to attend to, and then to unconsciously process quantity, as they prepare to speak about entities, something not required when they use their L1.

49 Let us now draw together the threads of this account to see how numeric concepts in Vietnamese would be represented and activated in Weaver++, and how this representation can give rise to the emergence patterns for English plural marking observed by Dao (2007).

## 5. Developmental account

### 5.1 Hyponymy and Classifiers in Weaver++

50 To represent the conceptual relations between classifiers and numerals in Vietnamese, we borrow from Levelt et al.'s (1999) treatment of hyperonymy or relations between generic (superordinate) and more specific (hyponymous) terms. Taking account of earlier research by Roelofs (1992a; 1992b) which

revealed that 'distractor' words can facilitate retrieval of a semantically related target word, Levelt et al. (1999) suggest that co-hyponyms and their superordinate are all connected in the conceptual stratum and contribute activation to each other in that stratum. For example, in the experimental task of naming a pictured chair (as long as it is the only picture of a piece of furniture to be named in the experiment)<sup>3</sup> superimposition of the related words *furniture* (hyperonym), *bed* (cohyponym), and *throne* (hyponym) had a facilitating effect on the speed of the response. Figure 3, adapted from Levelt et al. (1999), shows how Weaver++ captures this through activation in hyponymous relations.

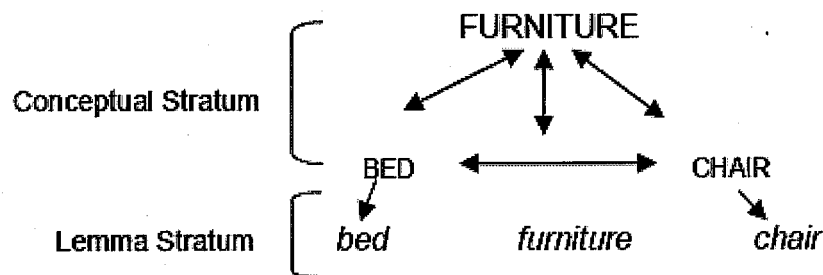


Figure 3. Facilitation in hyponymous networks in WEAVER++ (based on Levelt et al. 1999: 11, Fig. 5)

- 51 When the concept "CHAIR" is active, activation flows to the chair lemma and to the concepts of its superordinate FURNITURE, and its co-hyponyms, like BED. Activation then flows from the BED concept to the bed lemma, and from the superordinate to all its hyponyms, and vice versa. Thus a concept directly activates its own lemma and indirectly activates the lemmas of its superordinate and co-hyponyms. Each link adds activation to the network to which it belongs. So thinking about co-hyponyms simultaneously increases activation of the superordinate.
- 52 In our representation of Vietnamese, in Figure 4 we treat the general classifier *cái* which applies to most inanimate objects except those with a more specific classifier, as a hyperonym for those more specific forms, exemplified by *bông* the classifier for flowers (*hoa*) and *cuốn* the classifier for books (*sách*). The lemma of the classifier *cái* is linked directly to a lexical concept we call simply UNIT reflecting countability, the concept that unites all classifiers, and each specific classifier has a lemma and a concept that we name after the classifier form they activate. At the conceptual stratum, each specific classifier concept is linked to every other, and to the more general concept UNIT; specific classifiers are then effectively co-hyponyms of UNIT. In addition, each specific classifier is also linked to the concepts of the entities they classify.

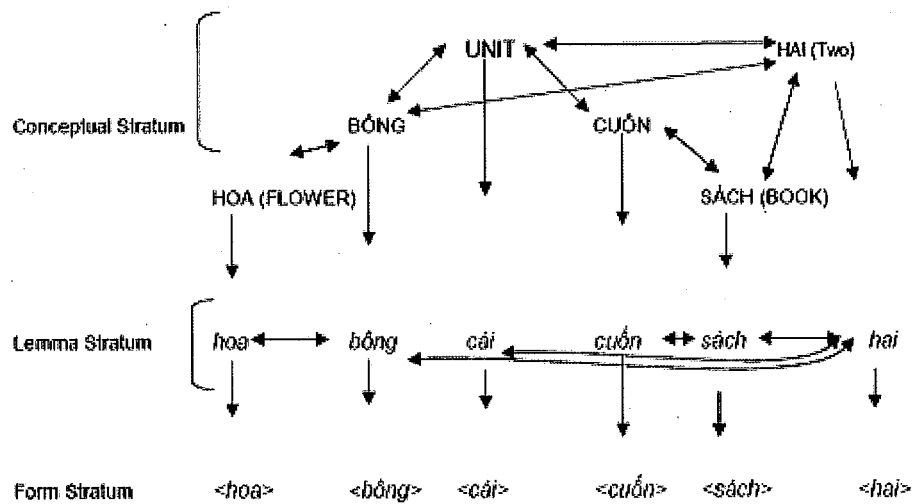


Figure 4. Relations between UNIT, CLASSIFIER, ENTITY, and NUMERIC concepts in Vietnamese.

- 53 At the lemma level, the lemmas of specific classifiers and related entities are also linked, because there is a syntactic collocation requirement between them.
- 54 Finally, NUMERIC concepts such as *hai*'two' and their lemmas are linked to CLASSIFIER concepts including UNIT, and their lemmas, but not directly to ENTITY concepts and Entity lemmas. Thus the classifiers must contribute activation to the network before a numeral and noun can be selected together. This inevitably leads to selection of the classifier form together with numeral and noun forms. We believe the links between numeral and classifier are stronger than those between classifier and noun, since anecdotally, the former functions pronominally at a higher frequency than the latter. This needs to be verified through research.

## 5.2 Steps in Acquisition

### Step 1: No plural marking

- 55 If the structure shown in Figure 4 above were used to process English, the UNIT concept would be activated when a numeral is, but for most English nouns, no English forms would be found to correspond to any classifier lemma, so links with those lemmas would weaken. The form <-s> may exist in the formal repertoire of the learner, but it cannot be activated in unconscious production, as it has no lemma and no connection to any lexical concept in the L1 network. This gives us the first step in acquisition, where no English nouns exhibit plural marking.

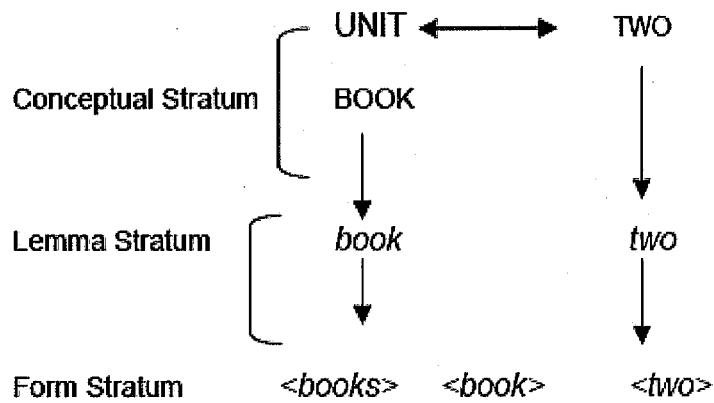


Figure 5. Loss of indirect connection between UNIT and ENTITY concepts.

**Step 2: Numeric plural**

56 At step 2, activation of a NUMERIC concept still activates the UNIT concept, but in the absence of Unit lemmas in the L2, cognitive processors attempt to identify other active nodes at the lemma stratum with which to forge a link. Facilitated by exposure to English, a node is developing to link the affix <-s>, with the concept of PLURALITY; but there is as yet, no clear link between PLURALITY and ENTITY concepts or noun lemmas. Instead, a weak link is forged between the active UNIT concept and the emerging Plural node. As a consequence, the L1 UNIT concept takes on the character of the L2 PLURAL concept which entails countability (as UNIT also did). The L2 system has departed from the L1 system.

57 As a consequence, it is primarily the activation of the emerging PLURAL concept by NUMERIC concepts that leads to selection of the plural form <-s>. That form is realised on nouns because plural noun forms are stored as syllabic structures in the form level; there is no *independent* form <-s> to which the plural node can be linked, as shown in Figure 6.

58 Note that there is no syntactic unification here; information is not transferred between the Numeral and noun lemma. It is co-activation of a numeral and a plural morpheme both responding to the UNIT concept and Plural lemma.

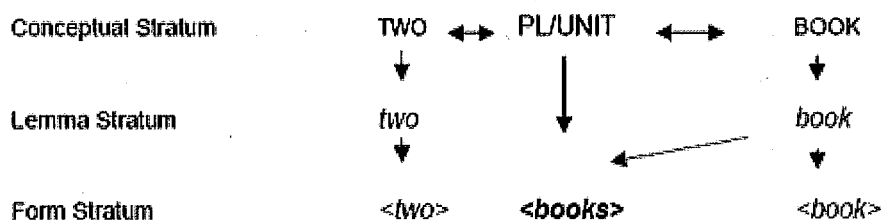


Figure 6. Numerals facilitate activation of plural node.

59 When no numeral is present, neither the original UNIT concept nor the emergent PLURAL concept is activated. The emerging link from the noun lemma to the inflected plural noun form is not strong enough alone to select that form over the simpler <book>.

60 Over time though, with use of the plural marking with a numeral, the links between the new PLURAL/COUNT concept, the noun lemmas and inflected forms will strengthen; a plural *morpheme* will develop as a discrete entity; the plural node in the lemma stratum will become subsidiary to the noun lemma,



forming a diacritic feature and plural-marking will become target-like as shown in Figure 7.

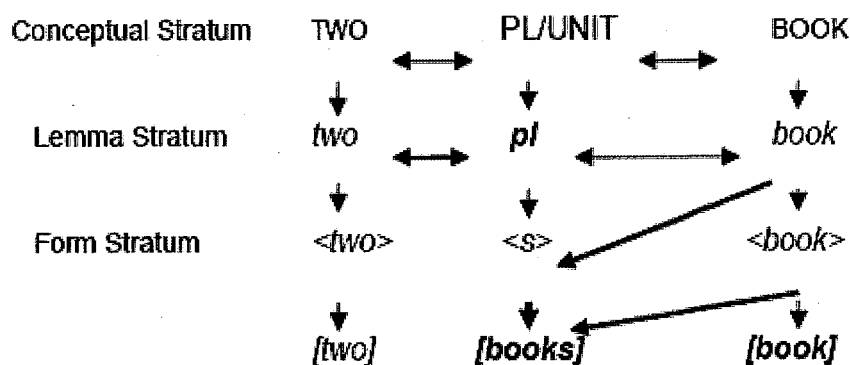


Figure 7. Target-like plural-marking in L2 English.

- 61 When numerals are involved, this still need not require syntactic unification. As long as they are activated along with nouns in response to the same conceptual representation, numerals need have no diacritic feature for number; the unacceptability of *five dog* may register only at the conceptual level, not the syntactic level.

## 6. Conclusions

- 62 In conclusion, by combining the notion of co-activation or semantic agreement - where two lemmas are activated by the same concept, with the notion of conceptual transfer, where conceptual-lexical links in the L1 provide a neural scaffold into which emerging L2 lemmas can be integrated, we have provided a plausible, theoretically grounded account of the early emergence of numeric plural in the ESL of Vietnamese learners. The model of hyponymy proposed in Weaver++ can be applied effectively to classifier systems and produces interesting hypotheses with regards to the transition from general number to grammatical number in SLA.
- 63 It seems clear that the notion of 'phrasal agreement' is much too coarse to capture the variation in processing demands of nominal structures cross-linguistically. In seeking to understand and account for the path of acquisition, more attention needs to be paid to the way number and other features are conceptualised in different linguistic systems, as well as to the means of expression and processes of agreement available to learners at different stages of development.

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## Notes

- 1 These feature structures are simplified: LEXCAT = Lexical category; DET = Determiner; DEIXIS, stands in for features that would limit the use of the form to contexts with a retrievable antecedent; LOC stands for Locative, and PROXIMATE, is intended as a value that contrasts with a counterpart in *that* and *those*.
  - 2 English has a few words of a similar type, like the inherently singular and non-inflecting *head* which selects an inherently plural noun as in *ten head of cattle*, but most English measure words are simply count nouns that can quantify mass nouns, like *slice* in *ten slices of bread*.
  - 3 Experiments show that a distracter that is also a potential target has an inhibitory rather than facilitative effect, see Levelt et al. (1999: 10ff) for discussion.
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